

LIVESTOCK SECTOR REPORT

CAMBODIA · LAO PDR · THAILAND · VIETNAM

REVIEW OF THE LIVESTOCK SECTOR IN THE MEKONG COUNTRIES

Vivian Knips

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Introduction

There are various reasons for devoting attention to the livestock sector in the Mekong countries. Although agricultural sector in all four countries is so far still strongly dominated by rice production; development of the sector, and hence of rural communities, will require increasing intensification, which in turn entails shifting from rice to higher value production per hectare and per unit of labour. Livestock production, particularly in the context of an agrarian structure dominated by very small farms, offers the opportunity to capture a higher value-added per hectare than crop-based agriculture. Additionally, efficiency gains in crop and livestock production are to be realised through the further development of integrated farming systems.

Furthermore, there is ample scope to increase animal production since prospects for rising regional and international demand for livestock products, particularly, pork, poultry and milk, appear to be fairly strong.

Finally, livestock plays an important role for the livelihoods of poor farmers both as a food and income source. On one hand, the development of livestock stands to markedly improve the nutritional status of the population by adding more protein to diets and helping to alleviate protein deficiency; and on the other hand, livestock is an important source of income for a large share of farmers in the Mekong region and its development has important repercussions for poverty reduction and income distribution, directly for the single household and through multiplier effects on local communities.

The economy and the agricultural sector

The four Mekong countries Cambodia, Lao PDR, Thailand and Vietnam do not form a homogeneous group but rather show significant differences concerning living standards, economic performance, per capita income and population size. Lao PDR, Cambodia and Vietnam are among the poorest and least developed countries in East Asia whereas Thailand belongs to the group of newly industrialising countries (NICs) in the region.

While the GDPs of Lao PDR and Cambodia only amounted to USD 3.6 or 2.4 billion in 2000, the economies of Vietnam and Thailand are a multiple of this size with GDPs of USD 27.9 and 170.3 billion respectively. All four countries experienced strong economic growth in the last decade with average annual GDP growth rates of between 5 and 7 percent (Table 1).

Agriculture remains an important part of the economies and societies of the Mekong countries with large shares in overall GDP and employment. The sector's contribution to overall GDP amounts to as much as 52.9 percent in Lao PDR, 37.1 percent in Cambodia, 24.3 percent in Vietnam and is of somewhat less importance in Thailand with a contribution of 10.5 percent.

Whereas the share of agriculture in total GDP has declined in all four countries between 1990 and 2000, the importance of the livestock sector within agriculture has moderately increased over the same period. In 2000 livestock contributed roughly around 20 percent to agricultural GDP in all four countries while the contribution of livestock to overall GDP was 5.4 percent for Vietnam, 10.3 percent for Lao PDR, 9.7 percent for Cambodia and 2.5 percent for Thailand (Table 1).

A comparison of the crop and livestock production indices over the last twenty years taking 1990 as the reference year shows that livestock production has grown stronger than crop production. The indices for livestock production which started from a lower level than those for crop production had surpassed the latter in all four countries by the year 2000.

Table 1: Mekong region: GDP, agricultural GDP and contribution of livestock to agricultural and total GDP, 1980-2000.

Country	Year	Billion US \$ and shares					Crop production index ⁴	Livestock production index ⁴
		GDP ¹	Share agricultural GDP in total GDP ²	Share livestock GDP in agr. GDP ³	Share livestock GDP in total GDP ³			
Cambodia	1980			10.5%		66.5	25.5	
	1990	2.2	55.6%	23.0%	12.8%	99.7	97.2	
	2000	3.6	37.1%	26.2%	9.7%	148.6	169.7	
Lao PDR	1980			14.4%		72.8	58.2	
	1990	1.3	61.2%	16.1%	9.9%	109.1	100.2	
	2000	2.4	52.9%	17.4%	10.3%	173.4	174.8	
Thailand	1980	52.2	23.2%	17.9%		81.2	62.9	
	1990	111.1	12.5%	23.0%	2.9%	93.8	97.3	
	2000	170.3	10.5%	23.6%	2.5%	123.4	130.0	
Vietnam	1980			16.2%		66.1	47.1	
	1990	13.6	37.5%	21.5%	8.1%	99.6	101.2	
	2000	27.9	24.3%	22.3%	5.4%	176.1	183.4	

¹ WDI 2002 in constant 1995 dollars

² WDI 2002

³ Calculated based on agriculture and livestock production indices in FAOSTAT 2003

⁴ FAOSTAT 2003 based on a 1989-91 three year average equal to 100

Population and Poverty

Table 2 gives the population sizes and expected rural and urban population growth for the four Mekong countries. Vietnam and Thailand have relatively large populations with 78.1 and 62.8 million people in 2000 respectively - Vietnam alone accounts for about half of the population of the Mekong region - and are densely populated. Cambodia and Lao PDR have much smaller populations of 13.1 and 5.3 million people in 2000, and also population density is much lower than in the other two countries.

Urbanization is progressing in the Mekong countries at a pace above demographic growth. However, despite this trend, by 2015 the greater part of the countries' population will still be living in rural areas.

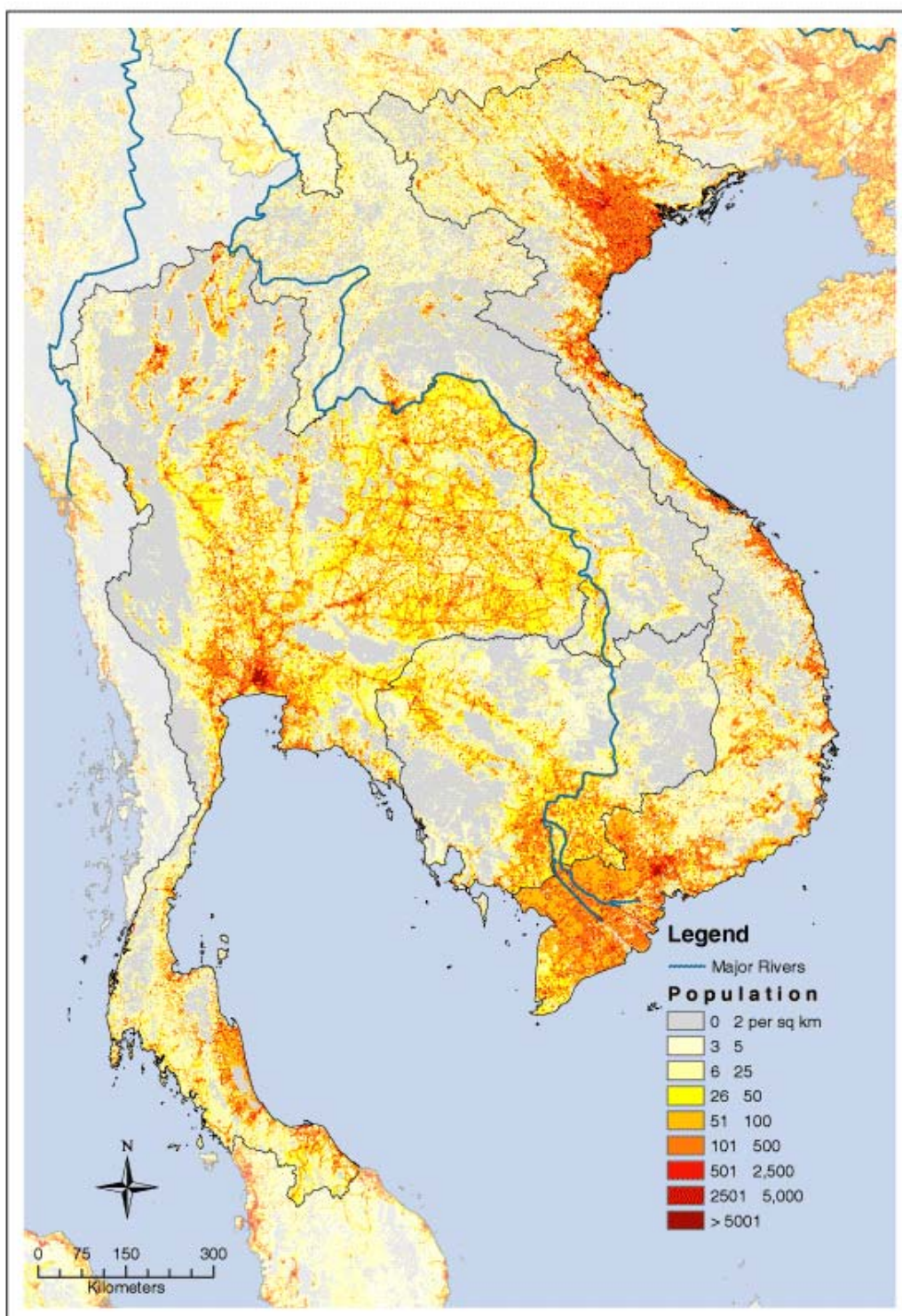
Table 2: Population (in millions and shares) in the Mekong countries, and urbanization trends, 2000 and 2015.

Country	Urban (2000) ¹	Rural (2000) ¹	Total	Urban (2015) ¹	Rural (2015) ¹	Total	2000- 2015 p.a. growth of urban pop ²	2000- 2015 p.a. growth of rural pop ²
Million people								
Cambodia	2.2 (16.9%)	10.9 (83.1%)	13.1	4.9 (26.1%)	13.7 (73.9%)	18.6	5.3	1.5
Lao PDR	1.0 (19.3%)	4.3 (80.7%)	5.3	2.0 (27.1%)	5.3 (72.9%)	7.3	4.6	1.4
Thailand	12.5 (19.8%)	50.4 (80.2%)	62.8	17.6 (24.2%)	54.9 (75.8%)	72.5	2.3	0.6
Vietnam	18.8 (24.1%)	59.3 (75.9%)	78.1	29.9 (31.6%)	64.6 (68.4%)	94.4	3.1	0.6
Mekong region	34.5 (21.7%)	124.8 (78.3%)	159.3	54.4 (28.1%)	138.6 (71.9%)	192.8	3.0	0.7

Source: ¹ FAOSTAT 2003² average logarithmic growth rates

Even though the percentage of the overall population which is dependent on agriculture for their livelihoods is decreasing as people move from agricultural into non-agricultural sectors, the agricultural population is expected to increase in all countries except Thailand (Table 3).

Map 1: Human population density (per square kilometre).



Source: LandScan 2002

Table 3: Population (historical figures and projections) active in agriculture in the Mekong countries.

Country	Year	Agricultural ¹	Non agricultural
Cambodia	1980	5.0 (76%)	1.6 (24%)
	1990	7.1 (74%)	2.5 (26%)
	2000	9.2 (70%)	3.9 (30%)
	2010	11.0 (66%)	5.6 (34%)
Lao PDR	1980	2.6 (79%)	0.7 (21%)
	1990	3.2 (78%)	0.9 (22%)
	2000	4.0 (77%)	1.2 (23%)
	2010	4.9 (74%)	1.7 (26%)
Thailand	1980	29.6 (64%)	16.4 (36%)
	1990	31.1 (57%)	23.6 (43%)
	2000	30.8 (49%)	32.1 (51%)
	2010	28.6 (41%)	41.0 (59%)
Vietnam	1980	38.7 (73%)	14.3 (27%)
	1990	47.1 (71%)	19.0 (29%)
	2000	52.6 (67%)	25.5 (33%)
	2010	56.0 (63%)	32.7 (37%)

Source: FAOSTAT 2003 (FAO 2003).

Despite the negative impact the Asian crisis (1997/98) had on the region, the Mekong countries have experienced high growth rates of per capita income between 1990 and 2000, ranging from as much as 5.4 percent annually in Vietnam to 4.1 percent in Thailand, 3.7 percent in Lao PDR and 1.8 percent in Cambodia (World Bank WDI 2002).

Table 6 shows that with the exception of Thailand overall poverty has been decreasing during the last decade in the Mekong countries. The increase of poverty in rural Thailand between 1992 and 1999 can be attributed to the economic crisis that hit the country in 1997, followed by a contraction of GDP by more than 10 percent. However, even with this increase in poverty, the share of people living below the national poverty line is less than half the size of that in the other three countries.

For all four countries the incidence of poverty in rural areas is much higher than in urban areas, this is especially pronounced in Thailand and Vietnam. Moreover it shows that despite the fact that Thailand is a much richer country in GDP per capita terms than the other three, the number of people living in poverty in Thailand is bigger than for Laos and Cambodia together while the number of poor people in Vietnam is double that of the other three countries combined.

¹ The agricultural population is defined as all persons depending for their livelihood on agriculture, hunting, fishing or forestry. This estimate comprises all persons actively engaged in agriculture and their non-working dependants.

Table 4: Population living in poverty in countries in the Mekong region, 2000.

	Estimated 2000 population (million)			Poverty incidence (%)		Number of people in poverty (million)		
	Total	Urban	Rural	Urban	Rural	Total	Urban	Rural
Cambodia	11.1	1.8	9.3	25.2	40.0	4.2	0.4	3.7
Lao PDR	5.4	1.3	4.1	26.1	41.0	2.0	0.3	1.7
Thailand	61.4	13.3	48.1	1.5	17.2	8.5	0.2	8.3
Vietnam	79.8	15.7	64.1	9.0	45.0	30.3	1.4	28.8

Source: Asian Development Bank – Key indicators 2003

Human diets

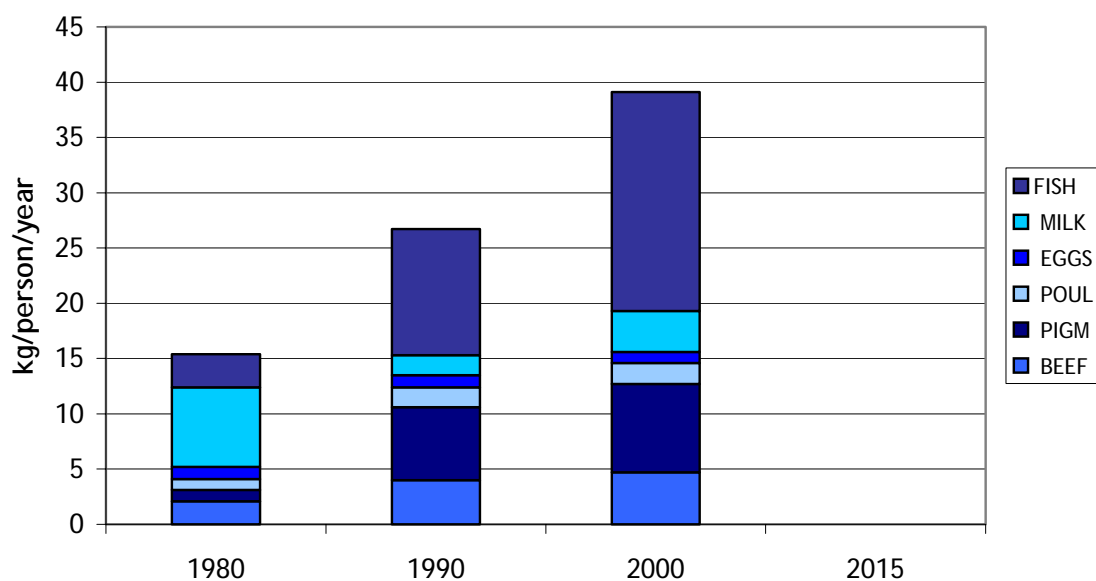
Historic and expected trends in animal food consumption are given in figures 1-4. In general, consumption of animal products has increased over the last two decades with an equally strong increase in the consumption of meat and fish/seafood. This increase in consumption is strongly skewed to urban populations where incomes have risen much faster and poverty incidence is much lower than in rural areas.

As evidence for Thailand and Vietnam indicates that income elasticities for the demand of livestock products are positive, demand for those products will most likely continue to increase with rising per capita incomes and it can reasonably be expected that the same holds true for Cambodia and Laos.

With the exception of Thailand meat consumption per caput is dominated by pork. Only in Thailand does poultry meat have the highest per caput consumption. The development in the per capita consumption of meat is expected to closely resemble that of fish and seafood, implying that there will be no shift in consumption patterns between the two products with rising incomes. Nevertheless, rising incomes especially in urban areas of Thailand and Vietnam have led to considerable changes in dietary preferences and have brought about a more demanding public wishing to substitute 'staples' such as rice with higher quality and protein rich food.

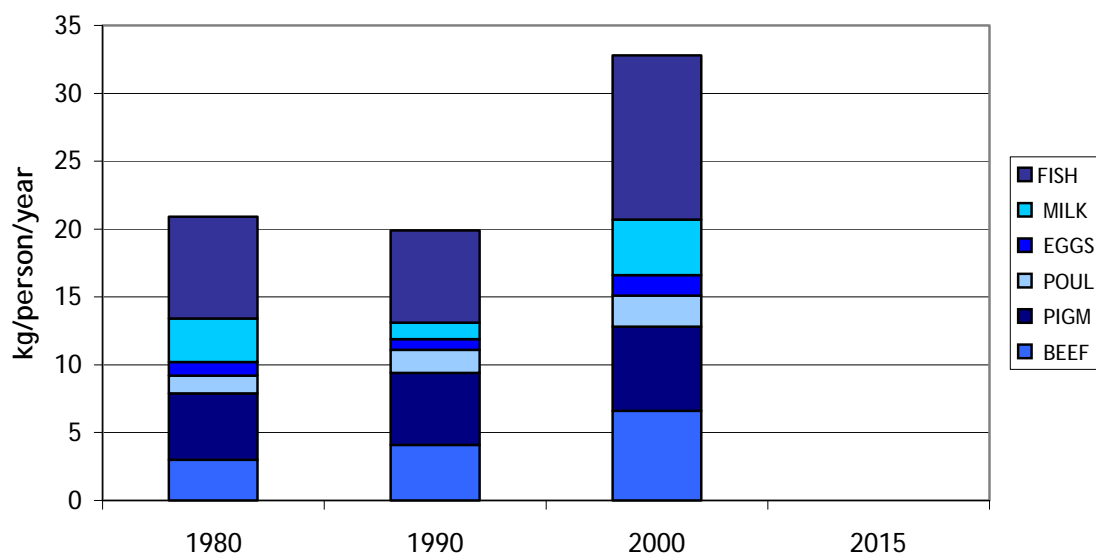
Milk and milk products do not belong to the traditional diet in the Mekong countries; however, especially in urban centres the demand for dairy products is increasing (Kaufmann *et al.*, 2003). Thailand is the only one of the four countries so far where per caput consumption of milk and eggs has been increasing considerably and this trend is expected to continue in the next decade.

Figure 1: Cambodia - Trends in per capita consumption of livestock products 1980-2000.



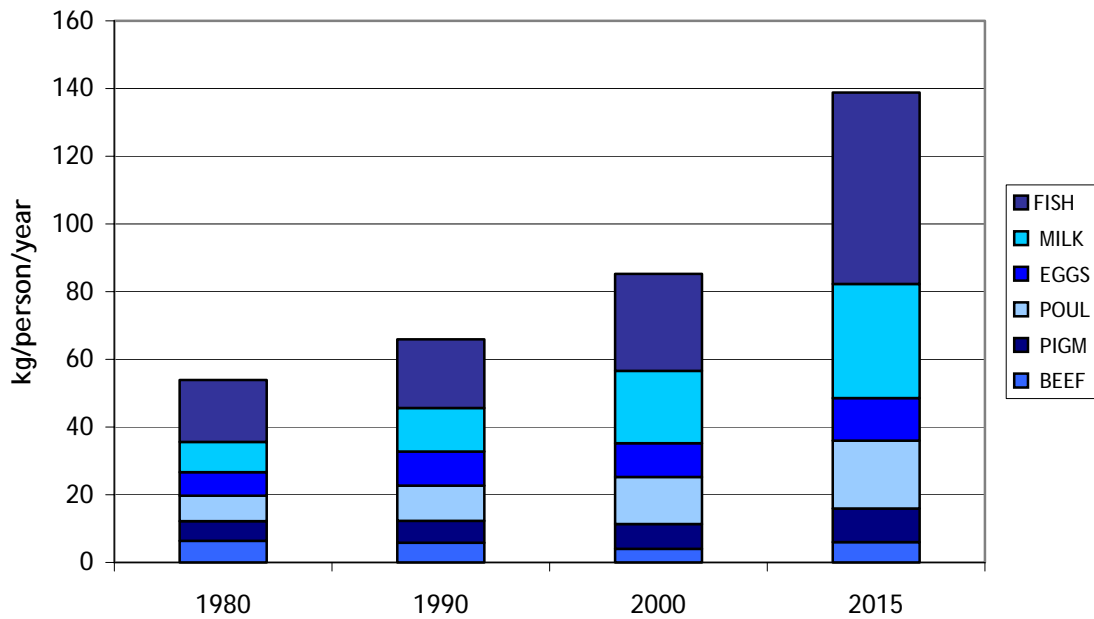
Sources: FAO WAT 2015/2003, FAO Yearbook of Fishery Statistics 2002, ACIAR

Figure 2: Lao PDR - Trends in per capita consumption of livestock products 1980-2000.



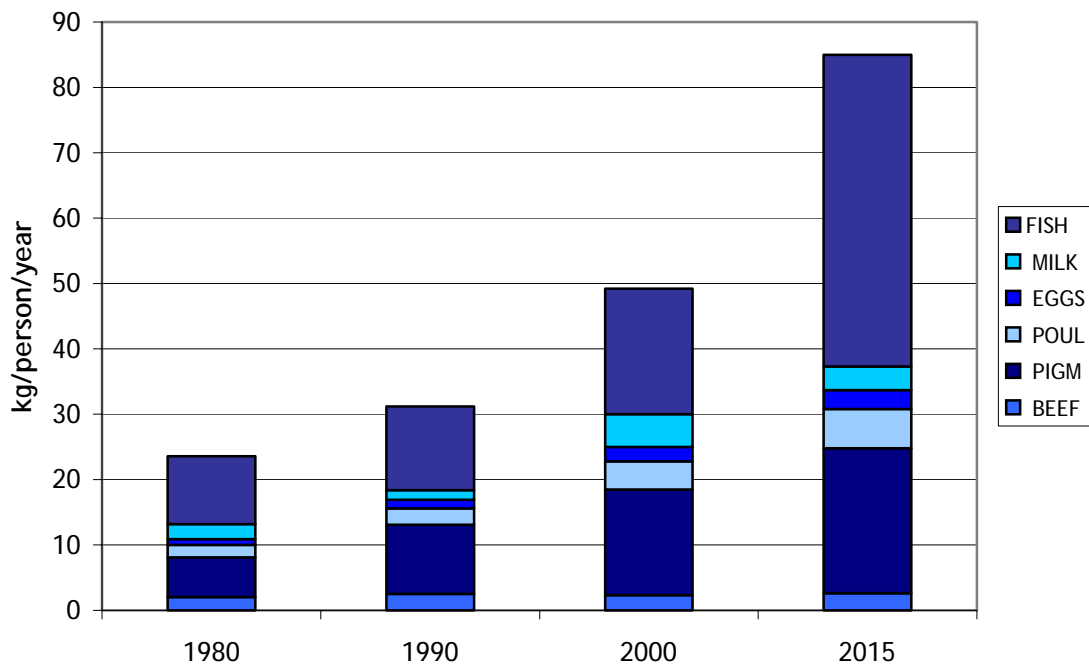
Sources: FAO WAT 2015/2003, FAO Yearbook of Fishery Statistics 2002, ACIAR

Figure 3: Thailand - Trends in per capita consumption of livestock products 1980-2015.



Sources: FAO WAT 2015/2003, FAO Yearbook of Fishery Statistics 2002, ACIAR

Figure 4: Vietnam - Trends in per capita consumption of livestock products 1980-2015.



Sources: FAO WAT 2015/2003, FAO Yearbook of Fishery Statistics 2002, ACIAR

Trends in production and consumption of livestock products

General overview

From 1980 to 2000 consumption of livestock products in the Mekong region has shown strong increases with production patterns, except for the case of milk, having closely followed the trends in consumption. None of the four countries has managed to raise dairy production fast enough to meet the local demand and all depend on imported dairy products. Most of the expansion in meat production has come from pigs and poultry animals. Increasing demand for livestock products can be ascribed to per capita income growth, population growth and progressing urbanisation.

Beef

Between 1980 and 2000, production and consumption of beef have increased in all countries with the exception of Thailand with especially strong increases in Cambodia and Laos where the beef production and consumption quadrupled over this period. Production and consumption of beef are estimated to further increase within the next 10 years by factors of between 1.4 and 1.8. Cambodia, Lao PDR and Vietnam are expected to remain self-sufficient in the production of beef for the next decade with Lao PDR even achieving a trade surplus of about 10 percent. In contrast, Thailand will most probably remain dependent on beef imports for meeting part of the domestic demand for beef in the years to come (Table 5).

Table 5: Development of beef¹ production and consumption.

Country	Year	Production (1000 Mt)	Consumption (1000 Mt)	Net Trade ² (1000 Mt)	Self-sufficiency ratio % ³
Cambodia	1980	14.0	14.0	0.0	100.0
	1990	38.8	38.8	0.0	100.0
	2000	61.4	60.1	1.3	102.1
	2015	92.7	92.7	0.0	100.0
Lao PDR	1980	9.7	9.7	0.0	99.8
	1990	22.2	16.8	5.5	132.6
	2000	38.5	33.9	4.6	113.5
	2015	68.0	57.5	10.5	118.2
Thailand	1980	297.7	293.2	4.5	101.5
	1990	313.1	316.7	-3.6	98.8
	2000	220.5	248.2	-27.6	88.9
	2015	384.9	434.9	-50.0	88.5
Vietnam	1980	102.7	104.3	-1.6	98.5
	1990	162.7	162.9	-0.2	99.9
	2000	175.6	175.7	-0.1	99.9
	2015	241.3	241.3	0.0	100.0

¹ beef includes cattle and buffalo meat

² negative values mean net imports

³ SSR = ratio output / domestic disappearance. Domestic disappearance is equal to production minus net trade and net changes in stocks.

Pork

The production and consumption of pork has risen significantly in all four countries between 1980 and 2000 with an especially marked increase in Cambodia. Cambodia started from very low production and consumption levels in 1980 and since then production and consumption have risen by a factor of 16.

Between 2000 and 2015 further increases in the production and consumption of pork of a factor of 1.6 for Thailand and Vietnam and about 2 for Cambodia and Laos PDR are expected. Except in the case of Thailand production is expected to keep pace with the growing consumption of pork in all countries. Thailand is expected to have lost its self-sufficiency by the year 2015 and might have to meet a minor part of the domestic demand for pork through imports (Table 6).

Table 6: Development of production and consumption of pork.

Country	Year	Production (1000 Mt)	Consumption (1000 Mt)	Net Trade ¹ (1000 Mt)	Self-sufficiency ratio % ²
Cambodia	1980	6.5	6.5	0.0	100.0
	1990	64.0	64.0	0.0	100.0
	2000	102.5	102.5	0.0	100.0
	2015	188.6	188.6	0.0	100.0
Lao PDR	1980	15.7	15.7	0.0	100.0
	1990	21.1	21.8	0.0	96.9
	2000	32.1	32.1	0.0	99.9
	2015	66.0	66.0	0.0	100.0
Thailand	1980	265.1	264.8	0.3	100.1
	1990	357.7	356.9	0.9	100.2
	2000	460.7	457.9	5.9	101.3
	2015	714.9	724.9	-10.0	98.6
Vietnam	1980	322.7	322.2	0.5	100.2
	1990	719.3	702.6	16.6	102.4
	2000	1318.7	1248.4	70.3	105.6
	2015	2105.9	2096.1	9.8	100.5

¹ negative values mean net imports

² SSR = ratio output / domestic disappearance. Domestic disappearance is equal to production minus net trade and net changes in stocks.

Poultry

Poultry production and consumption have risen by around factor of three in all four countries between 1980 and 2000 and are expected to continue to increase by factors from two for Thailand to 5.7 for Lao PDR. While in Cambodia, Lao PDR and Vietnam production and consumption grow at the same pace, in Thailand production has outpaced consumption since 1980 and net trade of poultry has been rising fifteen-fold between 1980 and 2000. Thailand's export surplus is likely to shrink by the year 2015 but all countries are probably going to remain self-sufficient (Table 7).

Table 7: Development of production and consumption of poultry.

Country	Year	Production (1000 Mt)	Consumption (1000 Mt)	Net Trade ¹ (1000 Mt)	Self-sufficiency ratio % ²
Cambodia	1980	6.6	6.6	0.0	100.0
	1990	16.9	16.9	0.0	100.0
	2000	24.7	24.7	-0.1	99.6
	2015	46.8	46.8	0.0	100.0
Lao PDR	1980	4.3	4.3	0.0	100.0
	1990	7.2	7.2	0.0	100.0
	2000	11.5	11.7	-0.1	99.0
	2015	29.3	29.3	0.0	100.0
Thailand	1980	374.1	374.1	20.9	105.9
	1990	720.1	566.8	140.8	124.3
	2000	1202.3	863.8	317.0	135.8
	2015	1595.3	862.5	116.8	107.9
Vietnam	1980	97.9	98.3	-0.3	99.7
	1990	166.9	166.9	0.0	100.0
	2000	327.4	328.4	-1.0	99.7
	2015	566.5	566.5	0.0	100.0

¹ negative values mean net imports

² SSR = ratio output / domestic disappearance. Domestic disappearance is equal to production minus net trade and net changes in stocks.

Milk

Between 1980 and 2000 milk production increased by moderate factors of 1.5 to 2 in Cambodia, Lao PDR and Vietnam, whereas in the same period milk production in Thailand grew by a factor of 25.² For the period from 2000 to 2015 a further moderate increase in milk production is expected in all four countries. However, even if these increases in production are achieved, none of the countries will manage to reach self-sufficiency ratios of even 50 percent but all four will remain dependent on milk imports to satisfy domestic consumer demand which, since 1990, has risen much faster than production in all countries but Thailand (Table 8).

² This rapid growth was triggered by a large scale government program including such measures as import restrictions and the establishment of a country-wide collection network as well as local content regulation which obliges dairy processors to use a minimum amount of locally produced milk in their products.

Table 8: Development of production and consumption of milk.

Country	Year	Production (1000 Mt)	Consumption (1000 Mt)	Net Trade ¹ (1000 Mt)	Self-sufficiency ratio % ²
Cambodia	1980	13.9	47.8	-34.6	28.6
	1990	17.0	17.2	-1.1	94.1
	2000	20.3	47.2	-28.0	42.0
	2015	29.0	56.3	-29.1	49.9
Lao PDR	1980	3.1	10.3	-8.8	26.3
	1990	4.7	5.0	-2.9	62.1
	2000	5.9	21.4	-18.8	23.8
	2015	10.5	31.8	-27.2	27.9
Thailand	1980	18.8	410.1	-383.9	4.7
	1990	136.5	702.8	-589.2	18.8
	2000	465.4	1326.7	-878.8	34.6
	2015	989.2	2453.7	-1500.0	39.7
Vietnam	1980	41.7	119.3	-78.9	34.6
	1990	60.3	97.5	-39.0	60.7
	2000	70.7	385.3	-316.7	18.2
	2015	120.0	336.7	-220.0	35.3

¹ negative values mean net imports

² SSR = ratio output / domestic disappearance. Domestic disappearance is equal to production minus net trade and net changes in stocks.

Eggs

The production and consumption of eggs has been increasing by a moderate factor of between two and three in all for countries in the period from 1980 to 2000. A further moderate increase is predicted for the period of 2000 to 2015 and all four countries are expected to continue being self-sufficient.

Table 9: Development of production and consumption of eggs.

Country	Year	Production (1000 Mt)	Consumption (1000 Mt)	Net Trade ¹ (1000 Mt)	Self-sufficiency ratio % ²
Cambodia	1980	7.5	7.0	0.0	100.0
	1990	11.3	10.2	0.0	100.0
	2000	14.8	13.3	0.0	99.9
	2015	34.5	31.0	0.0	100.0
Lao PDR	1980	3.9	3.3	0.0	100.0
	1990	4.3	3.5	0.0	100.0
	2000	8.9	7.6	0.0	100.0
	2015	14.2	11.9	0.0	100.0
Thailand	1980	417.5	320.6	1.4	100.3
	1990	708.9	554.7	8.9	101.3
	2000	799.8	615.7	5.2	100.7
	2015	1157.5	903.8	0.0	100.0
Vietnam	1980	55.3	48.8	0.1	100.2
	1990	97.1	83.3	2.9	103.1
	2000	178.8	166.8	-1.0	99.4
	2015	290.4	269.2	0.0	100.0

¹ negative values mean net imports

² SSR = ratio output / domestic disappearance. Domestic disappearance is equal to production minus net trade and net changes in stocks.

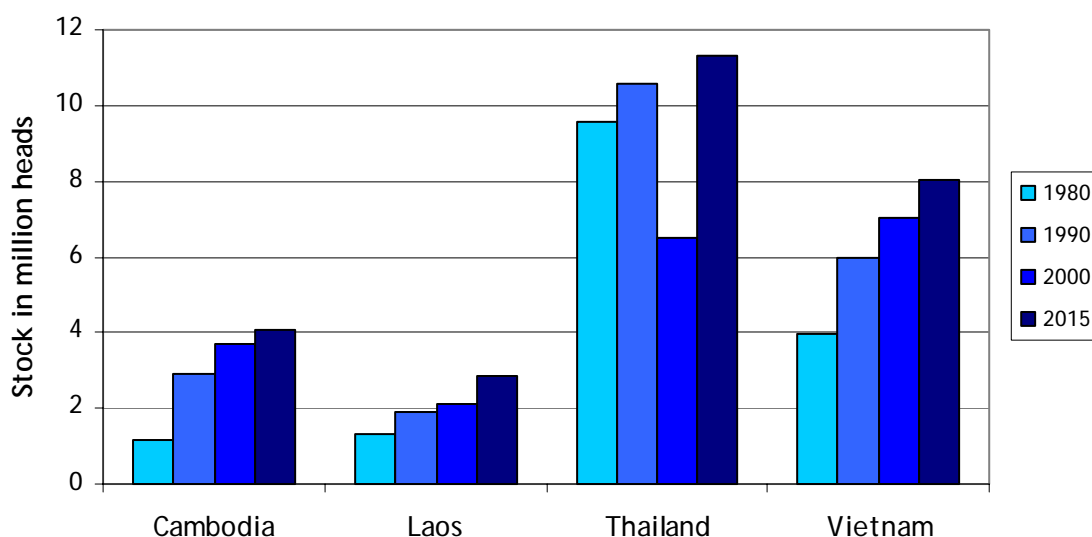
Livestock populations and productivity

Numbers of animals of all four species have increased strongly over the period from 1980 to 2000 (Figures 5 to 7). Especially strong have been the increases in the population of chicken which increased by factors of between 2.8 for Lao PDR and 6.2 for Cambodia. The sharpest rise in animal numbers occurred for pigs in Cambodia where the numbers rose by a factor of 14.7 starting from a very low level in 1980. The increase in animal numbers is expected to continue until 2015 for all four countries, however, at a somewhat slower pace.

The huge drop in the buffalo population observed for Thailand between 1990 and 2000 can be mainly attributed to the reduced importance of buffaloes as draft animals due to the increased mechanisation of agriculture (FAO RAP, 2002a).

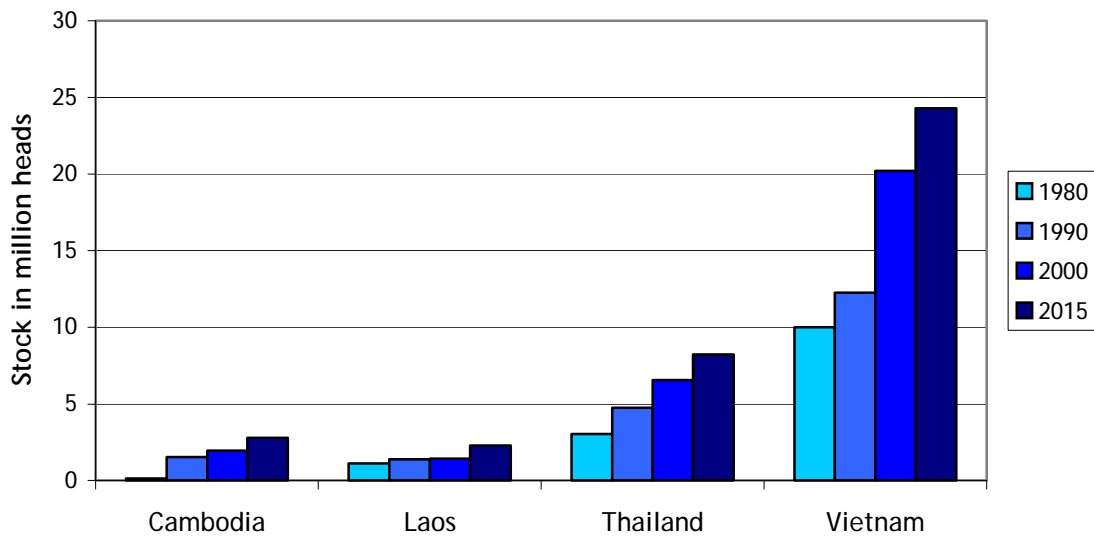
Compared to OECD countries, productivity of livestock is still very low in the Mekong region. Livestock in Thailand and Vietnam perform somewhat better than those in Lao PDR and Cambodia but are still far from reaching OECD country level. Relatively the best performance is achieved in the production of pork where Thailand and Vietnam achieve about two thirds the annual offtake of meat per animal achieved in the OECD countries. Even in a regional comparison, livestock in Cambodia and Lao PDR perform poorly with significantly lower productivity levels than those in Thailand and Vietnam. Overall, Lao PDR has the lowest livestock productivity while Thailand reaches the highest levels in the region (Annex Table A2).

Figure 5: Historic and projected number of buffaloes and cattle in the Mekong countries 1980-2015.



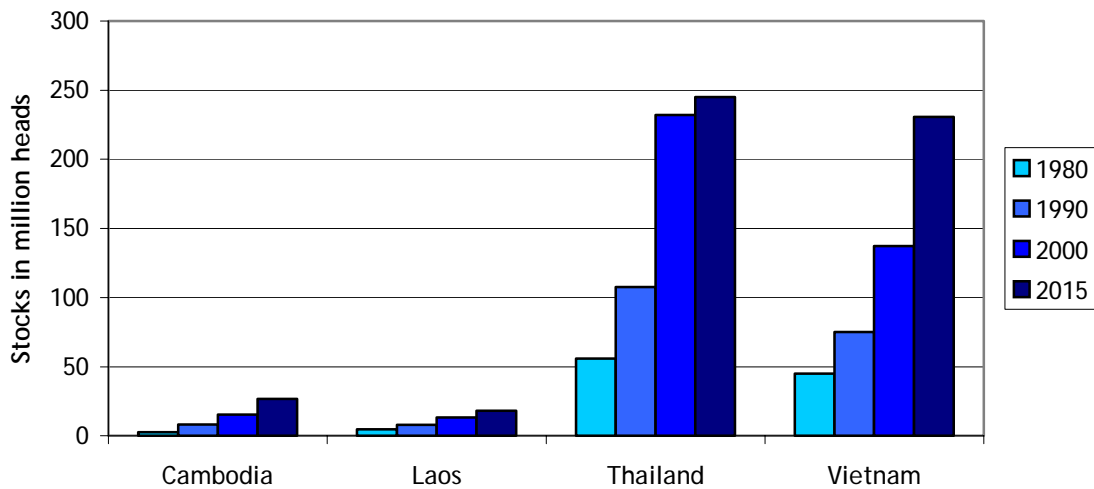
Source: World Agriculture towards 2015/30

Figure 6: Historic and projected number of pigs in the Mekong countries 1980-2015.



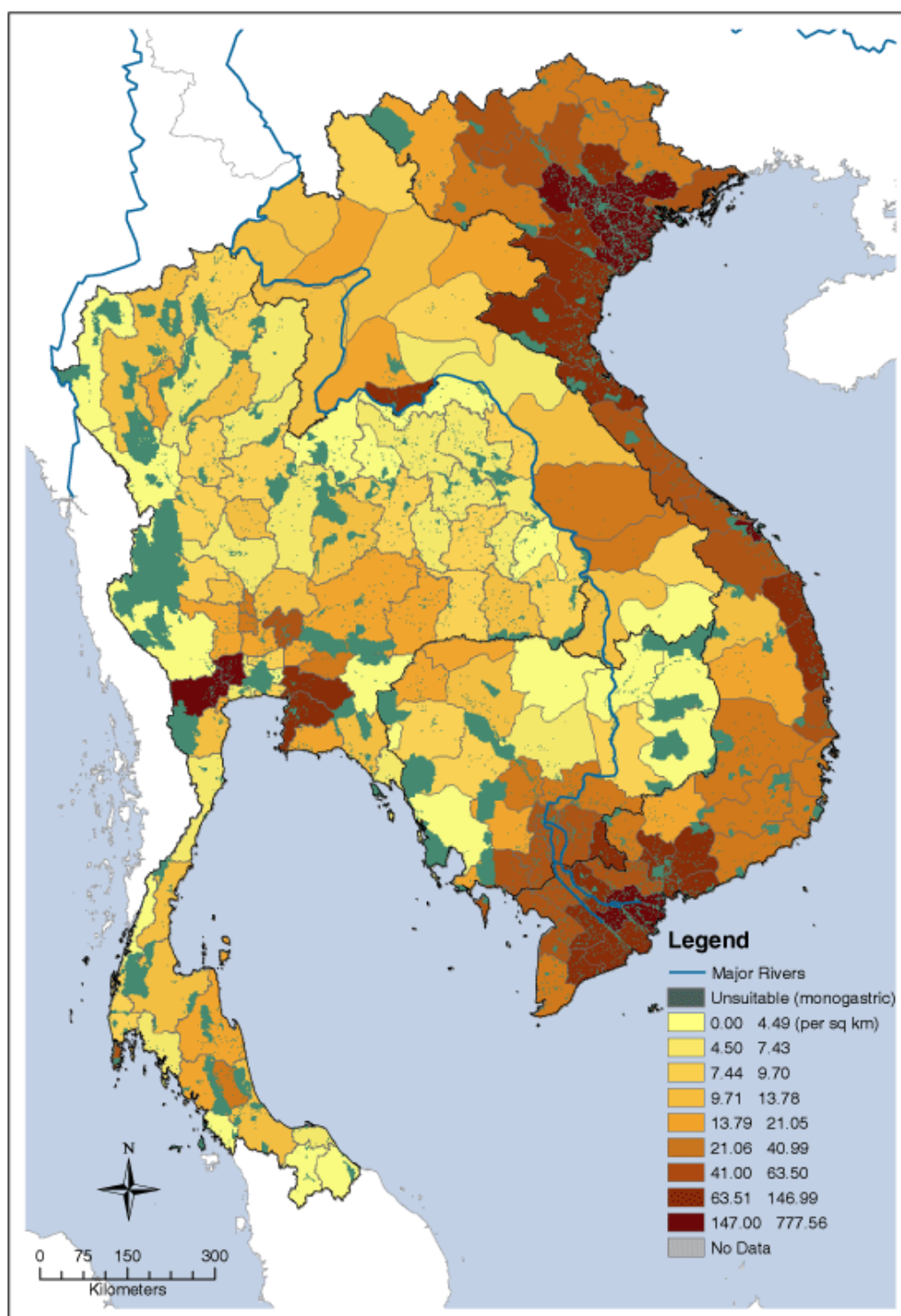
Source: World Agriculture towards 2015/30

Figure 7: Historic and projected number of chicken in the Mekong countries 1980-2015.



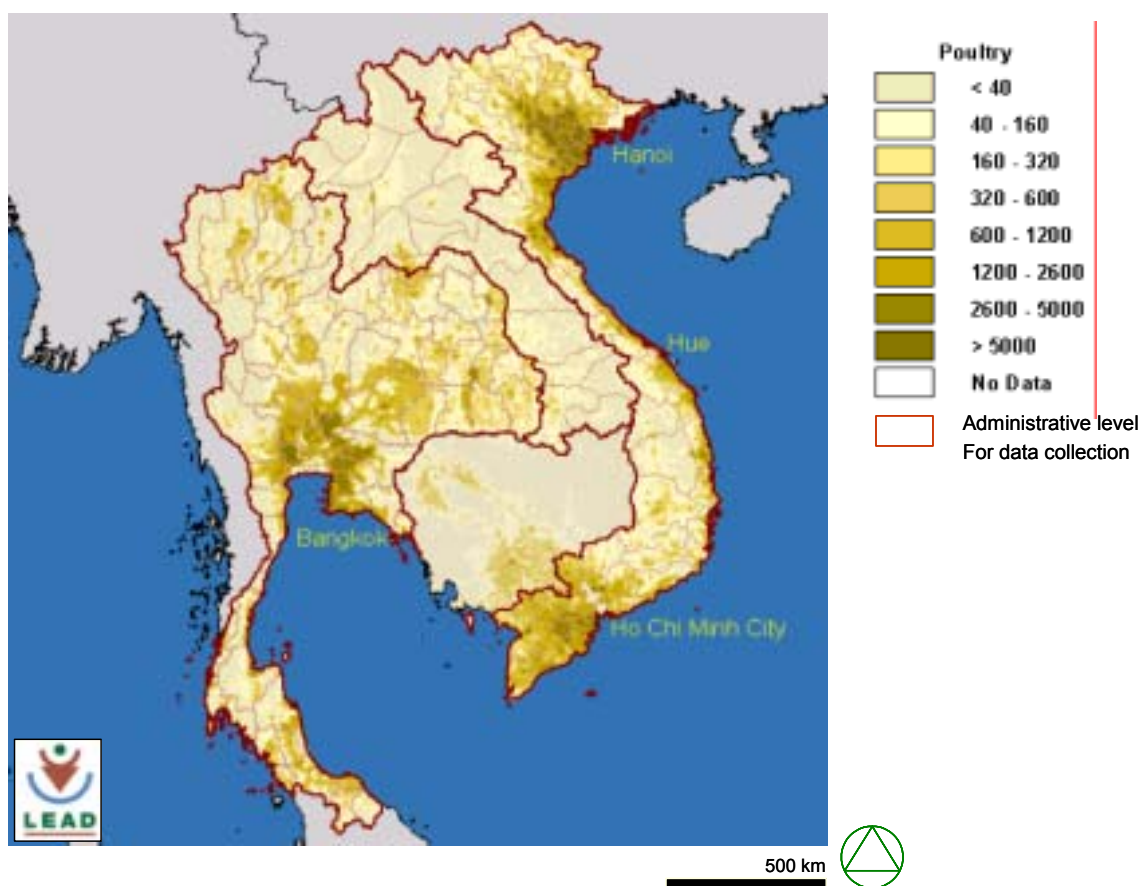
Source: World Agriculture towards 2015/30

Map 2: Density of pigs (adjusted for land unsuitable for monogastrics).



Source: FAO-AGA's livestock information system

Map 3: Estimated poultry density in Thailand Laos and Vietnam (animals per km2).



Source : LEAD FAO, 2002

Production Systems

Cambodia

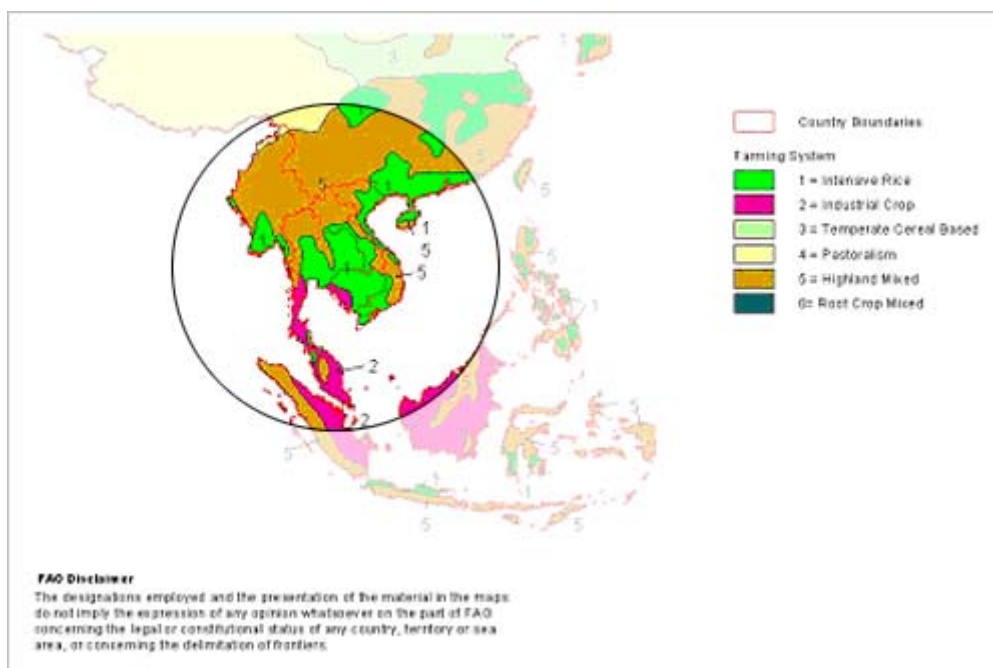
General observations

Livestock plays an important role in Cambodian farmers' lives. Cattle and buffalo are widely used for draft power, while pigs are raised for cash income and occasional home consumption.

Farmers themselves consume relatively few livestock products. Chicken are commonly slaughtered at special occasions but this covers only a very small part of the households' protein requirements. Cattle, buffaloes and pigs are sold to slaughterhouses/butchers but the meat is only rarely purchased back by the farmers. Domestic demand for meat is concentrated in the urban centres, particularly Phnom Penh. Therefore most trade flows for meat are directed from the provinces to Phnom Penh.

The great majority of livestock are raised as an integral part of a variety of different farming systems, most of which have rice production as the major component. Some specialized intensive meat and egg-producing poultry, and pig production is beginning to develop around major population centers such as Phnom Penh and Battambang (Maclean, 1998).

Map 4: Major farming systems.



Source: Dixon and Gulliver 2001

Cattle and buffalo

Cattle and buffalo are concentrated in the rice growing areas of Cambodia as their draft power is an integral part of rice production systems in most parts of the country. This is also reflected by the fact that cattle and buffalo are predominantly kept to provide draught power, soil preparation for rice growing and manure rather than for meat production. Cattle and buffalo ownership is widespread across the country with the average household owning two cattle and every second household owning a buffalo respectively (Maclean, 1998).

Chicken

Traditional village chicken raising is carried out by about 90 to 95 percent of all farming households in Cambodia. Usually families own a few chicken of mainly local breeds that are raised with minimal input (Khieu, 1999). Chicken are kept scavenging and are fed supplementary feeds, such as rice or paddy. Villagers usually keep chicken for the production of meat, either for home consumption or for sale. Sometimes also eggs are collected and sold. Semi-intensive production systems are still very scarce and only very few traditional chicken raising units at village level have been elevated to a semi-intensive level. However, in recent years an increasing number of intensive egg and meat production units that use imported breeds and prepared feeds have been set up near to Phnom Penh and Battambang (Maclean, 1998).

Pigs

Pig production systems in Cambodia can be classified into traditional pig raising, semi-intensive and intensive pig production. Traditional pig raising still predominates though in the last couple of years both semi-intensive and intensive piggeries have been increasing in number near population centres such as Battambang. Pig production is concentrated in the provinces around Phnom Penh which have easy access to the city's market. In these areas they also have ready access to feed such as rice bran in the rice-growing areas and by-products of fruit and vegetable growing in the river-bank areas (Maclean, 1998).

While the national average for pig ownership is about 1.6 head/rural household, there is some variation between households. Given the higher capital cost and management expertise required, pig breeding tends to be carried out by the better-off farmers whereas the raising of a single small pig purchased from a breeder is a typical activity of poor farmers for whom it is a way of capital accumulation with a small initial investment though rather risky given the absence of health services. The raising of several grower pigs in a semi-industrial fashion is primarily carried out by merchants such as rice millers or producers of rice-wine, both of which have easy access to cheap feeds (Maclean, 1998).

The profitability of pig raising is to a large extent determined by the quantity, quality and cost of rice bran, which is the basic pig feed in Cambodia, available at the local mill. Higher quality feed which would enable pigs to reach their full productive potential is usually neither available nor affordable for poor farmers (McClean, 1998).

Lao PDR

General observations

Livestock are found on most farms in Lao PDR. According to the Agricultural Census of 2000, 89 percent of all farm households are raising one or more types of livestock. Livestock are the most important single source of cash income for farmers providing an average of more than 30 percent of the cash income derived from agriculture for rural households in 1997/98 (Stür *et al.*, 2002). Apart from being a major source of cash income, farmers keep livestock for accumulation of capital/wealth; to provide draft power to cultivate land and transport agricultural produce; as well as manure for vegetable, fruit and crop production.

Livestock production in Lao PDR is firmly based in the smallholder sector. Over 95 percent of all animals are being raised by smallholder farmers. The smallholder farmers mainly operate mixed farming systems, growing both crops and rearing animals. Usually, livestock rearing is supplementary to shifting cultivation systems.

Only a small number of commercial pig and poultry enterprises (and one dairy farm) exist which are all located in lowland areas near population centres such as Vientiane, servicing the meat, egg and milk needs of people living in these areas. These commercial enterprises generally use imported animal breeds and concentrate feeds from Thailand (Stür *et al.*, 2002).

Commercial pig and poultry production in Lao PDR is disadvantaged by higher feed cost for monogastric animals than in neighbouring countries where producers have access to cheaper ingredients for concentrate feeds and larger domestic markets. Apart from production constraints, all agri-businesses tend to be constrained by an uncertain legal environment which makes Lao PDR a more difficult place to conduct business than other countries in the region. A further very important constraint limiting animal production are animal diseases which lead to very high mortality rates in poultry, pigs and buffalo calves (Stür *et al.* 2002).

Cattle and buffalo

The main purpose of cattle and buffalo keeping is the provision of draught power in paddy fields, local slaughter and home consumption. Cattle and Buffalo are grazed and crop by-products are only rarely used as animal feed and purchased feed is very uncommon. Manure is not used as fertilizer on the fields (Kaufmann *et al.*, 2003). Dairy cattle are only of minor importance in Lao PDR. Compared to Thailand or Vietnam, commercial farming is still of minor importance, however, frequent animal movement (in both directions) due to marketing of animals across the borders to Vietnam, Cambodia and Thailand takes place.

Chicken

Chickens are the main type of poultry raised in Lao PDR with most poultry meat being produced by smallholders. Especially in the remote areas poultry meat is the main source of protein and income for farmers. Most households raise 20-30 chicken, predominantly in scavenging systems, with low growth rates and little egg production. Raising chicken is usually the task of women in the household.

Commercial poultry production units are found near population centres such as Vientiane. Most of these 'agribusinesses' are small cottage industries with few employees. In general, production costs tend to be high since semi-intensive production is dependent on concentrate feed, which in many cases is imported from Thailand (Stür *et al.*, 2002).

Pigs

Pigs are widely kept all over the country with 64 percent of all households involved in pig production (Kaufmann *et al.*, 2003). Pigs of predominantly indigenous breeds are kept by smallholders as a supplementary source of income for rice farmers with smallholder pig production accounting for 96 percent of the total pigs produced in Lao PDR. The number of pigs kept by household varies between an average of 1.4 and 3.7 animals, depending on the region. Almost invariably, pig raising is the task of women (Kaufmann *et al.*, 2003).

The management of pigs tends to be extensive with pigs being allowed to roam freely and scavenge, however, despite free roaming, pig production tends to be very labour-intensive with supplementary cooked feed provided in most cases. In some villages pigs (weaners) are fattened in pens for the local market and management systems are more intensive (Stür *et al.*, 2002)

Thailand

General observations

Commercialisation of livestock production has progressed much further in Thailand than in the other Mekong countries. This holds especially true for the production of monogastric livestock which is already dominated by industrial production systems.

Beef cattle

The cattle industry in Thailand is largely a small farm industry. Almost one third of farms carrying cattle in 1993 had either one or two animals, while a further 51 percent had between three and nine animals. About one percent of farms had more than 50 head, and less than a quarter of one percent of farms had 100 head of cattle or more. These figures show that the cattle industry in Thailand still very much remains a small farm industry. The limited land area available means that obtaining feed is likely to be a problem for the operators of these farms, particularly during the dry season (FAO RAP, 2002a).

Three different types of beef farms exist in Thailand: Breeding farms that mainly sell breeding stock to other farmers (the number of these farms has decreased in recent times due to the unfavourable market conditions), traditional farms that usually have small backyard operations with cattle being occasionally used as draft animals and only slaughtered at high age producing low quality beef, and finally feedlot operations which fatten cattle before slaughter. The latter either purchase old cattle from traditional farms and fatten them for two to three months for slaughter and sale at fresh markets or they purchase young animals, fatten them for six to ten months and sell the meat to supermarkets, hotels and restaurants.

Most of the buffalo are found in the North-eastern region which is the poorest region of Thailand. Although there were some farms in each of the regions that had 10 or more buffalo, these tended to be the exception rather than the norm. Most farms had one or two buffalo. This reflects the importance of buffalo as draft animals and their suitability for the Thai environment. The increased mechanisation that has occurred in Thai agriculture has resulted in the replacement of buffalo on many farms by tractors and other mechanical implements, a trend that is likely to continue (FAO RAP, 2002a).

Dairy cattle

Milk production in Thailand is dominated by small dairy farms which typically have five to ten milking cows. However, recently farms are getting larger (around 20 percent of dairy farms now have more than 20 head of cattle, compared with 6 percent ten years ago). Generally, dairy farming is characterised by low productivity and problems with infertility and/or mastitis with as many as 30 percent of dairy cattle being affected. Poor feed quality is also a major problem, leading to poor quality raw milk (Quirke *et al.*, 2003).

The Thai dairy industry is organized along cooperative lines. Basic requirements to form a cooperative are a minimum of 60 farming families, owning a total of at least 300 cows. The distance from the milk collection point should be no more than 20 km and there should be a market for the milk. Importantly, the cooperative should have veterinary and artificial insemination facilities available. Not just any farmer can become a cooperative member. Farmers have to have passed a training course on dairy farming and have a minimum of 1.6 ha of land and preferably a minimum of 5 cows. The cooperatives also operate feed mixing plants to meet the animal feed requirements of members and provide them with technical advice and training (FAO RAP, 2002a).

Feed currently accounts for about 60 percent of total raw milk production costs. (Sitthipongpanich and Tempelman, 2001).

Chicken

Most poultry production in Thailand now takes place in commercial operations with the industry being dominated by large multinational companies. Already by the mid-1990s family farms accounted for less than 25 percent of production due to the expansion of commercial farms. Independent commercial growers often engage in contract growing with smaller growers, however, the number of contract growers is likely to decline due to their inability to equal the economies of scale attained by the large commercial growers (FAO RAP, 2002a).

The broiler industry is completely integrated with feed-milling companies and mainly produces for export markets, predominantly Japan and the European Union. Large improvements in broiler farming have been facilitated by improved genetics, the use of advanced techniques for poultry-raising, the pioneering of contract farming by large agribusiness companies in the early 1970s, and low feed prices reflecting Thailand's surplus in maize. Most integrated producers have replaced parent-type stock with yield-type stock. This has put the industry in a place to produce larger broilers (around 2.5 kg), which will further improve productivity (FAO RAP 2002a, Quirke *et al.*, 2003).

Pigs

Pork production has moved from a system dominated by small growers to larger scale commercial operations. Around 80 percent of total production now takes place on large farms and feed mill companies. Especially the collapse in production in the wake of the financial crisis in 1998 had a large impact on small farms. Low prices and high costs of production forced many small farms out of operation. Much of the resurgent introduction has been generated by larger operations. Lack of credit has made re-establishing small

farms a difficult task. Moreover, the introduction of European 'high lean' live pigs contributed to higher costs via housing and feeding requirements and this also favoured large-scale production. Growing concern over diseases in recent times has led to a wider use of vaccines, which has further increased production costs; however, over half of the total production cost can be attributed to feed costs (Quirke *et al.*, 2003).

Vietnam

General observations

Livestock in Vietnam are predominantly raised in small-scale household production units. At present, smallholder producers supply the majority of meat in the market, with most of the households operating individually in the production and marketing of livestock and livestock products (Lapar *et al.*, 2003).

Genetic improvements in the animal herd have occurred only very slowly and at an unbalanced rate in different parts of the country (more rapidly in peri-urban areas) and across different producers (more rapidly among large commercial producers). The adoption of improved breeds has been more rapid for poultry than for pigs and cattle, albeit slow overall and hindered by the absence of certification and standards as well as lack of coordination between national and local programs (IFPRI, 2001).

Beef cattle

Beef cattle are distributed throughout the country, with a concentration in farming systems of the central provinces and the lowest numbers in the river deltas. Cattle are also relatively common in peri-urban areas and in the upland areas in the north, where they are kept for draught purposes. Small farms usually keep 1 to 4 cattle for dairy, beef or manure. Crop residues are used as the main feed source. The majority of cattle and buffaloes in Vietnam are integrated into mixed farming systems (Kaufmann *et al.*, 2003).

Dairy

Almost all dairy cattle are owned by household farmers. Dairy farms in Vietnam normally only own a small number of cows (usually less than ten animals), however, there are a few large farms holding about 50 to 100 cows in regions like Cu Chi and Binh Thanh districts of Ho Chi Minh City where also most of the dairy production occurs. It is estimated that 70 percent of producers own 3 to 5 cows, 25 percent own 10 to 15 and only 5 percent of the producers own more than 50 cows. The population of crossbred dairy animals (between local female cattle and Holstein-Friesian bulls) accounts for nearly 90 percent of total dairy population of Vietnam (Quirke *et al.*, 2003, Ministry for Agriculture and Rural Development of Vietnam, 2002)

Chicken

Poultry production plays a very important role for rural development in Vietnam. More than 80 percent of the poultry production in Vietnam is based on traditional production systems at the smallholder level even though a number of families now keep flocks of between 1,000 and 10,000 birds. Chicken serve as a supplier of high quality protein to farming families as well as providing cash income through the sale of meat and eggs (Lapar *et al.*, 2003).

Some 70 percent of the chickens produced in Vietnam are local breeds raised outdoors, with the remaining 30 percent divided among different foreign breeds. The main locations for chicken production are close to urban areas and provinces with large amounts of waste from food processing industries. State owned hatcheries supply day-old chicks for fattening and supply feed and veterinary supplies for household farms (Quirke *et al.*, 2003).

The industrial poultry farming system in Vietnam is so far not fully integrated across all production levels and eggs and day-old chicks have to be imported from overseas. Broiler chicken production is carried out by private farm, which are still financially weak and lack access to technology, health-care and marketing facilities (Lapar *et al.*, 2003).

Pigs

Pigs are the most important livestock species in Vietnam, with 95 percent of the pigs being kept on family farms which are integrated into the local agricultural system. The remaining 5 percent are kept either by state-run semi-industrial farms or medium size commercial farms which are more market oriented (Quirke *et al.*, 2003, PRISE).

Households typically own 2 to 3 pigs and also the average commercial farm is small (5 to 100 pigs) while only a few state owned enterprises have operations with 500 to 1,000 pigs. Especially on very small farms much of the feed is scavenged. Production is mainly in the north of Vietnam, and in areas with high concentrations of cassava, rice and soybeans. Pig production is largely dependent on crop by-products and residues and on employing family labour (Kaufmann *et al.*, 2003).

An integrated system involving provision of breeding stock, feed supply, fattening, slaughter and processing has only recently developed around Ho Chi Minh City. Foreign companies invest in building up these systems, which are reaching capacities of 20 to 200 thousand pigs (Lapar *et al.*, 2003).

Animal health

Livestock in the Mekong region are affected by a variety of diseases that constrain the productivity of different livestock species. Reliable information on the seasonal and spatial occurrence of particular diseases as well as of their economic impact is however scarce. The diseases perceived as most important by animal health experts in the region are given in Table 14. These diseases are impacting livestock production in various ways such as premature death, reduced body weight and fertility, reduced yield of meat, milk or eggs as well as reduced capacity for work. Each individual disease causes some of these effects (in some cases even all) and almost all have severe effects on overall productive efficiency of animals, reducing the conversion of available feed into marketable products (Morris, 1999).

Table 10: Most important diseases/pathogens, ranked according to their impact on the livelihoods of poor livestock keepers.

Disease/pathogen	Cattle/ Buffalo	Pigs	Poultry	Mekong region
Anthrax	A			B
Duck virus enteritis (DVE)			A	
Ectoparasites		A	A	A
Food-and-Mouth disease (FMD)	A	A		A
Fowl cholera			A	
Fowl pox			A	
Gastro-intestinal helminths	A ²	A	A ¹	A
Haemorrhagic septicaemia (HS)	A			A
Hog cholera (CSF)		A		A
Newcastle disease (ND)			A	A
Brucella suis		A		B

Source: Perry *et al.* (2002)

A: top 10 ranked diseases, B: 11-20

¹ including coccidiosis ² toxocara vitulorum

The most important diseases of cattle and buffalo seem to be haemorrhagic septicaemia which can cause the death of a considerable number of animals per outbreak in a typical village, foot-and-mouth disease which can have serious economic consequences when occurring during ploughing periods, anthrax, blackleg and parasitic diseases such as liver fluke and roundworms (toxocariasis) (McClean, 1998). While the control of highly infectious diseases such as FMD is crucial for the promotion of inter- and intraregional trade, smallholder production systems are particularly affected by endemic parasitic diseases and haemorrhagic septicaemia (Perry *et al.*, 1999).

Disease and elevated mortality are also major problems in pig raising, and farmers will generally not invest in improved nutrition, housing and management until they can be confident of reducing the risk of disease (McClean, 1998). Classical swine fever (CSF) and other, often undiagnosed diseases frequently occur as epidemics, killing many animals in a single outbreak.

Village poultry raising is set back by regular outbreaks of disease, especially Newcastle disease and fowl cholera which are reported to cause mortality rates of about 70-80 percent of the total chicken flock (Khieu, 1999; Vongthilath and Blacksell, 1999).

Compared to the other three countries, Thailand is far more severely affected by the indirect impact of infectious diseases (Newcastle disease and foot-and-mouth disease) because they limit the country's export possibilities for meat.

Among the reasons for the high incidence of livestock diseases are poor nutrition and sanitation, inappropriate management practices, poor access by farmers to information on how to control and treat diseases and poor veterinary support resulting in incorrect disease diagnoses, movement of diseased animals and limited vaccination coverage (Stür *et al.*, 2002).

Marketing and Trade

General observations

Official data on live animal and livestock product trade hardly exists and is rather unreliable for the Mekong countries though for Thailand the situation is somewhat better. In the case of live animal trade this is partly due to the large scale of unrecorded cross-border trade that takes place in the region.

Tariffs on the import of livestock products tend to be relatively low in Lao PDR, Thailand and Vietnam (for Cambodia data is not available) but all countries tend to have somewhat higher tariffs on the commodities, which are most important in terms of domestic production and consumption (Annex Tables A3 to A5).

Cambodia

Local trading of buffalo, pigs and chickens within and between villages often takes place for payments in kind rather than in money. Town traders such as slaughterhouse operators or market sellers come to the villages to purchase cattle, pigs and chicken. Less frequently, villagers bring their animals to town to sell them directly to the slaughterhouse or to consumers (Ramsay and Maclean, 1998).

Cambodia has traditionally exported live animals to its more populous neighbouring countries, a trade flow that has been characterised by large fluctuations in numbers of animals exported, and changes in destinations (Maclean, 1998). However, the extent of animal movements is not easy to determine as there is no monitoring system in place and animals are moved through the forests as in the case of Ratanakiri province rather than through border crossings (Ramsay and Maclean, 1998).

Meat processing and marketing facilities tend to be of a very poor standard (FAO RAP 2002b).

Lao PDR

For cattle and buffalo well organised marketing systems exist. Small traders at village and district level buy animals and move them by trekking over small roads and tracks to the nearest truck loading point; traders based in major towns organise collection by truck and supply the urban market, as well as exports and border trade. Even though transport costs are generally high, they are not likely to have a major effect on livestock sale prices since the value of animals per kg is high (Stür *et al.*, 2002).

Meat prices are highest in Vientiane and the best quality animals are being exported or sold to the urban population in Vientiane while the poorer quality animals are consumed locally. Moreover, in provincial markets price controls are in place depressing meat prices in rural areas (sometimes even to levels below production costs) and in some places there are also quotas in place for the number of animals than can be moved from a district or province to another. Domestic trade is also hindered by excessive paperwork; licenses, letters of approval and certificates are needed which can only be obtained by paying bribes to officials on all administrative levels. Access to market information is limited for all farmers and especially those in remote upland areas which put them into a disadvantage when negotiating sale prices for their livestock (Stür *et al.*, 2002).

The major urban areas of Vientiane, Louang Prabang, Phonsavanh, Savannakhet and Pakse constitute the centres of domestic demand. The main Lao market for large livestock is Vientiane. Most of the cattle and buffalo go to the Dondu slaughterhouse owned by the local government where 1,500-1,800 buffalo and cattle are slaughtered every month. Alongside, there are private/unofficial slaughter places where the vast majority of animals are being slaughtered (Stür *et al.*, 2002).

Lao PDR is a net exporter of live cattle and buffalo with a substantial part of the exports occurring through unrecorded and unregulated border trade to Thailand. An estimate for the total number of cattle and buffaloes exported each year to Thailand would be about 100,000 animals. Price differentials ensure that the demand for Lao livestock in neighbouring countries is currently sufficient to absorb all good quality cattle and buffalo produced in Lao PDR (Stür *et al.*, 2002).

Marketing of pigs can be difficult depending on the location of the farm, as the transport to the market can be expensive and difficult or even impossible depending on the quality of the roads. Even though in locations with difficult market access, middle-man traders may visit villages, they will generally offer sub-standard prices and thus not alleviate the marketing problems for small farmers (Vongthilath and Blacksell, 1999).

The potential for pig or poultry exports is very limited though as Thailand is the region's largest producer of commercial pigs and poultry, and clearly has a competitive advantage in the production (Stür *et al.*, 2002).

Thailand

Beef

There is no "standard price" for beef cattle and markets are not well developed. Traditionally the slaughter of low-quality cattle provides 90 percent of beef to the market. The beef produced in Thailand is not up to export standard because of poor beef processing procedures and facilities (FAO RAP, 2002a).

Even though there are high tariffs on beef imports (51 percent) protecting the local market there is little incentive for the development of commercial farms because of scarcity of land and high levels of investment required. The Department of Livestock Development estimates that it can take up to three years for the investment to be recouped.

A further problem that the beef industry faces is smuggling from Lao PDR and Myanmar. According to the Department of Livestock Development (1996), the number of smuggled cattle amounts to about 400,000 per year. Smuggled cattle are sold in Thailand at prices lower than Thai farmers are willing to accept for locally reared animals. The cattle from Myanmar are said to harbour diseases including foot and mouth disease. This makes it difficult for Thailand to successfully implement control programs for diseases and has contributed to the failure of efforts to eradicate foot and mouth disease in cattle and pigs. Thai export opportunities for both of these industries are therefore restricted. Finally, the industry faces problems due to government regulation for slaughter facilities. These are under the control of the Ministry of the Interior which creates difficulties for the Ministry of Agriculture in implementing programs for the cattle industry (FAO RAP, 2002a).

Dairy

The Thai dairy industry is marked by a strong cooperative structure. With the exception of a few fully integrated farms, all dairy farmers are members of one of the 113 dairy cooperatives which are formed around common milk collection points, forming the link between the farmer and milk processor. The individual farmer transports his raw milk to the cooperative's collection point where the quality of the milk is tested. Some collection points possess processing installations where a portion of the delivered milk is immediately converted into pasteurised milk for school milk use. The cooperative organises the daily transportation of the milk from the collection point to the milk processing factories, using refrigerator trucks. Upon arrival at the factory the milk is subjected to another quality test, after which the price for the raw milk is set. At the end of the month each farmer receives his payment at the collection point, which varies according to the quality of the milk he has delivered (Sitthipongpanich and Tempelman, 2001).

The cooperatives often lack the financial resources to invest in milk collection facilities and in transport and processing facilities. The limited number of people in the dairy cooperatives with an adequate knowledge of management, accounting and extension is also a problem for the industry. For many cooperatives the scarcity of trained personnel resulted in their being run by government officers, in the early 1990s. Cooperative members had little, if any, say in the operation of the cooperatives (FAO RAP, 2002a).

While there has been an annual export growth of 22 percent between 1990 and 2000, over the same period imports have grown by an annual rate of 5.4 percent, combined with an annual increase in production of 12.3 percent, which has led to an overall decrease in the reliance on imports (Tables 8 and A4). Milk imports operate under a quota allocation system. The main products imported are non-fat dry milk and whole milk powder. These are subject to an in quota tariff of 5 to 30 percent and an over quota tariff rate of over 200 percent. Imported milk powder is both cheaper and of higher quality than locally produced raw milk. To protect the domestic dairy farmers the government, in 1998, established a local content requirement policy that obliges all domestic dairy processing firms to obtain at least 50 percent of their raw materials locally. This regulation will remain in force until 2004. Furthermore a ceiling price of USD 0.33 per litre on raw milk sold to the factory by a cooperative has been fixed, improving the revenue/production cost ratio and clearly also the profit margin for dairy farmers. The strong regulations of the Thai dairy sector at every level of the production chain and the price interventions together with the local content regulation have contributed to dairy farmers being among the richest farmers in Thailand (Sitthipongpanich and Tempelman, 2001).

Poultry

There has been a strong growth in exports with Thailand having become one of the largest exporters of poultry meat in the world. The devaluation of the Thai baht following the economic crisis has led to spectacular growth in exports since 1997. Exports grew at an average of 16 percent per year in the period 1997 to 2000 compared with a period of almost no growth from 1990 to 1996.

Imports of poultry meat are strongly regulated. A tariff of 33 to 60 percent is levied on poultry meat imports and in addition, an import licence fee of 10 baht per kg has to be paid. Import licences must be granted by the department of livestock development. These restrictions offer strong protection of the domestic market and import volumes are therefore very low (Quirke *et al.* 2003).

Thailand's main export destination for poultry meat has been Japan though recently its share of the Japanese market has been pressured by exports from the United States, Brazil and China. Under World Trade Organisation rules, subsidies on broiler production will have to be phased out. Even though Thai officials believe that since the Thai industry receives little in the form of subsidies, it should be able to gain a competitive advantage on international markets, critics point out that Thailand's competitive edge is beginning to be lost to neighbouring countries such as Vietnam and China because of rising wage rates in Thailand.

Pork

Until the mid 1980s, small intermediaries who were often the agents of large wholesalers collected animals by travelling from village to village, and then delivering the pigs to slaughterhouses, which were occasionally operating illegally. In recent years, with the development of commercial pig units, their role has diminished. Nowadays, contract growing of pigs takes place with feed milling companies providing piglets, animal feed, veterinary services and farm management skills to contracted pig growers (FAO RAP 2002a).

Most of the pork produced in Thailand is consumed domestically because of the presence of foot-and-mouth disease in some of the producing areas in limit export markets for fresh meat to Hong Kong, Vietnam and Singapore, while processed pork-based products are more widely exported (FAO RAP, 2002a).

Vietnam

General observations

Livestock production is far from meeting domestic demand while products are of poor quality and expensive by regional and world standards (Vu, 2003). While demand for meat has been rapidly increasing, the shift in demand towards higher quality products has likewise become more apparent. The increased preference for higher quality meat has far exceeded Vietnam's ability to produce meat of the desired quality levels. This is largely due to loose monitoring of the various participants in the commodity chain which hardly allows quality control. Especially for small producers there is no incentive to produce high quality products because the additional effort and cost involved would not be covered by the price they would receive in the market (Lapar *et al.*, 2003)

Feed constitutes about 70 percent of the average producer's cost for raising livestock with prevailing feed prices in Vietnam being high by international standards, particularly for high protein raw materials such as soybeans. Factors contributing to these high costs are limited local production, low yields and import duties (IFPRI, 2001).

Domestic trade is hindered by high transportation cost and the absence of cold chains. Long-distance trade in live animals is especially costly due to the additional effect of substantial weight loss in animals transported over long distances. Marketing is also limited by restrictions concerning the movement of livestock products of which only a minor part is imposed due for health-related reasons (IFPRI, 2001).

Most of the domestic trade takes place locally, with farmers selling at the farm gate, as they do not have access to organised markets and auctioning systems. As a result, information about markets, prices, and other issues is limited. The lack of an organised system of live animal markets has resulted in the majority of marketing and distribution of live animals and animal products being undertaken through a network of marketers operating in informal groupings and often undertaking exchanges on a face to face basis (Lapar *et al.*, 2003).

Animal slaughtering, meat processing and distribution are characterised by unhygienic conditions due to poor practices and lack of infrastructure such as the supply of clean water (IFPRI, 2001).

Beef

The cattle marketing system is composed of four middlemen, the trader, wholesaler, slaughterer and retailer. Live cattle are also sold to wholesalers and retailers while carcasses and meat are sold to retailers or directly to households (Lapar *et al.*, 2003).

One of the constraints for the development of the beef sector are inadequate slaughter facilities for commercial beef production.

The Vietnamese beef market is protected by a 20 percent tariff on imported beef. However, there are no barriers to the importation of breeding animals, livestock semen or veterinary products. The Ministry of Science, Technology and Environment imposes quality control requirements on meat and by-products, including offal (Quirke *et al.*, 2003).

Dairy

The state-owned company VINAMILK is the largest milk processor in Vietnam with a close to monopolistic market share of 85 to 90 percent. Despite this, the Vietnamese dairy market is becoming increasingly influenced by foreign investment, with companies like Nestlé, St Lawrence and Austdairy developing milk supply capacity. Currently only 40 percent of milk is produced by farms with organised distribution links to processing centres whilst the residual 60 percent is supplied by smallholders (Quirke *et al.*, 2003).

The Ministry of Science, Technology and Environment has imposed quality control requirements on milk and cream, yoghurts and products containing milk constituents. Also included are butter and fats cheese and milk curds (Quirke *et al.*, 2003).

Poultry

For poultry there are similar product marketing flows in place as for the beef and pork. Live chicken are usually sold to retailers and wholesalers, while carcasses are sold to wholesalers, retailers or directly to consumers (Lapar *et al.*, 2003). Distribution channels for chicken are short (most common methods are motorcycle, cycle or foot; there is no cool transport). Some 70 to 80 percent of the chickens are sold on local markets unprocessed; 15 to 20 percent are dressed and sold to restaurants while the remainder is sold to food processors.

Foreign commercial enterprises also operate in the Vietnamese market, which have set up integrated industrial commodity chains. The Vietnamese poultry producers involved in the chain follow precise technical prescriptions and are supplied with animals and feed. They

receive credit, technical support and are linked to a commercialisation network but remain totally dependent on the subcontracting company (PRISE).

The local market is protected by a 20 percent tariff on poultry imports. Imported chicken are claimed to be mainly targeted at the growing tourist market in Vietnam rather than at domestic households. Although industrial broiler production has grown rapidly, consumers still tend to prefer local chicken due to their lower price.

The export potential for Vietnamese poultry is currently relatively low due to the low quality of the product (below world standard) (Quirke *et al.*, 2003).

Pork

Similar to the cattle marketing channel, the pig marketing system is composed of four middlemen. These are the traders, wholesalers, slaughterhouses/meat processors and the retailers. Live pigs and piglets are primarily sold to traders, wholesalers and slaughterhouses while pig carcasses and other meat products are usually sold to retailers or directly to consumers (Lapar *et al.*, 2003).

Around 93 percent of pork is consumed fresh, 4 percent goes into the food service businesses and 3 percent is processed with most pork still being consumed within 10 km of the slaughter site. Pork production in Vietnam is constrained by a lack of improved feed as well as by poor quality and low hygiene processing and slaughter facilities (Quirke *et al.* 2003).

Imported pork is subject to a tariff of 30 percent, however pork is hardly imported. The Vietnamese Government has launched a policy heralding Vietnam's plans to export 80,000 Mt of pork by 2005 (64,500 Mt were exported in 2000), and increasing the volume to 100,000 Mt by 2010 (Quirke *et al.* 2003).

Government Policies

Cambodia

Although core issues for livestock development have been recognised, livestock policy formulation and implementation have only just started. A priority issue of the Cambodian government are animal health services and disease prevention and control. A government decree to enforce vaccination and control of animal movements has been approved. Furthermore, the government allows private veterinary service operation and supports the establishment and training of village animal health workers.

Animal feed and breeding improvement have been identified as further areas of concern, however, it is still not clear what policies the government intends to adopt to foster these objectives (Sen, 2002).

Lao PDR

The government of Lao PDR is generally supportive of free market principles and aims to establish a regulatory and legal framework that encourages private sector investment and commercial development. The main constraints are local applications and interpretations of what are believed by local authorities to be the "real" underlying policies.

The State Enterprise for Food and Crop Promotion (SEFCP) was established by the government to regulate the price of food commodities and guarantee food security at the provincial level. In practice, instead of regulating prices, the SEFCP fixes prices for certain commodities (paddy, milled rice and meat) which are sometimes lower than production costs. In some provinces, the SEFCP exerts a virtual monopoly over markets for food commodities and private traders are not permitted to trade beyond provincial borders

without authorisation. Procedures for private enterprises to obtain licenses and permits to trade food commodities are lengthy and rent seeking opportunities are ample (Stür *et al.*, 2002).

Government regulations also provide for the marketing and registration of livestock, the movement of animals and their products as well as veterinary supplies across the border and internally within the country. Furthermore animal disease prevention and vaccination, the slaughter of animals and meat inspection as well as the conservation and breeding of livestock are subject to government regulation.

Legal requirements for importing livestock, feed and veterinary supplies are onerous and the same holds true for exports of live animals or livestock products. Within Lao PDR, irrespective of whether they are destined for export or not, all cattle and buffalo have to be vaccinated against haemorrhagic septicaemia, and in some areas, additionally against anthrax and blackleg. Pigs must be vaccinated against hog cholera and chickens against Newcastle disease and fowl cholera. There are comprehensive conditions concerning the reporting of animal disease epidemics and the subsequent control of the epidemics including restrictions of animal movements in declared epidemic zones. Particular conditions apply to anthrax, black quarter, hog cholera and foot-and-mouth disease outbreaks, all of which are notifiable (Stür *et al.*, 2002).

In addition to the nationwide regulations imposed by the central government, provinces impose special directives on the livestock industries in their areas of control which are not consistent among provinces. The potentially crippling impact of the above mentioned regulations for the livestock sector are, however, mitigated by the fact that the regulations are mostly not enforced (Stür *et al.*, 2002).

Thailand

Rice farmers who move out of rice growing into dairy farming receive a long term loan from the government-backed Bank of Agriculture and Agricultural Cooperatives (BAAC). Farmers raising beef cattle receive similar incentives (FAO RAP 2002a).

In 1985 the National Milk Drinking Board was established with the objective to promote the drinking of milk in Thailand. In 1989, the National Milk Drinking Board initiated a school milk program which requires 240,000 Mt milk per year and on which 158 million US dollar were spent in the year 2000. In addition, the government has heavily promoted dairy production to improve income distribution. This has encouraged an increasing number of farmers to switch from rice to dairy production, with 23,000 farmers currently engaged in milk production (Sitthipongpanich and Tempelman, 2001).

Following the economic crisis in 1998, the Thai government initiated no-interest loans to hog farmers under certain conditions. There has been some growth in pork exports though export performance has been highly variable. Government policies to promote pork exports include an effort to establish a foot-and-mouth - disease free zone in the three eastern provinces (Quirke *et al.*, 2003).

Vietnam

Imported corn faces a tax of 10 percent, in addition to the 5 percent import tariff, increasing the prices for animal feed in Vietnam and contributing to the high level of livestock product prices in the country (Vu, 2003).

Unlike for the rice sector, there is no comprehensive government policy in place for the livestock sector, which has received little budgetary support and also little regulatory interventions concerning marketing, health, and environment. This is most apparent in the condition and location of slaughter/processing industry and meat available for consumption in market stalls and restaurants. Any livestock policy is solely focused on

production and consumption targets, rather than on regulatory, capacity building, and research and extension activities (IFPRI, 2001).

In 2002, however, the government launched a nationwide program on 'Hunger alleviation and poverty reduction' to support poor farmers and improve living conditions of people in rural areas. The programme involves the provision of low-interest credit to poor farmers for the purchase of piglets, beef cattle and dairy cows and has encouraged farmers to engage in livestock production (Lapar *et al.*, 2003).

Concluding Remarks

Agriculture and livestock remain important components of the economies and societies of the Mekong countries and growth of the livestock sector has outpaced growth in crop production. Especially in rural areas the wide majority of the people tends to be involved in livestock production in one way or the other. With the exception of poultry and pig production in Thailand, which have now become dominated by large-scale industrial production systems, livestock production is still largely in the hands of smallholders and characterised by low in- and output and hence, low levels of production per animal.

As there are strong prospects for growing domestic and regional demand for livestock products due to progressing urbanisation and rising per capita income levels. Thus, an increase in livestock production would serve two purposes: contribute towards meeting the demand of urban populations for animal protein by domestic production (reducing import bills) and provide large numbers of small-scale producers with additional income.

In order to boost domestic production without setting up industrial livestock production systems, which would contribute little to rural poverty reduction, it is a core necessity to raise the productivity of the smallholder production systems. As the low productivity of small-scale production systems is caused by poor feeding, animal health problems, management deficiencies and the keeping adapted but low yielding breeds, policies to enhance productivity need to address these areas.

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Annex

Table A1: Trends in the number of animals in the Mekong region 1980-2015.

Country	Year	Stocks in 1,000 heads			
		Buffaloes	Cattle	Pigs	Chicken*
Cambodia	1980	375	772	132	2,442
	1990	736	2,181	1,515	8,163
	2000	694	2,993	1,934	15,249
	2015	4,088		2,788	26,785
Laos	1980	862	447	1,111	4,621
	1990	1,072	842	1,372	7,884
	2000	1,028	1,100	1,425	13,095
	2015	2,856		2,267	18,361
Thailand	1980	5,651	3,938	3,021	56,043
	1990	5,094	5,482	4,762	107,559
	2000	1,900	4,602	6,558	232,000
	2015	11,333		8,241	245,171
Vietnam	1980	2,313	1,664	10,001	45,200
	1990	2,854	3,117	12,261	75,200
	2000	2,897	4,128	20,194	137,300
	2015	8,040		24,296	230,665

* for poultry projections WAT 2015/2030 country data has only one figure for all species.

Table A2: Development of livestock productivity in the Mekong countries (kg/animal/year), three year averages.

Country	Year	Beef ¹	Milk ¹	Pork	Poultry meat ¹	Eggs ¹
Cambodia	1980	11.8	11.8	43.2	1.6	4.2
	1990	13.4	5.8	40.0	1.4	4.2
	2000	17.4	5.7	47.4	1.4	4.2
	2015	22.8	7.1	67.8	1.8	4.8
Lao PDR	1980	7.9	2.4	15.4	0.8	4.9
	1990	11.5	2.6	15.0	0.8	4.6
	2000	17.7	2.8	25.3	0.9	6.2
	2015	23.8	3.9	29.1	1.6	5.9
Thailand	1980	29.3	1.9	79.2	5.2	7.0
	1990	29.3	12.8	75.1	5.6	9.0
	2000	29.2	61.4	69.1	4.7	8.2
	2015	34.6	88.8	86.8	6.5	10.0
Vietnam	1980	25.6	10.5	32.5	1.5	4.1
	1990	27.1	10.0	58.8	1.6	4.4
	2000	25.2	10.2	69.2	1.8	5.1
	2015	30.0	14.9	86.7	2.5	5.2
OECD	2000	93.6	962.0	134.7	7.1	3.6

Source: World Agriculture towards 2015/30

¹ total production divided by total population irrespective of specialisation in production as data on sub-populations is not available in many cases

Table A3: Live Animal Trade in the Mekong Countries 1980-2000, three year averages.

Country (Birds in 1000)		1980			1990			2000		
		Exports	Imports	Net trade	Exports	Imports	Net trade	Exports	Imports	Net trade
Cambodia	Bovines	0	n/a	n/a	0	n/a	n/a	12,550	n/a	n/a
	Pigs	n/a	0	n/a	n/a	0	n/a	n/a	336	n/a
	Poultry	n/a	0	n/a	n/a	0	n/a	n/a	48	n/a
Laos	Bovines*	0	0	0	64,333	0	64,333	44,133	29	44,104
	Pigs	n/a	0	n/a	n/a	0	n/a	n/a	829	n/a
	Poultry	n/a	0	n/a	n/a	0	n/a	n/a	142	n/a
Thailand	Bovines	21,714	1,986	19,728	564	24,458	-3,894	2,892	192,651	-89,759
	Pigs	2,890	544	2,346	271	5,006	-4,735	3,534	328	3,207
	Poultry	2,645	1,927	718	1,371	2,538	-1,168	4,242	889	3,353
Viet Nam	Bovines	0	n/a	n/a	1,271	n/a	n/a	0	n/a	n/a
	Pigs	0	0	0	0	0	0	0	0	0
	Poultry	n/a	0	n/a	n/a	0	n/a	n/a	717	n/a

Source: FAOSTAT 2003

* numbers are underestimating the actual trade volume as a substantial part of trade occurs through unrecorded and unregulated border trade mostly to Thailand

Table A4: Livestock Product Trade in the Mekong Countries 1980-2000, three year averages.

Country Qty Mt		1980			1990			2000		
		Exports	Imports	Net trade	Exports	Imports	Net trade	Exports	Imports	Net trade
Cambodia	Bovine Meat	n/a	0	n/a	n/a	0	n/a	n/a	6	n/a
	Pig Meat	n/a	0	n/a	n/a	0	n/a	n/a	7	n/a
	Poultry Meat	n/a	0	n/a	n/a	0	n/a	n/a	70	n/a
	Eggs	n/a	0	n/a	n/a	0	n/a	n/a	19	n/a
	Milk	0	3,782	-3,782	0	107	-107	0	10,864	-10,864
Laos	Bovine Meat	n/a	22	n/a	n/a	628	n/a	n/a	0	n/a
	Pig Meat	0	n/a	n/a	0	n/a	n/a	3	n/a	n/a
	Poultry Meat	n/a	0	n/a	n/a	0	n/a	n/a	5	n/a
	Eggs	n/a	0	n/a	n/a	0	n/a	n/a	0	n/a
	Milk	n/a	843	n/a	n/a	1,000	n/a	n/a	5,802	n/a
Thailand	Bovine Meat	144	109	35	1,391	770	620	4,137	1,677	2,460
	Pig Meat	214	3	211	1,114	16	1,098	8,463	113	8,350
	Poultry Meat	19,968	31	19,937	143,531	109	143,422	416,497	375	416,122
	Eggs	1,437	11	1,425	8,429	173	8,256	5,722	462	5,260
	Milk	11,192	41,580	-30,388	6,204	60,425	-54,221	57,129	103,541	-46,412
Viet Nam	Bovine Meat	8	1,577	-1,569	52	433	-381	5	43	-38
	Pig Meat	436	0	436	16,754	0	16,754	64,571	14	64,557
	Poultry Meat	0	333	-333	30	0	30	90	43	47
	Eggs	110	0	110	2,892	0	2,892	1,900	1,652	248
	Milk	0	8,079	-8,079	0	3,760	-3,760	24	27,798	-27,775

Source: FAOSTAT 2003

Table A5: *Ad-valorem* tariffs on livestock products (percentages).

	Beef	Pork	Poultry meat	Milk, conc.	Milk, not conc.	Eggs
Cambodia	n/a	n/a	n/a	n/a	n/a	n/a
Lao PDR	30	30	30	5	5	30
Thailand	51	33/42	33-60	40 ^a	5 ^b -30	27.3
Vietnam	20	30	20	20	15/30	30

^a In quota rate 20% out of quota rate 42%

^b Except "Milk and cream, in powder, of a fat content not exceeding 1.5%", in quota rate 5%, out of quota rate 220,8%

Table A6: Dependence on animal feed imports.

Qty 1,000 Mt	1980			1990			2000		
	Imports	Exports	Net imports	Imports	Exports	Net imports	Imports	Exports	Net imports
Cambodia	0	0	0	0	0	0	0.3	2.5	-2.1
Laos	0	0	0	0	0	0	8.8	0.03	8.8
Thailand	132.4	114.0	18.5	678.4	306.2	372.3	1,912.7	302.6	1,610.1
Viet Nam	0	4.7	-4.7	0	4.4	-4.4	527.0	1.6	525.4

Source: FAOSTAT 2003