Survey of the East Asia Livestock Sector

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ACRONYMS AND ABBREVIATIONS

ACIAR Australian Center for International Agricultural Research
ADB Asian Development Bank
ADF Agence Française de Développement
AI Artificial Insemination
ALive African Livestock (Initiative)
APIP Agricultural Productivity Improvement Project
CIAT International Center for Tropical Agriculture
CIDRAP Center for Infectious Disease Research and Policy
DANIDA Danish International Development Agency
DLGS Directorate General for Livestock Services
EASRD East Asia and Pacific Region Rural Development and Natural Resources Sector Unit (World Bank)
EAP East Asia and Pacific Region (World Bank)
FEATI Farmer Empowerment through Agricultural Technology and Information
FMD Foot and Month Disease
GDP Gross Domestic Product
GKSI Union of Indonesian Dairy Co-operatives (Gabungan Koperasi Susu Indonesia)
FAO Food and Agriculture Organization of the United Nations
FAOSTAT FAO Statistical Databases
HAACP/ISO Hazard Analysis and Critical Control Point/International Organization for Standardization
HPAI Highly Pathogenic Avian Influenza
IFAD International Fund for Agricultural Development
IFPRI International Food Policy Research Institute
JICA Japan International Cooperation Agency
LEAD Livestock, Environment and Development Initiative
LID Livestock in Development
MLF Micro Finance Loan Fund
mmt Million metric tons
MOA Ministry of Agriculture
NGO Non-governmental Organization
PIN Production Index Number
RDF II Second Rural Finance
RRMC Rural Rearing Multiplication Center
PLSA Participatory Living Standards Assessment
SLP (Mongolia) Sustainable Livelihoods Project
SME Small and Medium Enterprises
SVS State Veterinary Services
SWAP Sector-Wide Adjustment Program
UNDP United Nations Development Program
VSF Vétérinaires sans frontiers (Veterinarians without Borders)
WHO World Trade Organizations
WITS World Integrated Trade Solution
WTO World Trade Organization
PREFACE AND ACKNOWLEDGEMENTS

This survey of the livestock sector in the East Asia Livestock Sector was undertaken from September 2003 to August 2005, for the World Bank’s East Asia and Pacific Region Rural Development and Natural Resource Management Sector Unit. The livestock sector in East Asia is both rapidly growing and important to the livelihoods of the poor. The original objective was to put together available literature on the livestock sector to inform World Bank involvement in this expanding and dynamic sector. The purpose of this working paper is to communicate findings and messages relevant to the larger development community and policymakers. The approach followed is to first explore production trends and poverty linkages, then to identify issues facing smallholder producers and affecting sustainability. The final chapter considers the problems faced in delivering livestock sector support, innovative approaches being used currently in World Bank Projects, and remaining challenges.

Mark Wilson, (Director, EASRD) provided leadership for the survey and Stephen Mink (Lead Economist, EASRD) provided guidance throughout the survey. The survey was authored by Jennifer Ifft, with significant inputs from Rick Chisholm (EASRD) and Andrew Goodland (EASRD). Cees de Haan (ARD) and Vera Songwe (EAPRM) served as peer reviewers. Comments were also provided by Robin Mearns, Nathan Belete, and M. Noureddine Benali (EASRD). Evelyn Laguidao provided editorial support. Other World Bank staff, both in EASRD and other departments, provided invaluable advice and information.
EXECUTIVE SUMMARY

1. The potential of livestock sector growth to contribute to the alleviation of poverty in the EAP Region is considerable. Various indicators from countries across the region show that livestock is especially important to the poor and thus a suitable target for development assistance. This survey will review sector trends, identify challenges to efficient and sustainable livestock sector growth in several EAP countries, and consider the challenges and opportunities for delivering successful livestock sector projects and programs. Based on the sector background and barriers to development, potential interventions in the livestock sector in East Asia will be explored. The overall objective is to provide the development community and practitioners in livestock development with a greater understanding and appreciation of the importance of the livestock sector growth to poverty reduction and sustainable development in East Asia.

2. East Asia is at the forefront of global trends of increasing livestock demand and production. A global “revolution” in demand for animal-based products has been predicted by Delgado, et al. (1999). As wealth increases, especially in less developed countries, the annual consumption of animal products is predicted to rise in 2020 to 303 million metric tons (mmt) of meat and 654 mmt of milk. This is an increase from levels of 168 and 391 in 1993, respectively. In East Asia\(^1\), the livestock sector is experiencing consistent growth. The annual growth of meat consumption is 3 percent for China and 2.4 percent for other EAP countries. Growth levels for milk are predicted to be 2.8 and 1.7 percent, respectively. This growth in consumption creates great opportunity for livestock sector development in the countries of the East Asia & Pacific region.

3. An analysis of livestock production shows dramatic increases throughout the region over the past 15-20 years. Demand for and production of livestock products in East Asia has been increasing significantly over the past 20 years and this trend will continue. This growth is in almost all types of livestock, although variation is significant. Sheep and beef have not been an overall large source of growth, while pigs, eggs, poultry and milk (dairy sector) have all been significant sources of growth. Trade has not been a significant source of overall growth for the livestock sector, with most products produced domestically being consumed domestically and relatively small overall imports. Predictions of livestock product consumption indicate that domestic demand can largely absorb any further production increases.

4. Changes in livestock sector structure, difficulties of smallholder organization, and increased risk and vulnerability decrease the capabilities of smallholders to improve their livelihoods through livestock production. The extent of smallholders’ market access and benefits from sector growth is a concern throughout the region, especially in middle-income countries where industrial livestock farming is growing while smallholders still produce the majority of livestock. Smallholders face changes in market structure that they are in a disadvantaged position to adapt to. They also face

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\(^1\) East Asia and EAP Region will be used interchangeably to refer to the countries included in the World Bank (administrative) East Asia and Pacific Region. Cambodia, China, Indonesia, Laos, Mongolia, the Philippines, and Vietnam will be particularly focused on.
higher levels of risk and vulnerability; facing increased poverty in face of changing political, economic, and physical conditions. Smallholders are also less organized, thus their ability to influence public policy is less; as well as their ability to organize for greater access to markets or services.

5. **There is a need to develop both institutional and technical capacity at the national and region level for livestock-related environmental policies.** Growth in livestock production can have detrimental impacts on the environment, if either policy-induced or due to inadequate management, and often appropriate regulatory frameworks are not in place. The scope of environmental degradation ranges from degraded pastures to public health hazards from improper waste management of concentrated livestock production in peri-urban areas. Regional and domestic variations exist, but environmental degradation limits the potential of livestock sector development. If policies are enforced, a major concern is the impact of regulation on smallholders.

6. **Transboundary animal disease in the region is both an urgent and long-term barrier to livestock sector development.** This is a specific area that has been receiving a great deal of media and international attention recently due to the spread of ‘avian flu.’ Regional management of transboundary livestock diseases is essential for coping with diseases such as avian flu. National and regional capacity to address animal health issues has large externalities and in general would benefit from greater development. As with environmental problems, the impact of disease on smallholders is an especially important area to explore.

7. **Although each country faces unique challenges, the need for significant improvement of livestock sector services is a common theme throughout.** Serious constraints to livestock sector growth exist in many countries throughout the region: food safety, infrastructure, extension/training/information services, marketing/cooperative services, animal health, credit/insurance, common pasture management, water supply, and research/breed improvement. Countries with the lowest level of livestock development often have very low levels of livestock services and provision of public goods; institutional challenges often exist in countries with more developed service systems. Improving services can increase the income of the rural poor through increasing productivity and decreasing market barriers.

8. **Livestock projects in the past have had less focus on smallholder needs; today projects are more demand-driven and are increasingly taking into account lessons learned.** In the past projects have been more technical and donor or central-government driven, not taking into account local institutions and the needs of the poor. There are also difficulties with delivering services and reaching large numbers of geographically dispersed smallholders. Improving delineation and mechanisms of delivery for both public and private services is critical for livestock sector development. The role of the private sector in service provision will vary from country to country; key considerations for private or public provision are the ability and willingness of the private sector to provide specific services and the public goods characteristics of specific services. Private sector will have a key role in improving provision of inputs, technical training, and
marketing services. Public sector services are especially important to address externalities such as environmental protection, pandemic disease and food safety.

9. **There are many opportunities to increase support to livestock sector in East Asia, to increase the income of the rural poor and sustainability of livestock sector growth.** Current projects are addressing many of the key challenges of livestock sector while having a more participatory approach and take into account the need of institutional change. To achieve the ultimate development objectives of poverty reduction and sustainability, livestock projects will have to focus on empowering smallholders to participate in markets and addressing externalities such as environment and transboundary disease. Participatory and livelihood-based approaches, institutional change, private/public sector partnership will be among key aspects of future projects.
1. LIVESTOCK SECTOR BACKGROUND AND TRENDS

Livestock in Development

Livestock sector development occurs as a part of overall economic development. As incomes increase, demand for livestock products increases. In wealthy countries, meat consumption per capita is at least four times the level of developing countries. Despite this disparity, developing countries have seen great increases in meat consumption over the past 20 years. The increase of animal product consumption with increases in income is universal, although once a high level of wealth is attained animal product consumption levels off. Combined with urbanization and populations that are still increasing, as well as ongoing economic development, there is a tremendous capacity for continued increases in animal product consumption worldwide (Delgado et. al., 1999). This trend is especially visible in the East Asia and Pacific (EAP) Region.

Livestock is important to the livelihood of the rural poor. Twenty-five percent of the global poor (those living on $2 per day or less) are dependent on livestock for at least part of their livelihood (Perry et. al., 2002). This figure rises to an estimated 70 percent for the rural poor. The contribution of livestock to agricultural GDP has been estimated to be almost as much as cereals, that is, about 30 percent globally, and it is also the fastest growing agricultural sub-sector. If livestock sector growth is labor-intensive and based upon increases in production and efficiency for smallholder-farmers, the poverty reduction potential is significant; likewise, large-scale livestock development alone has less potential for reduction of rural poverty (Ashley, et. al., 1999).

At the subsistence level, livestock can provide nutrition, clothing, wealth/status, and even basic livelihood support, while using surplus labor and household surpluses for feed. This type of livestock production is typically low input—as well as low output. As agricultural and economic development occurs the nature of livestock production changes. More inputs are used, and livestock can be a significant source of cash revenue. The demand for meat (or protein/animal products) will increase as economic development occurs, “pulling” livestock sector development. As livestock sector development occurs, its impact on the poor is critical to development objectives. LID (1998) identifies six ways that livestock is important to the livelihood of rural people:

- Livestock is a source of cash income
- Livestock is one of the few assets available to the poor, especially women
- Livestock provides the draft power and manure important for many crop systems
- Livestock allows the poor to utilize common property
- Livestock is a source of income diversification and stabilization
- Livestock is often the only source of income for the ‘poorest of the poor’

Delgado, et al. (1999) discuss how pro-poor livestock development could impact poverty. Livestock provides an opportunity for the very poor to maintain at least a subsistence income despite their low resource/capital base. Poor people often have little access to land or more productive land/pastures, but livestock can be produced with household
surplus, through backyard-raising, and through using common property. Often women directly benefit from livestock production and with the growth of the sector are able to enter the cash economy. Country-level household surveys show how globally livestock is more important to the incomes of the poor than the rich.

Livestock also appear to be more important to the incomes of the poor in East Asia. A household survey from the Philippines indicated that the poorest fifth of the population relied on livestock for 23 percent of their income, while the richest fifth only relied on livestock for 10 percent of their income. In Cambodia, available sources have cited livestock as the most important source of cash income. In rural Cambodia, the livestock contributes to 19 percent of household income for the poorest 40 percent of households, while 11 percent for the wealthiest 20 percent of households. In some areas livestock income tends to be fairly similar across different classes, but in Plateau areas the importance of livestock decrease significantly for the wealthiest households (4th and 5th quintiles). Two recent surveys have shown that 62 percent of households hold bovines, 54-56 percent hold pigs, and 74-75 percent hold household poultry (Helmers, 2003). In Thailand, livestock comprise 28.8 and 27.2 percent of farm income for the 1st and 2nd poorest quintiles of rural households, respectively, while only accounting for 21.7 and 13.8 percent for the 4th and 5th quintiles (most wealthy), respectively. 11.6 percent of poorest quintile of rural households has livestock as their primary enterprise; only 4.1 of the wealthiest quintile has livestock as their primary enterprise (See Annex 4).

Strong evidence exists that the poor have a strong preference for investing in livestock activities over other activities. Lending use for World Bank-funded rural microfinance projects in Vietnam has indicated that livestock is one of the most popular uses of loan proceeds and the most popular amongst agricultural activities (Table 1). For the Second Rural Finance Project (RDF II), livestock loans were 21.8% of total lending, highest amongst agricultural activities and second only to services (23.6%). For the Micro Finance Loan Fund (MLF), which goes to even poorer recipients, livestock was by far the most popular activity at 37.8% of total lending. This self selection indicates the importance of livestock to the poor in Vietnam.

<table>
<thead>
<tr>
<th>Table 1.1. Use of rural finance loans in Vietnam</th>
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<tbody>
<tr>
<td></td>
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<tr>
<td><strong>No. of loans</strong></td>
</tr>
<tr>
<td>Cultivation</td>
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<tr>
<td>Animal Husbandry</td>
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<tr>
<td>Processing</td>
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<tr>
<td>Aquaculture</td>
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<tr>
<td>Services</td>
</tr>
<tr>
<td>Others</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
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</table>

(Source: RDF Project Management Office, 2005)
Production Trends

The livestock sector in East Asia appears to have potential for further supply-side growth. Livestock production—supply-side growth—might keep up with the “demand side”—the ongoing increasing demand for livestock products—through two types of growth (Nin, et. al. 2002). One type is based on technological advancement and the other is based on efficiency gains. Through analyzing the “technology” and “efficiency” frontiers, Nin, et. al. find that pig production in East Asia has largely reached its efficiency frontier. Pig production reached its technology frontier approximately a decade earlier than that of milk and poultry; milk and poultry still have a large growth potential on the efficiency frontier. Thus milk and poultry stand to be the most dynamic sectors over the next few decades, with “catching-up” or efficiency-type productivity growth. Ruminant production, however, has not attained the same levels of productivity growth in East Asia. This may be due to competition for scarce capital and labor in the region, in addition to environmental constraints (Coyle, et. al. 1998). Overall there is potential for further supply-side growth in the East Asia livestock sector based on technological improvements and increasing efficiency.

Feed balance is perhaps the most important issue for efficiency-based growth. Restrictions on import of feed grains will increase production costs of livestock producers and feed balance may become a larger issue in the region if restrictions on grain imports...
increase or are continued. For China, a model developed by Simpson (2003) indicates that up to 2030 China can technically meet its feed requirements for cattle without further imports, based on continued policies that support treatment and feeding of crop residues. This model supports work that has indicated that China has a production cost advantage on beef production and that China can meet its overall demand for not only beef but also other animals and freshwater fish products. Increasing maize imports are expected to lower feed costs for swine. China might also benefit from substitution of sweet potato for maize as an animal feed, but only if price and policy distortions to sweet potato production are removed (Huang, et. al., 2005). These examples show how policy considerations regarding feed production and trade are important to allow East Asian countries to competitively increase livestock production to meet their growing demand.

![Graph 1.1 Primary Livestock Production in East Asia, 1980-2002, mmt](image)


Livestock production growth in East Asia illustrates how the livestock sector growth is related to increasing demand for animal products due to economic development, urbanization, and population growth. As shown in Graph 1.1, livestock production has over 20 years increased from 20 mmt to more than 100 mmt in China—an increase of more than 500 percent. In the rest of the region, production almost tripled, from 6.5 mmt to 17 mmt. China clearly dominates the region in absolute livestock production numbers. For this reason, for most of this survey, regional trends will be separated into China and East Asia excluding China.

China exemplifies how livestock sector growth can occur alongside economic development—its booming livestock sector shows no sign of slowing down. In 1978, when China adopted its “reform and open” policy, demand for livestock products was greater than supply. With rapid and sustained levels of economic growth, demand grew rapidly and supply followed; after 20 years with 500 percent growth China still imports slightly more livestock products than it produces. Supply and demand are largely balanced—surpluses exist in some areas (Zhang, et. al, (b), forthcoming).
Not only has production of livestock increased, but it has been a larger source of growth than crops. As Graph 1.2 illustrates, livestock production has had increasingly higher
growth levels than crops since at least 1990. The PIN (production index number) values are calculated using net production quantities and weighted by international commodity prices in 1989-1991. Since 1990, the livestock PIN in China has increased by 134 percentage points, compared to an increase of 59 for the crops PIN. For the rest of the region, the livestock PIN has grown 53 percentage points since 1990, while the crops PIN has only grown 30 percentage points. At the disaggregate level (Graph 1.3), three main country groupings surface for livestock growth. China is experiencing livestock sector growth well above the rest of the region. Laos, Cambodia, Vietnam, and the Philippines are all experiencing continued growth (more than 50 percent increase over 10 years), and Mongolia and Indonesia have had low sector growth, during periods of great economic and social change.

Graph 1.4 Livestock production trends in China by species, mmt, 1980-2002

Across the region, pig production is clearly the largest source of livestock production, especially in China (Graphs 1.4, 1.5). Since 1990, poultry meat production has sharply increased to the level of pig production in the rest of the region. Milk and eggs show significant increases in production throughout the region, as does poultry in China. Egg production seems more prominent than poultry meat production in China, while poultry meat production dominates egg production for the rest of the region. Buffalo, beef, sheep, and goat production do not seem to be a large source of growth for the livestock sector, especially in absolute terms. This trend is, however, largely aggregate; some regions, often very poor, are highly dependent on ruminants.

Overall trade of livestock products is a very small portion of actual domestic production for the region as a whole, with only gradual growth. This is illustrated in Graph 1.6; although total trade has doubled in 20 years it is still scarcely more than six percent of domestic production. Excluding China, the region has small net exports of meat as well as eggs (Graph 1.8). Pig meat (Vietnam leads), poultry meat (Thailand leads), and hen eggs (Malaysia leads) are net livestock exports in the region. Dairy is the one exception to the low trade trends in the region (Graph 1.6). The data from the past 20 years indicates that the increase in domestic dairy production has lagged far behind growth in domestic demand. This is true for the entire region, although China is significantly less dependent on dairy imports. While the rest of the region imports over double the amount of milk equivalent that is produced, China imports approximately 25 percent of the level of domestic production.

Other East Asian countries, including developed countries, are important markets for meat exports from the low/middle income East Asian countries. This trend is increasing for China while decreasing for other East Asian Countries (Graph 1.10). Globally, the region has neither a large share of livestock product exports, nor is it a large market for livestock imports (FAOSTAT, 2003 and WITS, 2003).
Graph 1.6 Share of Trade in Total Primary Livestock Production in East Asia, 1984-2001, %

Source: FAO (2003); ‘Trade’ in this graph includes both exports and imports.

Graph 1.7 Milk Production and Trade in East Asia from 1980-2001, mmt, Excludes China

Graph 1.8. Net Exports of Major Livestock Products in East Asia (excludes China), 1980-2001, mt


Livestock product consumption has been steadily increasing across East Asia. As illustrated by Graph 1.11, China has seen the most dramatic increase in meat consumption across the other EAP developing countries. Meat per capita is now above the world average and egg consumption is at the same level as developed countries.
Furthermore, demand is expected to double in the next 20-30 years despite rural residents still lagging behind urban residents in animal product consumption (Zhang, et. al., forthcoming). Mongolia has meat consumption at double the level of China, but it has been slightly decreasing since 1980. Livestock are a prominent part of Mongolia’s rural economy and this has apparently affected consumption levels. Although these countries have not seen the same dramatic increases as China, Cambodia, Laos, Philippines, and Vietnam have all seen their meat consumption increase by at least 50 percent since 1980; in Cambodia and Vietnam it has more than doubled.

Milk and egg consumption have been slowly increasing in most EAP countries since the mid 1980s; egg consumption in China increased dramatically from 2.6 kg/capita/year in 1980 to 15.6 kg/capita/year in 2001. The Philippines has much higher milk consumption that the other countries studied: 22.6 kg/capita/year in 2000 compared to 11 in China and 3.8 in Vietnam (see Annex 1 for Egg and Milk Consumption Graphs). China leads in pig meat consumption; Laos, Cambodia, and the Philippines in bovine meat consumption; and China and the Philippines in poultry consumption. Most countries (Mongolia and Indonesia excluded) have experienced steady increases in pig, bovine, and poultry meat consumption since 1980 (FAOSTAT, 2004). (See Annex 2 for meat consumption data.)

**Domestic Markets and International Trade**

Domestic demand in East Asia will be the main outlet for increases in livestock production, although trade in specific products may be a significant source of growth. Delgado, et. al. (1999) predict that consumption demand alone will be the major driving force for the livestock industry over the next 20 years. Although a few specific countries or specific species have vigorous export markets, the majority of livestock products consumed are produced domestically (Graphs 1.6-1.9). Imports are also small in comparison to total of major livestock production, except for milk (Graph 1.7), for which almost all countries in the region are not self-sufficient. Without major shifts in policy or consumption trends, it is likely that dairy imports into the region will be necessary to meet demand.

In a study of globalization and the livestock sector in several Asian countries, including China, Thailand, Philippines, and Indonesia, Quirke, et. al. (2003), confirm the findings on production and trade trends. For the several Asian countries studied, livestock production is expected to continue increasing, but will not outpace growth in domestic demand. With trade liberalization, part of this increasing demand will be met by imports. Significant productivity gains and investment in food safety and quality will have to be made before these countries can meet domestic demand and significantly export livestock products.

The figures below (Table 1.2 and 1.3) illustrate considerable growth in demand for livestock products in the EAP region, both in absolute and relative terms. Given 2002

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2 Mongolia was not included in Graph 1.11 so consumption trends of other countries could be clearly viewed.
production levels and estimated 2020 consumption level, the scope for domestic production growth within this period ranges from 13-120 percent. With the ongoing levels of income growth, urbanization, and population growth, these markets are all but guaranteed. Through this market growth, the livestock sector throughout the region has available domestic markets if its products can be produced efficiently and competitively. The impact of trade is uncertain and not all countries have become WTO members. This is an interesting area for further study; some research has indicated that China has a comparative advantage in terms of production cost for many types of livestock products and Cambodia has a comparative advantage in beef cattle.

Table 1.2: Predicted Consumption and Production Growth to 2020

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</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>3.0</td>
<td>2.8</td>
<td>85</td>
<td>17</td>
<td>2.9</td>
<td>3.2</td>
<td>86</td>
<td>19</td>
</tr>
<tr>
<td>Other East Asia</td>
<td>2.4</td>
<td>1.7</td>
<td>8</td>
<td>2</td>
<td>2.4</td>
<td>3.9</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>South East Asia</td>
<td>3.0</td>
<td>2.7</td>
<td>16</td>
<td>11</td>
<td>3.1</td>
<td>2.9</td>
<td>16</td>
<td>3</td>
</tr>
</tbody>
</table>

*All production figures are in million metric tons
Source: (Delgado, et. al., 1999)

Table 1.3: Scope for Domestic-Driven Production Growth to 2020

<table>
<thead>
<tr>
<th></th>
<th>2002 Production Levels (mmt)</th>
<th>Expected Consumption-2020 (mmt)</th>
<th>Growth Potential from Domestic Demand, 2002-2020, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk-China</td>
<td>14.8</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>Milk-Other East Asia Pacific</td>
<td>2.6</td>
<td>13</td>
<td>400</td>
</tr>
<tr>
<td>Meat-China</td>
<td>67.8</td>
<td>85</td>
<td>25</td>
</tr>
<tr>
<td>Meat-Other East Asia Pacific</td>
<td>10.9</td>
<td>24</td>
<td>120</td>
</tr>
</tbody>
</table>

2. CHALLENGES TO SECTOR DEVELOPMENT

Asia has the fastest growing livestock sector in the world, and many forces affect this development. Steinfeld (1998) has identified many of the broad trends (often still ongoing) that characterize this growth:

- Asset, petty cash, and insurance uses of livestock are decreasing in some areas, while still important in others
- Use of animals as draught power is decreasing
- Increased focus on “lean meat” in production, with byproducts being used as feed and for industrial uses, reflected in breeds/species used
- Livestock concentration in ‘moister’ areas and also urban areas
- Trend from horizontal integration towards vertical integration
- Coexistence of modern, industrialized livestock production and subsistence or small-scale, labor-intensive livestock production
- Slow expansion of grazing land production and pasture degradation; increased use of mixed crop-livestock systems

Several challenges to economically and environmentally sustainable development of the livestock sector exist throughout the region. Smallholder farmers are prevalent in many of the agricultural sectors in the region, and often exist alongside more industrialized farms. Integrating these farmers into growing markets and empowering them to benefit is of great concern, especially for poverty reduction. The nature of future markets must also be considered—the structure will most likely change significantly.

Livestock productions systems always have interactions with the environment, which can be either positive or negative. Some of the most positive interactions include consumption of household crop surplus and by-products by livestock and usage of livestock waste to improve soil fertility. Negative interactions include over-grazing and contamination of drinking water by livestock waste. Although the negative environmental impact of livestock can be mitigated, appropriate mechanisms are often not in place or not effective.

Animal health and livestock disease are pervasive problems throughout the region—highlighted by the ongoing avian flu epidemic. In many countries, livestock mortality severely limits productivity and disease directly impacts the livelihoods of smallholders.

The livestock sectors in countries throughout the region are often lacking basic services in the following areas: food safety, physical/market infrastructure, extension/training, inputs, financial services (“micro-finance” and insurance) and research/breed improvement. The private sector can provide many of these services, but some services take on public good characteristics or involve significant externalities.

Integration of Smallholders
Integrating smallholders into modern, changing markets will entail addressing the major issues that preventing their participation. Delgado, et. al. (1999) view livestock sector
growth in developing countries, including East Asia, as largely inevitable and driven by
demand, and thus point to the role of smallholders as critical to the final poverty-
reduction impact of livestock sector growth. They make three policy recommendations to
this end: (1) small-scale producers need to be included in the policy response to livestock
sector growth; (2) the distorting incentives given to larger-scale/industrial producers need
to be removed; and (3) small-scale producers need to be vertically integrated in a manner
that protects their interests. If livestock sector growth is to realize its poverty reduction
impact, the challenges facing smallholder producers must be addressed. Three key
challenges facing smallholder livestock producers that need to be taken into account are
discussed: structural changes, smallholder organization, and risk and vulnerability.

**Structural Changes**

Smallholder farmers still are the dominant producers of livestock products in the EAP
region, but their market share is decreasing. Throughout the region, highly integrated
food markets—including supermarket chains—are developing to varying degrees, while
traditional markets and widespread small-scale production remains. In many ways, the
poor and most vulnerable are least able to take advantage of growing markets and
technological advances. Furthermore, the presence of large, dominant livestock
processors tends to put smallholder farmers at a disadvantage, in terms of both price and
market access. Price decreases (at the least in real terms) are common when the
production of a commodity increases. A risk exists that large numbers of smallholders
will receive inadequate returns from livestock production—one of their main sources of
livelihood. Although throughout this process of livestock development many small
farmers will shift to urban employment or alternative rural sources of livelihood, the
absolute and relative numbers of smallholders ensure that the issue of smallholder
integration remains. If smallholders are not able to remain competitive and benefit from
structural changes in the livestock and food industry, the poverty reduction impact of
sector development may be limited. In many countries, this is also a sensitive political
issue, as disparities between urban and rural income are large (Upton, 2004).

As economies develop, food supply chains become more complex, with final products
having greater value. The ongoing process of global integration of markets also indicates
that at least in the long term, nationally-produced livestock products will have to compete
with imported ones. Urbanization, concentration of retailers, and food quality and safety
requirements also drive changes in supply chains. In this process, increased integration of
livestock processing, marketing, and retailing is likely. As large urban markets become
more formalized, the structure of markets for livestock products will change and
supermarkets will exhibit a greater influence on livestock production. Smallholders are
potentially disadvantaged in this process, as they often lack the information and capital to
participate in more homogeneous supply chains with stringent product requirements
(World Bank, 2004: 270-274). Vertical integration of smallholders for participation in
changing markets would require improved producer organization, contractual
enforcement, improvement in channels of information for smallholders, provision of
market infrastructure (i.e. roads, food standards), and general coordination with private
sector firms.
Improvements and increased regulation related to environmental protection, animal health, and food safety are not always “scale-neutral” and with increasing structural changes pressure to improve the sector in these areas increases. A study of swine farms in the Philippines showed that smallholder swine producers load less nutrients per kg output, thus internalizing higher costs for this externality. Large numbers of smallholders may complicate disease eradication. As market-based and consumer pressure to improve policies in these areas increase, policymakers may prefer larger farmers for monitoring food-safety, animal disease, and environmental impact, as it is cheaper to monitor relatively fewer larger farms. Improvements in these areas are desirable and in many cases inevitable, but in East Asian countries livestock policies for environment, food safety, and health need to balance objectives in these areas with smallholder impact and poverty reduction goals (Camargo, et. al., 2004, Delgado, et. al., 2004, Narrod, et. al. 2004).

With these structural changes ongoing in the livestock sector, linking smallholders to the private sector becomes increasingly important. Government has a role to play to create an enabling environment to this end, that might include legal reform, contract enforcement and activities to support farmer association or cooperative development, as well as provision of market information. As market requirements change to demand specific uniform safety and quality characteristics for livestock products, promotion of these linkages might be the only way to maintain smallholders competitive and profitability. The Agricultural Technology Project (China) has several activities that link technology providers to processors to farmers. The Smallholder Cattle Development Project (China) has helped bring market information to smallholders and allowed them to respond to market demands. One way for smallholder livestock producers to stay profitable is contract farming, or franchising. Poultry farming in Indonesia is a good example of this—although there are many inefficiencies in the Indonesian livestock sector, contract poultry farming is profitable for producers and links them to modern markets.

China and the Philippines provide two examples of the structural changes occurring in the livestock sector and the impact on smallholders. China’s livestock sector has seen significant structural changes in the last few decades. Livestock has a critical role in the agricultural sector—a politically sensitive sector with increasing urban/rural disparities—consisting of 30 percent of agricultural GDP in 2001, up from 15 percent in 1978. Initially livestock production was based from state farms and smallholders; today state farms are minimal and smallholders are still a dominant form of production in an increasingly diverse system. Pastoral systems are declining while industrial systems are developing. Pork production is still at the highest level, but poultry meat/egg production and milk production are growing faster and rapidly catching up.

Smallholders still dominate the livestock sector in China, except in the poultry industry. In 2001, pig farms with holdings of less than 50 hogs annually contributed 75 percent of total pork production. Agricultural integration has largely occurred in three forms: contractual relations (49 percent), cooperatives (14 percent), and joint-stock holdings (13 percent). The leading enterprises involved in these types of integration are often small-
scale and uncompetitive, and engaged in primary processing. Support policies, in terms of both services and legal/administrative support, are inadequate. Within this context, the interests of the parties involved in integration would benefit from policy reforms. Smallholders are at a distinct disadvantage, all parties will often break contracts if better prices are offered elsewhere. Enterprises account for 70 percent of contract-breaking, smallholders for 30 percent. Often, support to the livestock sector (e.g. land use, input support, direct subsidies) ends up in the hands of larger enterprises. If smallholders cannot become competitive in China’s ever-changing market, the poverty reduction impact of livestock sector growth will be diminished (Zhang et. al., (a) & (b), forthcoming).

Supermarkets in China have been growing at a rapid rate over the past 15 years, having captured 35 percent of urban food retail as of 2002 and are now found outside of major urban areas in towns and in less developed regions. This trend is being driven by urbanization, income growth, liberalization of foreign direct investment in retailing, and Chinese policies supporting growth of supermarkets. Supply chains are now being drastically altered: procurement is changing from wholesale markets to distribution centers and direct procurement. The ability of smallholders, with average landholding of less than 0.5 hectare per household, to stay competitive under these changing conditions is uncertain (Hu, et. al., 2004).

WTO accession and increased international trade is a great concern for the livestock sector for several countries in the region; increased trade can impact the structure of the industry. China has pledged “zero support”—that it’s aggregate support to the agricultural sector will be zero. To a degree, the impact of this hinges of the level of market integration of specific regions. Furthermore, agricultural subsidies will be no greater than 8.5 percent of agricultural product value. As the aggregate support calculation includes explicit and implicit taxes to agriculture, this is not necessarily restrictive as agriculture has historically been “taxed”. Green box policies also offer flexibility in providing support to farmers. Distortions exist in several areas, and will be decreased on an incremental basis. China does not have significant trade in international trade in livestock products, but has a comparative advantage in many areas, including basic livestock products: hogs, cattle, poultry. If disease and quality requirements can be met, the livestock sector could benefit from WTO accession. However quality and reputation of Chinese products is inadequate for international competitiveness. From a smallholder or livelihood perspective, the prospects are even more mixed, as smallholders often diversify with livestock and crops, and the crop sector faces a greater threat from WTO accession. As further studies are completed and experience in market integration is gained, the impact on the livestock sector will be clearer, but it is certain that international market competition will be an important issue for the livestock sector over the next decade (Zhang et. al., (a) & (b), forthcoming).
Box 2.1 - Smallholders and Poultry and Pig Markets in the Philippines

Throughout the process of rapid livestock sector growth, smallholder production, primarily hog and broiler chicken, has continued to dominate, decreasing only from 83 percent in the 1980s to 77 percent in 2002. After 1985, demand growth based upon population growth, urbanization, and increases in income fueled livestock sector growth. Import restrictions and high feed-grain tariffs have ensured that growth is largely fueled by the domestic market. Smallholders have been able to take advantage of some technological advances such as nutritional improvements through using concentrated feed. The feed milling industry is developed and integrated to the extent that even smallholders are dependent upon feed milling companies. Smallholders are able to access live markets (the most prevalent) through village traders. Technological change in the commercial sector has, however, been more advanced, and the largest operators have formed a producer association that is affiliated with an association of large feed millers.

Large operators dominate the supermarkets, institutional markets, etc., but the continued popularity of fresh meat/live markets has ensured that at least for now smallholders are still competitive. Large hog farms are required to have stringent waste management—but smallholder farms, less than 1000 head, have more regionally variable regulations and enforcement. This is especially an area of contention in peri-urban areas, where smaller farmers are often accused of causing the most severe waste problems. Smallholders do not face the same level of regulation and many smallholders often concentrate production in certain areas. The public perception of smallholders causing more environmental problems does match with evidence that smallholder farms have better nutrient balances than larger farms. Food safety is a large problem for smallholders—virtually all the slaughterhouses they use are not meeting domestic or international standards. Enforcement of food safety and environmental standards under current conditions could threaten the livelihood of smallholder hog producers.

The broiler industry has had a different development path than the hog industry, with approximately 80 percent of output attributed to 6 firms or integrators. These firms generally have a marketing, food safety, and political advantage, and can better withstand large market shocks—which are not infrequent. The rest of output is largely attributed to independent commercial raisers, who can compete on efficiency terms, sometimes even surpassing integrators in efficiency despite the economic of scale. They largely rely on live broiler markets. As with the commercial swine sector, large-scale integrators have formed an industry association that sets daily benchmark prices for live broilers. The formation of this industry association also illustrates how larger-producers have greater political clout and links with the feed milling association (Catelo, 2002; Costales & Delgado, 2002; and Rola, 2002). Over time, if externalities are not approached in a manner sensitive to smallholder issues and smallholder cannot improve linkages to private sector input supplier and processors and meet any changing market demands, their competitiveness is likely to even further erode.
Smallholder Organization

Smallholder organization plays a critical role in allowing farmers to protect their interests in regards to public policy, staying competitive in changing markets, and gaining access to services. Small farmers cannot have a voice in the bargaining process if they are not organized and represented in decision-making processes (Collion and Rondot, 2001). Political power is also an issue—organizations run by larger producers can negotiate easier access to imported feed grains, influence preferential policies, etc. To address these issues in the Philippines, some independent broiler producers and hog farmers from Batangas City have both started cooperatives. Although issues of scaling up remain, farmer organization is way for smallholders to remain competitive. These cooperatives are characterized by effective business organization, which is linked to their success (Catelo, 2002). As indicated by the Philippines example, small farmers are much less organized and larger farms are able to negotiate not only for government policy in their favor but also negotiate with input suppliers. Smallholder organization can take on multiple roles: lobbying, marketing, provision of credit, input provision, education, etc. Mongolia and Indonesia provide examples of the potential of rural producer organizations and the challenges that they face.

Mongolia’s semi-intensive dairy sector currently has smallholder organization that has played a significant role in sector development. A case study (World Bank, 2003d) indicated that in the semi-intensive dairy sector, institutions were evolving to meet the needs of this profitable sector. A DANIDA project in the early 1990s supported formation of a national Dairy Farmers Association and Processors Association and also provided start-up material and means for dairy farmers. The farms studied in the above case study all had direct access to markets in Ulaanbaatar, and prices were high enough to support semi-intensive production. Without a high level of government support, this sector has progressed from the model farms and associations originally supported by DANIDA. Given these favorable conditions and the progress made through the DANIDA project, dairy farms following a semi-intensive mode of production have been able to access many “group goods” to the level necessary to ensure profitability. These include sharing of labor and equipment for hay-making, developing relationships with processors, and, in one village, developing a system for well payments. Although opportunities for capacity building in the sector still exist, this indicates that models for cooperation amongst farmers do exist under many circumstances and can be viable.
Box 2.2 - A Comparison of Farmer Organization in Indonesia: Dairy and Poultry

Indonesia provides insightful examples of successes and failures of farmer cooperatives and associations. Farmer organization may have a critical role in ensuring the integration of smallholders into developing markets. The largest cooperative in Indonesia is the national milk cooperative—GKSI—and is overseen by the Ministry of Cooperatives and SME. Cooperatives members own 64 percent of all dairy cattle; the rest are largely raised in traditional settings. The GKSI operates almost all collection centers and milking processing plants in the country. The cooperative is largely ran in a top-down fashion and faces the following problems:

• Cooperatives fees are high and not commensurate with service provided
• Half of the cooperative branches no longer function due to bankruptcy or dissolution
• Membership has little input in the day-to-day activities of the cooperative
• Small-scale producers operating outside GKSI are unrepresented
• Dairy cow productivity is low

Institutional change and involvement of primary producers are a recommended first step in addressing these problems.

Farmer groups, beginning from the village-level, are prevalent in Indonesia and based on strong traditions of social organization. Often women raising smaller livestock form village-level groups—these are usually successful. Poultry production is a pillar of the livestock industry in Indonesia, and the success and failure of two village poultry programs hold important lessons for smallholder integration.

One program was led by the DLGS (Directorate General for Livestock Services) and had a goal of intensifying meat and egg production at the village level. The key components of the program were improved husbandry, vaccination against Newcastle Disease (the most prominent and devastating disease affecting poultry in Indonesia), and improved feeding and housing. Village participation was low and the program has (relatively) recently been discontinued. The problems included: top-down administration, low access to input and markets, irregular vaccination, inadequate technical support, low cash income generation, and lack of trust in the program by participants.

Another program, funded by a private-sector NGO, the ‘Rural Rearing Multiplication Center’ (RRMC) program, has thus far achieved considerable success. The program links smallholders with both the private sector and available public sector services. As of 2002, the program had 123,300 farmers participating in 17 provinces. Individual districts are managed separately, including at the financial level. Each district in the program has full input and support services, including a small slaughterhouse and its own feed mill. Agribusinesses supply the main inputs (chicks/feed) and buy back the finished poultry products. The public sector is involved through provision of health services, assistance in feed mill construction, and breeding chick supply. Given that the necessary incentives and a sound design are already in place, many things are necessary for the continued success of this program, including good management/coordination of the many parties involved, farmer group participation, good financial management, disease prevention, and equitable relationships based on legal agreements (Brandenburg, 2002). The partnership with the private sector also has been a key contribution to success.
**Risk and Vulnerability**

Many poor livestock keepers through the region face multiple sources of risk and vulnerability—from severe weather conditions to fluctuating market/economic conditions. Sometimes risk stems from sources unique to livestock producers, while other times it stems from sources of risk that affect all poor through the country or the rural poor. Beyond the obvious benefits of preventing or mitigating the impacts of sources of risk on smallholders, managing such risk allows smallholders to shift resources from less-efficient activities that are a part of their strategy to avoid risk to activities that will generate more income.

There are numerous policies and programs that can reduce the vulnerability of smallholders. In Mongolia, the World Bank-funded Index-based Livestock Insurance Project will pilot insurance based on livestock mortality indices. This will utilize the latest innovations in agricultural insurance to protect smallholders from large fluctuations in income due to periodic severe winter weather. Contract farming is a way to avoid price risk; prices are set in advance of production. China’s experiences with agricultural integration illustrated how the legal and institutional framework necessary for such types of farming to succeed is often inadequate. Farmer organization could give farmers the bargaining power to influence policies that might mitigate the risks that they face.

As illustrated by the stagnating production trends, Indonesia provides an example of livestock producers suffering an economic crisis. Livestock sector growth in Indonesia suffered during the recent financial crisis. Total livestock GDP has remained stable at 11 percent of agricultural GDP post-crisis; before the financial crisis its importance had been increasing. Increasing prices of feed grain due to rupiah devaluation and decreasing consumption of livestock products due to decreasing income drove this trend. Livestock is an important source of income generation and protein for rural residents—many relied on livestock during the economic crisis for emergency cash (Brandenburg, 2002).

Gender and vulnerability is also a critical issue in livestock production. Women play a key role in the management of small livestock but productivity is often restricted by available time and access to both feed and water. There is evidence of this from several EASRD projects. In the Heilongjiang Agricultural Diversification Project, thousands of women were supported to raise geese, and this activity has had one of the broadest and most noticeable poverty impacts of the project. In Laos, the time utilization of women farmers is being studied as part of preparation of the Xebangfai Rural Livelihoods Project. Studies indicate that livestock compete with horticulture, rice, family maintenance and cash income activities (e.g. weaving) in a 12-14 hour day. A farm systems approach to understanding potential for any new activity is thus needed.

Mongolia highlights how the poor are especially vulnerable to climatic conditions in a time of economic transition. This case also gives an idea of the complex conditions surrounding the risk and vulnerability faced by smallholders.
Almost half of the population of Mongolia is involved in livestock production, largely pastoral and extensive (95 percent) and 36 percent of the population lives in poverty. Agriculture is Mongolia is largely dominated by livestock, as illustrated in Graph 11. Livestock GDP was as much as 36 percent of total GDP in 1999, down to 20 percent in 2002. The decrease likely reflects the impact of dzud (see below) and development of other sectors. The livestock sector has been undergoing great changes since the dismantling of the state collectives, negdeils, in 1990, the beginning of a period of economic liberalization for Mongolia. The national herd in Mongolia has increasing (when measured by bods, a traditional measure for animal units) since 1990, but critical infrastructure and public/group goods for the livestock industry have been declining. Consecutive dzud, or severe winter weather, occurred in the late 1990s, killing many animals and plunging vulnerable families into poverty. This boom and bust cycle is not sustainable and increases poverty. Furthermore, agriculture involution is occurring, a process in which the number of people working in the sector increases dramatically while productivity stagnates. More specific problems include degradation of well infrastructure/water availability, lack of access to veterinary services, lack of access to information, inadequate risk management, uncertainties in land tenure and land use patterns, and environmental degradation of certain pastures combined with abandonment of others (Griffin, 2003 & Mearns, 2004).

**Agriculture and Livestock GDP in Mongolia**

![Agriculture and Livestock GDP in Mongolia, 1995-2002](image)

Source: WB Office Ulaanbaatar
Environmental Issues

Livestock Environment Interaction and Challenges

Livestock can have a detrimental impact on the environment in many ways if poorly managed or policies induce overproduction or inadequate waste management. Conversely, livestock can integrate well into local environmental conditions, especially in the case of integrated crop-livestock systems, which are still present throughout the region (Pezo, 2002). As livestock are not inherently harmful to the environment, management and regulation are key tools for preventing negative outcomes (Steinfeld, et. al., 1997). If improperly managed, certain types of livestock systems can cause overgrazing and subsequent, perhaps irreversible, degradation of grasslands. Industrialized livestock systems can emit high levels of nitrates and other harmful substances into ground and surface water through accumulation of waste in the absence of adequate waste management practices. Likewise, small-scale but dense livestock production can be detrimental to the living conditions of producers and neighbors, while also posing waste management problems. In East Asia, institutional and political mechanisms to deal with these challenges are not well-developed.

The environmental impact of concentrated livestock production poses a particular threat to livestock sector development in the EAP region. Weak or non-existent land use planning and environmental regulations and enforcement allow for industrial livestock enterprises bear few of the environmental costs they impose and thus there is little incentive to reduce them. Livestock producers are sometimes not aware of the full extent of the environmental problems they cause. The most cost-effective options to mitigate the environmental impact of livestock waste are not always available or properly understood. Moreover, affected communities are not well informed or organized to pressure them to reduce the pollution they cause.

There are also climate change-related concerns for livestock: at the global level livestock contributes about 20 percent of the global methane emission and 10 percent of global N₂O (nitrous oxide, a much more aggressive greenhouse gas) emission. Extrapolation of global data, taking into account poor manure storage and application techniques in East Asia, indicates that the intensive livestock production systems in East Asia contributes to about 0.5 percent of global methane emission and about 3 percent of global nitrous oxide emission (World Bank, 2003b).

Country Examples

China’s livestock sector growth is confronting environmental constraints. This is especially true for pastoral systems and in the case of concentrated smaller-scale pig production. However, in back-yard production systems, often as much as 86 percent of manure is used for fertilizer. Much of China’s pasturelands are degraded; they are a core source of livelihood for livestock producers in the northwest. Ninety percent of grasslands are deteriorated or in the process of deterioration. National level programs for “cut and carry” are now allowing for regeneration of grasslands. Industrial production is now undergoing significant development and poses serious environmental threats. Sixty percent of industrial-scale animal and poultry farms do not have wastewater treatment
facilities and they also often do not have markets for benign or beneficial usage of manure. Industrial production is increasingly based around urban areas, causing increased public health risks. Regulations in China on livestock waste management have been developing, but adequate enforcement mechanisms are far from functional (Zhang, et. al., (b), forthcoming).

In Mongolia land tenure is an especially complicated issue that is related to livestock and the environment. Since the early 1990s, pasture use around urban areas is becoming increasingly concentrated while more remote pastures are not being used. Mongolia has the largest common pasture area in the world, and many institutions for traditional pasture management remain. Currently traditional customs make it difficult to deny pasture access, while wealthier herders have been able to secure land tenure for more desirable areas through the provisions under the 1994 Land Act. Thus the poor are often left with access to less desirable pasture land and more vulnerable. Given this differentiation, traditional institutions for pasture management are becoming less feasible, at least in a complete form. Unique, consensual/negotiated policy solutions will be necessary to address sustainable land tenure issues in Mongolia (World Bank, 2003d).

In the Philippines, the examination of the broiler and hog industries reveals weak environmental sustainability. Currently, national institutions are weak in terms of enforcing or providing incentives to farmers for effective environmental management. In the hog industry, environmental protection is a critical issue, but if approached in certain ways could threaten smallholders. Concentrated smallholder production is perceived as a large source of livestock pollution, but increased environmental regulation/enforcement if applied without appropriate considerations could devastate the currently competitive smallholder producers. The perception of smallholders creating more pollution is likely incorrect, as research has shown smallholder farms have better nutrient balances than industrial farms. Due to their prominence, backyard pig farms produce 80 percent of hog-based pollution and are essentially unregulated, but cost-effective methods for mitigation do exist (Catelo, 2002). This is an important consideration for approaching the environmental impact of livestock in the region—harm to smallholder livestock producers from increasing regulation should be minimized.

Regional Level Environmental Challenges

Many of the environmental issues related to the livestock sector in the EAP region are not only of national concern, but also of regional concern (as well as global). The problem of livestock waste in the South China Sea highlights this problem. The South China Sea is negatively affected by livestock waste pollution from all countries bordering it. If one country in the region individually improves zoning and environmental regulations and enforcement, a beneficial decrease of livestock waste could occur domestically. However, the impact of other countries’ pollution affecting international waterways might still persist and pose a problem. Many types of industrial/concentrated livestock production will not take into account the true cost of their waste management practices if the appropriate regulatory framework is not in place or not enforced. It is possible that environmentally detrimental livestock waste management practices could move to

3 This section is largely based on World Bank, 2003b.
countries in the region with weaker regulations or enforcement. This would save immediate costs for the livestock producers involved, whom are most likely to be large-scale, but would be detrimental for the region as a whole.

These problems stem from increasing intensive livestock production in the region. Due to a high animal concentration and insufficient agricultural land for the production of feed within peri-urban areas of East Asia, most feed used is concentrate feed brought from elsewhere. A large proportion of the nutrients contained in concentrate feed is not retained in the animal’s body but excreted in urine and manure, so there is an excessive concentration of nitrogen (N) and phosphorus (P) compounds in peri-urban areas of several East Asian countries, which results in significant water, land, and air pollution.

Preliminary estimations of nutrient balances in the region, which include manure and chemical fertilizers as source of nutrients and crops as the main nutrient sink, have been made for a coastal band of 50 km inland from the South China Sea. These estimates indicate nitrogen and phosphorus overloads on the coastal land, with hotspots in the Mekong Delta (7.2 and 3.1 tons per square kilometers respectively), the mouth of the Red River (6.3 and 4.0 tons per square kilometers receptively) and the whole Chinese coast of the South China Sea (3.1 and 2.4 tons per square kilometers respectively). Currently, animal manure is estimated to account for 47 percent of the phosphorus supply and 16 percent of the nitrogen supply. With the dramatic expected increase in demand for meat and milk, this share will continue to grow.

**Transboundary Livestock Disease Issues**

Transboundary animal disease not only directly affects the livestock sector—it’s direct and indirect impacts on a country can be significant. The most obvious is the welfare or income loss of decreased productivity and increased mortality. This can have multiplier effects, especially on the rural economy. Product prices may increase or decrease, depending on trade bans in place and competitors. Poor consumers who cannot substitute income or nutrition sources may face food security problems from livestock disease. Human health can be impacted from animal disease, and wildlife is often at risk. The public funds spent on animal disease control can be significant and decrease funds available to other important areas (Otte, at al, 2004).

Although the patterns of infection/epidemics can vary, the threat of disease to livestock producers is constant. Although the technical capacity to treat disease has greatly increased, so has the movement of goods and people. Properly preventing and mitigating disease has a strong public good element, even at the regional and international levels. The non-participation of a small group of farmers in disease treatment and prevention in a country can negatively affect the national economy, a large part of the livestock sector, and even human health. One country could have similar effects on a region or globally. The impact of disease on food security and rural income also can necessitate public sector involvement.
Animal disease has moved to the forefront of livestock policy recently, as ‘avian flu’ has caused several human deaths and massive poultry sector culling in many Southeast Asian countries as well as China. Most countries within East Asia are at the national level battling various types of livestock disease; the level of disease and level of prevention and treatment programs vary from country to country. Transboundary animal diseases, especially those of epidemic proportions, are of regional concern, if not global. Effective region coordination underpins successful prevention or rapid mitigation of diseases that can easily spread from country-to-country. WHO and FAO have led these efforts; the World Bank/EASRD has fast-tracked an emergency loan to Vietnam for coping with the impacts of the disease.

Avian influenza has been identified for over 100 years, and previous outbreaks have occurred in Hong Kong and the Republic of Korea. The widespread epidemics were caused by two strains of the virus. Wild birds are carriers of the disease and although resistant they can pass it on to domesticated birds. Once infected domestic birds are highly contagious the recommended response is usually to cull entire flocks to prevent further spread. Further steps to be taken include imposing immediate bans on shipment of birds to and from infected areas, safe disposal of culled animals, and disinfection of infected areas. Vaccine campaigns can be used to both reduce mortality and decrease infection. To initially prevent epidemics, good farming practices, health surveillance programs, and in-place mechanisms for rapid response to local outbreaks are necessary. The poorest countries are worst placed to develop such systems and are starting from a much less well-organized response capacity. From a livelihoods perspective, smallholder commercial and subsistence poultry operations can be devastated by such an epidemic, resulting in increased poverty (FAO, 2004a).

In December of 2003, Cambodia, China, Indonesia, Lao PDR, Thailand, and Vietnam all reported outbreaks of Avian influenza. Along with the other countries infected, over 100 million birds have died or been culled—the impact of the disease has been unprecedented. Many countries have undertaken massive programs to prevent further spread of the disease and at least China and Indonesia have been using vaccines. Responses beyond culling have involved infection, quarantine, and bans on trade. Future prevention or rapid response will entail putting in place more effective systems of surveillance and improving capacity for response. Training for improved farming techniques and improving rural infrastructure would also be helpful. For livelihoods, food or financial aid or assistance with diversification can be helpful (FAO, 2004b).

Vietnam was one of the countries hardest hit by the Avian flu. It has estimated that 43.2 million birds were lost due to the disease or culling and the cost of control has been $83 million. The disease also caused an increase in food prices and substantial environmental damage in affected areas. By March 30, 2004, Vietnam had declared that the disease is under control and that poultry operations could return to normal. Avian flu received top-level political support, with the Prime Minister setting dates for eradication (CIDRAP, 2004).
Basic Services

In East Asia, although provision of livestock sector services has largely progressed, significant gaps in the services available still exist. Although some needs are very specific to local areas or countries, several themes under sector services do emerge across the EAP region. Livestock productivity in many countries/areas is low, often due to a lack of education/training and can be improved through increasing/altering inputs, health measures, breeding, and more efficient use of outputs. Potential areas of for improving services include research and initiatives for vaccination, pro-poor marketing systems, improved animal breeding, extension services, and linkages amongst national institutions, donors, NGOs, and farmer groups (Hoffmann, 1999). Credit and risk management constrain many livestock producers (as well as most of the rural poor) in the region that might be appropriate for some type of intervention. Provision of food safety regulations and programs becomes increasingly important with structural changes towards

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Box 2.4 - The Impact of Avian Flu and Government Response in Vietnam

The most recent estimate of poultry losses in Vietnam is 38.8 million birds lost to disease or culling—approximately one-sixth of the national poultry inventory. The 15 human deaths caused cemented the link between animal health/disease and public health issues. Besides causing serious hardship for rural poultry owners, the epidemic has had further negative effects on the poultry service trade and has caused meat prices to rise above levels accessible to low income consumers. An estimated 0.3 percent of GDP was lost due to the avian influenza, or US$120 million.

Poultry is very important for smallholders in Vietnam: 70 percent of farming households keep poultry and seventy percent of the poultry population is held by smallholders. Poultry is the second most important meat in the Vietnamese diet; village-raised poultry is even able to receive premiums over industry-raised poultry and other meats. The poorest quintile of the population in Vietnam receives 7.1 percent of their income for selling poultry and eggs. Some data has indicated that semi-intensive smallholder poultry units were the most hurt by the epidemic.

The government’s veterinary, diagnostic, and surveillance capabilities were not adequate to rapidly and efficiently respond to the disease. The government had a strong response to the epidemic, with ministerial coordination to village (commune) level carrying out of culling and prevention activities. The numbers culled were unnecessarily high, given limited epidemiological activities. An assessment in a few Northern provinces indicated that 22 percent of birds were culled, of which only 20 percent were affected by avian flu. Furthermore, the compensation policy for poultry holders was under funded and communication between the central government and provinces was weak. Serious institutional strengthening is needed to address these weaknesses, as well as greater commitment of resources (World Bank, 2004b).
dominance of supermarkets and specialized export markets. With the recent advent of widespread and devastating ‘avian flu’ in Southeast Asia, the public sector role of providing disease control and prevention services has become more pronounced and politically expedient. In the country analyses, a more detailed overview is given of the areas that could benefit from improved sector services.

The method of delivery of livestock services is an ongoing challenge in East Asia. Umali, et. al. (1992) analyze how livestock services might be provided through public or private sector delivery. They recommend country-specific decisions on what services are appropriate for public sector provision or privatization. Livestock services can be defined as services that play a role in: reduction of production losses, protection of society from transmissible disease, and increasing livestock productivity and product quality. The public sector has generally dominated provision of these services in developing countries, but private sector involvement is increasing in areas were profit is feasible. A guideline for livestock services policy is the public good nature of goods to be provided and the externalities involved as well as level of private sector involvement. Vaccination and epidemic prevention and mitigation are clear public goods, with significant externalities involved; while veterinary services and drugs can feasibly be provided by the private sector in many circumstances. Extension and training services can be public or private and delivery is often complicated by problems from funding shortages to overstaffing in developing countries. Sometimes private sector providers of inputs will offer training. Ultimately, national-level provision of livestock services will be based on demand and willingness to pay at the farm level and political, administrative, and financial feasibility at the government level. Private and public delivery will also be based on these local conditions as well as level of private sector development.

Provision of services is linked to smallholder livelihoods. For smallholders, public sector-provided services are often the only ones available to them. Formation of farmer groups is a method of overcoming these barriers, through both group provision of services and improving access to existing private and public services. Facilitation of partnerships between smallholders and the private sector would also increase access to inputs and information. Often smaller-scale farmers are competitive in terms of efficiency, but lose market share due to hidden transaction costs, distortions, and externalities that are not scale-neutral. In Thailand, market-oriented small-scale poultry producers were found to be profit efficient, while in larger farms similar profit efficiency is based on overcoming “basic access barriers”. The major “basic access barriers” facing smallholders are lack of quality inputs and market recognition (Delgado, 2004). Accessing other players in the marketing chain is difficult for smallholders and a key public good to ensure smallholder competitiveness is facilitation of smallholder access to inputs and markets.

Improved services for animal health would greatly increase productivity and producer income. High disease levels and poor animal health inhibit development of the livestock sector in several countries of the region. In Vietnam, for example, the cost of livestock mortality alone is $58 million (IFPRI, 2001). Studies on the economic impact of animal disease are rare and tend to focus on developed countries. Some studies of African
countries have shown that animal disease can cause economic losses of millions of dollars. A study of disease control in Thailand showed that if export markets came open as a result of disease-free status, disease control programs would likely have positive outcomes beyond the sector at the macroeconomic level, causing increases in investment and employment (Purcell, et. al., 1997). Research done by the Australian Center for International Agricultural Research on developing vaccines for Newcastle Disease, which frequently decimates village chicken herds, has led to vaccines which can be transported and used easily in poor, inaccessible villages. The present value of this research in mainly Vietnam, Malaysia and Africa is $US220 million, with a cost-benefit ratio of 70 (ACIAR Center for International Economics, 1998).

Country Examples
Cambodia, Laos, and Vietnam have relatively under-developed livestock sectors, yet livestock in these countries is a critical part of the livelihoods of the rural poor. Likewise, they both lack adequate basic services that would allow for increased sector development. China gives an example of how livestock sector services are still facing challenges in countries that have experienced greater sector development.

China
In China sector services and a legal environment restricting rural producer organizations are significant barriers to development of the livestock sector. Administrative functions at national and provincial level tend to be dispersed amongst different agencies/ministries, causing problems of both overlap of functions and incomplete service delivery. Legal reform is needed in many areas, and could have a role in decreasing the tax/fee burden on farmers and removing barriers for accessing micro-credit. Technical/extension services are also under-funded and there is disconnect amongst research, education and extension. Credit and insurance are services of importance to the entire rural sector, and have great potential to improve the position of smallholder livestock producers. Many government programs are addressing these issues, but they are complex and reform will not be rapid (Zhang, et al., a & b, forthcoming).

In the area of animal health, veterinary services in China have been largely provided by the public sector, with a (largely successful) focus on infectious disease. Public investment in controlling infectious disease has been high and the Ministry of Agriculture (MOA) is currently taking measures to both improve disease control and provide an appropriate framework for the private sector to provide veterinary services. Recently the private sector has been playing a larger role, especially on larger, intensive farms and for smallholders in areas with more advanced livestock development, in some areas providing up to 50 percent of animal health services. Bedard and Hunt (2004) recommend strengthening the veterinary profession in China to provide a structured association to address the following issues: (i) expanded services from diagnostic laboratories on production-disease related constraints, (ii) disease surveillance, and (iii) inappropriate use of antibiotics and other animal drugs.
Cambodia
In Cambodia, an improvement in livestock services could have a significant impact on poverty reduction. Agriculture, of which livestock is a significant part, is critical to the rural poor. Eighty percent of Cambodians live in rural areas; 44 percent of farmer-headed households are below the poverty line. Women make up 55 percent of the agricultural workforce—much higher than in other sectors, but still have higher poverty levels in rural areas than men. During its economic transition, the government of Cambodia has prioritized rural livelihoods, to deepen the poverty reduction impact of increasing economic growth. If increased agricultural productivity and service provision to small/medium sized operations drives agricultural growth, poverty reduction will occur more quickly. Measures to improve rural livelihoods include promotion of smallholder livestock production—approximately 90 percent of all livestock is produced by smallholders. Yet, allocation of resources from the government, for both agriculture and livestock, has been low. It may not be adequate for maximizing poverty reduction, especially when also considering low grassroots-level capacity.

The Cambodian livestock sector is one of the least developed in the region. In many ways, livestock production is still characterized by subsistence-level purposes, including source of assets/cash income for crisis/times of surplus, family consumption, provision of draught power/manure, etc. Even under current circumstances, Cambodia has a comparative advantage for export of live cattle. However, the nominal protection coefficient for pigs suggests that producers face implicit taxes while consumers are favored. This is not due to policy measures, but based on poor infrastructure and market development. Animal health is also problematic in Cambodia: 10 percent of cattle and buffalo, 60 percent of poultry, and 46 percent of pigs are lost to attrition early in life. The desired/political responses to transboundary disease are not feasible in terms of resource and capacity. The food safety system is very underdeveloped, but the need for this is not as pronounced in local markets, where most meat is sold fresh/same day, is still low. Availability of credit and agency overlap in providing services are other issues that the livestock sector faces (RWA, 2003).

During 1996-2000, pig production growth was low due to floods, but poultry growth was at an average of 8.8 percent. Much more potential for livestock to contribute to income may exist, but is constrained by current productivity levels. When veterinary services are undertaken in villages, the impact on mortality has been shown to be significant. Cambodia in the long term may have a comparative advantage in integrated agricultural processing industries, as it is a low-cost producer for raw materials for the fish and livestock feed production. Such an integrated system could link SMEs, smallholders, agribusiness, and investors from throughout the region (World Bank, 2003a). There are many opportunities for livestock services to be improved to the benefit of smallholders, including extension and training, animal health initiatives, and infrastructure development.

Laos
Laos, like Cambodia, has a low-productivity livestock sector that would benefit from improvements to sector services. In Laos, the overall macro-economic situation is similar
to Cambodia, including a large rural population and percentage of people who derive their livelihood from agriculture. Livestock has a more prominent role than in Cambodia. In 2000, agriculture was 50 percent of GDP; in 1998 livestock comprised 20 percent of overall GDP. The population is 80 percent rural, and approximately 90 percent of farmsteads hold livestock. Over half of farm income is generated from livestock, and most production is traditional, low-input, and extensive. A third of farmers vaccinate their livestock; this low level of vaccination is rational given that nutritious food that would allow for full realization of productivity gains is scarce. Mortality is high and the few veterinary personnel are constrained by poor rural infrastructure. Marketing and processing systems are likewise underdeveloped. In the face of these constraints, natural conditions are conducive for livestock grazing (many grazing lands) and farmers are knowledgeable about feeding with the resources available (UNDP, 2001).

Since economic reforms in 1990, the demand for livestock products has grown while both cash crops and livestock growth has been higher than population growth. Regional specialization has also increased. Laos has slash and burn systems which are integrated with livestock, free scavenging, semi-permanent penning, and permanent penning amongst its livestock systems. In Northern Laos, slash and burn agricultural systems have the highest contribution to cash income generation in rural areas. Some districts in these areas also are reliant on livestock for sustaining basic livelihoods. In these areas, there is a need for technical support services, development of institutional capacity, marketing services, improved natural resource management, and legal services. In upland farming systems, livestock development provides a potentially sustainable alternative to slash and burn systems, but is constrained by disease, poor nutrition, lack of breeding programs, poor infrastructure, and insufficient research and extension. Shifting cultivation has been combined with the traditional small scale livestock production, which provides over 50 percent of cash income. Farmers however cannot incorporate increased livestock production while decreasing slash and burn systems without the above constraints being addressed. In “lower slope” villages that had been resettled, increasing animal husbandry and related services might mitigate significant social and economic problems caused by inadequate post-resettlement assistance. The prominence of livestock in the Lao economy and its importance to poor rural populations indicates that improved sector support could have large returns for sector growth and poverty reduction (Chapman, 1998).

**Vietnam**

Improvement of livestock services in Vietnam could help to decrease rural poverty. Rice production growth is slowing and rural incomes are lagging behind urban incomes. Livestock production is growing as rapidly as crop production, but only receives 4 percent of the national agriculture budget even though the majority of farm households have some livestock production. Still, potential for livestock production growth is great, given a consumption growth of 6 percent per year. From the supply side there is much capacity for increased production given multiple inefficiencies: productivity is low, markets function poorly, prices are high while quality levels are low, animal health services are inadequate, improved genetics are underutilized, extension and research are under-funded, and the meat-processing industry is underdeveloped (IFPRI, 2000).
low percentage of national agriculture budget devoted to livestock and several areas of inefficiency indicate a significant scope for improvement of sector services.

**Strengthening the Role of Para-veterinarians for Livestock Development**

Vietnam has developed an efficient network of paravets (around 30,000 *thuy y vien* in Vietnam) which have a wide coverage of the Country. These paravets represent by far the most relevant stakeholder between livestock smallholders and State Veterinary Services (SVS) which they complement at the grassroots level. Hence, as witnessed during the Avian Influenza Epidemic, the State Veterinary Services (SVS) will never have sufficient capacities to deliver services directly to all livestock smallholders for the prevention and control of animal diseases or for the implementation of livestock development programs. For example, in a district in Vietnam, around 3 livestock / animal health specialists employed by the State are working in an area where more than 10,000 livestock smallholders are.

However, paravet capacities are too often not sufficiently well considered while their role could be strengthened in many areas including:

1. **Planning of Livestock Development**
   - Collection of data for livestock statistics to help the identification of opportunities / constraints of livestock development.
   - Participation in platforms with other livestock-related services to elaborate strategies for livestock development or disease control programs.

2. **Private Services for Smallholders**
   - Deliver animal health care services to smallholders.
   - Deliver advice / extension services to smallholders.
   - Monitor technical & economical results of animal productions.
   - Help smallholders to obtain loans from credit institutions.

3. **Public Mandate on Animal Health**
   - Report diseases to SVS.
   - Contribute to the elaboration of disease control programs in collaboration with SVS.
   - Implement disease control programs at smallholder level, under supervision from SVS.

Most of these services have to be paid for by smallholders (individually or in groups) or by the State. Experiences on several of these aspects exist in Vietnam showing that some stakeholders (whether they are farmers, SVS, policy makers, etc.) have found an interest (or return on investment) in paying paravets to deliver services. These experiences go beyond the paravet as a lone private stakeholder, and include some institutional strengthening (paravet networks or association, for example). A comprehensive approach is needed and livestock development or disease control programs should be more focus around the multi-service capacities of paravets. It is essential that policies are further adopted taking account of what roles can be given to private paravets (VSF, 2004).
3. PROMOTING STRONG LIVESTOCK SECTOR DEVELOPMENT

This survey has shown the likelihood of continued growth of the livestock sector in East Asia and how livestock is important to the rural poor. Several areas where support is needed are identified, including addressing smallholder support, basic service provision, addressing environmental issues, and addressing livestock disease. Despite the need for such support and potential for improving the livelihoods of the poor, donor involvement, as well as national policy, could be enhanced and improved. Past livestock projects have sometimes not been as successful as might have been expected given the demand for them by smallholders. Although challenges still exist, new approaches are being used in livestock sector development that show great promise. With innovation and greater focus on the needs of the poor, there is potential for increased support to the livestock sector in developing countries across East Asia.

What Have Been Problems with Livestock Projects?

In a review of livestock in poverty focused development, Ashley, et al., (1999) point out that livestock forms a component of the livelihoods of at least 70% of the world’s rural poor, including extensive grazers, poor rain-fed mixed farmers and landless livestock keepers. However, these authors also review the impact of some 800 livestock related projects (457 of them implemented with World Bank financing) in the 1970s and 1980s and conclude that there is little evidence of sustainable impact on poverty. Similar analyses were conducted by the World Bank in 1993, and as a contribution by World Bank to the work of ADB 4 on livestock in 1991. The general conclusions were similar. Projects were found to have been donor or central government driven rather than demand driven. Actual involvement of farmers was minimal and multidisciplinary approaches were minimal owing to control by single line ministries. Implementation culture was often top down and overall capacity inadequate. A single focus rather than integrated crop/livestock focus was used even though integrated projects had a 50% higher success rate.

Why should this disconnect exist between demand among the poor for livestock projects and assistance and failure of implementation among funding agencies? The answer appears to be that livestock projects require particular attention to institutions and implementation/dissemination mechanisms when dealing with poor households. World Bank projects in EAP are no exception. Past projects focused almost entirely on public institutions for implementation with few linkages to the private sector. They have been top down rather than using participatory planning modalities and they have often not considered the wider farming system to which livestock contribute. Adequate financing mechanisms for multiple small loans have been inadequate.

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4 Asian Development Bank
“One Size Fits All” vs Participatory Livestock Development

Partly as a result of the early failure to develop successful approaches to smallholder livestock development, much of the benefit arising from a doubling of demand for livestock products in the last 20 years (Delgado, et. al., 1999) has been captured by private sector investment in industrialized livestock development, particularly for pork and poultry. Some eighty percent of the increased meat production in Asia since 1990 has been in commercial enterprises (de Haan, et. al., 2001). The poor have always faced inherent problems of acquiring livestock, maintaining them on small areas or without land, and selling them in isolation from organized markets and in competition with internationally distorted markets for livestock. Further, livestock trade is highly regulated for disease control. Feed supply for smallholders faces problems of inadequate property rights and access to common resources and there are growing environmental concerns regarding peri-urban livestock production (de Haan, et. al. 2001). Nevertheless, past project interventions have not helped. They have generally had a technical bias in areas such as credit, livestock supply, veterinary services but have also featured top down approaches based on universally applied models of development for project beneficiary households rather than rather than more tailored solutions adapted to the particular circumstances of the individual poor household. The poor either did not adopt the technologies presented because they were inappropriate or did not receive the technology because of institutional failures and capture of benefits by wealthier households.

When projects do not take into account participatory planning and local demand, resources are wasted without achievement of the desired improvements. In Indonesia, a loan from Japan in 2001 was used to construct 10 relatively modern line type slaughterhouses with the aim of improving food safety. The management of the facilities was sub contracted to the local private sector. However, the design of the work neglected installation of freezing capacity at all but one abattoir. The result was that the facilities could not service either the local domestic market where the demand is for freshly killed, preferably warm meat, for use in meat balls or the inter provincial urban markets where frozen beef and refrigerated transport is essential. The facilities are now mostly used for backyard slaughter style operations. The design demonstrated a failure to anticipate market needs at the outset and the project concept was too early for Indonesia, where there is still no strong demand by consumers for improved levels of food safety.

Recent smallholder oriented projects have had more success by using a participatory approach in which communities are assisted in developing a menu of choices surrounding livestock development which are adapted to the needs of mainstream farmers, the landless, and small entrepreneurs alike. In Laos, the CIAT (International Center for Tropical Agriculture) designed, Australian funded, Participatory Livestock Project (2003-2007) is using options such as beef fattening for smallholder farmers, backyard forage production for the landless and women headed households and village veterinarian training for small business entrepreneurs as a means of delivering an array of livestock sector initiatives. This approach is now being scaled up in a proposed ADB funded livestock sector project. Technical support, however, still relies on project funded extension agents and thus sustainability is heavily dependent on whether a simple suite of technologies can be developed which are easily replicable by communities. In
Bangladesh, de Haan et. al. (2001) quote the success of the ADB funded Bangladesh Participatory Livestock Project, which uses NGOs to disburse loan proceeds and conduct social mobilization, training, extension and monitoring for beef, goat and smallholder poultry production. The loan spread is from 1.25% for the organizing peak body to 6.25% for participating NGOs and 16-20% (market rates) for participating farmers.

**Box 3.1 - Getting It All Together: Bangladesh Participatory Livestock Project**

This two phase DANIDA project started in 1993 and is a partnership between NGOs and the Directorate of Livestock Services aimed at assisting large numbers of poor rural women in poultry production. The assistance covers:
- Organization into producer groups
- Credit through small groups without collateral along Grameen Bank lines
- Specialization as egg producers, chicken raisers or feed suppliers
- Disease control by village vaccinators
- Marketing of eggs by group members

The project included over 1.25 million women by 1997; women’s share of household income increased from 16 to 30% during implementation and consumption of eggs and milk more than doubled. Much of the success is due to provision of credit. DANIDA has subsequently established a “Network for Village Poultry Development” to assist in adapting the concepts elsewhere.

Source: Kristensen et. al. 2004

**The Problem of Finance**

Because livestock projects are popular with the poor, they must inherently address the needs of a large number of widely dispersed households in remote locations with no access to formal credit systems. In this situation, the formal credit system usually has no interest in supplying credit because of the overhead cost of servicing many small loans. Even in China, with well organized Finance Bureaus, the numbers of loans are often overwhelming. In the case of the Red Soils 2 Area Development Project (1994-1999), for example, some 70,000 households were projected to receive assistance through revolving livestock loans. In fact, the number of beneficiaries exceeded that total and livestock development was very successful in both increasing income and supplying organic manure for orchard development. However, administration of revolving loans proved impossible with available public sector resources and repayment left to participating governments at several levels.

The approach now being considered in China for large scale projects is that of combining Bank resources with National programs aimed at the poor such as the “Green for Grain” program in in SWAPS (Sector Wide approaches). In existing National programs, smallholders are supplied seedlings of timber and economic forest trees by grants and repayment is made from the national and provincial tax base. In an expansion of this approach, grants from World Bank loans (to be repaid by Central and Provincial levels from the tax base) could be used to capitalize the poor with livestock as an immediate income earning resource to improve livelihoods as trees develop toward bearing age. The difficulty with this approach is that most regular loans for agriculture are currently for
high return investments with substantial contribution and payment of the loan by beneficiary farmers. A different approach is needed when dealing with very poor households having incomes of less than 875 Yuan per capita per month\(^5\) and thus very limited capacity to invest or to repay.

Another approach has been to resort to in-kind credit in the form of repayment using progeny of breeding animals. This type of credit has been widely applied in Indonesia following models established by IFAD and World Bank in the Indonesia Smallholder Cattle Development Program (de Haan et. al., 2001). The main lessons learned have been that average repayment period with smallholder cattle is longer than expected (possibly seven rather than five years in a “two calf for one cow” program), and that sound community organization, technical competence in the implementing agency and trust and goodwill in participating groups are essential. Women’s groups work best. However, attempts to copy models of feedlot style fattening from credit in kind groups developed on Java or Lombok to more Eastern islands have also shown that environmental management is often neglected in planning and that manure disposal becomes a real problem where labor for distributing it to crops is limited.

**Increased Private Provision of Services for Smallholders**

A universal problem of livestock projects is the need for ongoing disease and management technical assistance at the lowest levels. Poor women headed households that raise poultry especially need this type of assistance. In the push for decentralization of government, fiscal austerity and de-scaling of the state role in the economy, public services have been reduced in most developing countries. In theory the changes should have opened up opportunities for private provision of services. In practice, a vacuum is often left in areas such as veterinary services because the skills migrate to higher profit areas such as domestic animal surgery where payment is assured (see for example Brandenburg, 2002 in relation to Indonesia).

De Haan et al. (2001) have summarized the services appropriate to privatization vs. public funding, largely using this criterion (Table 3.1).

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\(^5\) China’s National Poverty Line for 2005
Table 3.1 Classification of Animal Health Services by Public or Private Sector Activity

<table>
<thead>
<tr>
<th>Service</th>
<th>Private</th>
<th>Public</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical services</td>
<td>Yes</td>
<td>No</td>
<td>Mainly private good</td>
</tr>
<tr>
<td>Vaccine production</td>
<td>Yes</td>
<td>Rarely</td>
<td>Mainly private good. Some epizootic vaccines have public good value</td>
</tr>
<tr>
<td>Distribution of veterinary products</td>
<td>Yes</td>
<td>No</td>
<td>Mainly private good</td>
</tr>
<tr>
<td>Vaccinations and vector control</td>
<td>Yes</td>
<td>Possibly</td>
<td>Mainly private good but there may be externalities</td>
</tr>
<tr>
<td>Elimination of animals with epizootic disease</td>
<td>Yes</td>
<td>Possibly</td>
<td>Some public good aspects</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>Yes</td>
<td>Possibly</td>
<td>Mainly private good but there may be externalities</td>
</tr>
<tr>
<td>Veterinary research</td>
<td>Yes</td>
<td>Yes</td>
<td>Either</td>
</tr>
<tr>
<td>Education and extension</td>
<td>Possibly</td>
<td>Yes</td>
<td>Mostly public good</td>
</tr>
<tr>
<td>Policy development</td>
<td>No</td>
<td>Yes</td>
<td>Public good</td>
</tr>
<tr>
<td>Disease surveillance</td>
<td>No</td>
<td>Yes</td>
<td>Public good but can be contracted</td>
</tr>
<tr>
<td>Quarantine</td>
<td>No</td>
<td>Yes</td>
<td>Externalities but can be contracted</td>
</tr>
<tr>
<td>Quality control of veterinary products</td>
<td>No</td>
<td>Yes</td>
<td>Information asymmetries</td>
</tr>
<tr>
<td>Food Hygiene and inspection</td>
<td>No</td>
<td>Yes</td>
<td>Information asymmetries but can be contracted</td>
</tr>
</tbody>
</table>

The inherent problem of reliance on private sector provision of services is that the private sector generally expects a very large degree of market capture in return for services. To address this challenge farmer groups formed around smallholder feedlots adjacent to large scale commercial feedlots in Lampung Province, Indonesia. This arrangement functions efficiently because of private sector support for procurement of livestock and veterinary services. The large scale private sector uses a partnership with selected smallholders as a means of sourcing additional partly finished feeder steers and the smallholders benefit from technical services.

A particular problem of past projects has been the tendency of public services to favor the development of publicly run ranch style developments as breeding centers. Such projects have almost universally failed owing to the lack of incentives for and thus commitment of management. An example is the special breeding project for Bali cattle (P3 Bali breeding scheme jin Indonesia. This project was designed and funded over an extended period by the Government of New Zealand in an attempt to address the problem of conservation of the genetics of the Bali breed of cattle. However, it operated through government controlled stations (Dompu, Sumbawa; Bone, South Sulawesi; and Denpasar, Bali) which were the only depository of breed records. The stations themselves became identified with an unpopular national government and in 1998 the stations at Dompu and Bone were destroyed by local villagers, along with the records of 10 years of breeding effort. Fortunately one station, on Bali Island has continued in operation but is restricted in
impact nationwide by the existence of the genetic disease Jembrana on Bali. One alternative for the future is to promote local breeding improvement groups with farmer based organizations (Siregar, et al. 2003). Progress will be much slower, because of the lack of separation of genotype and phenotype effects unless a large group of breeding animals can be run together with the same feeding and other management. Nevertheless, slow progress is possible in identifying with farmers the importance of characters that contribute to financial gain such as conformation, birth weights, progeny survival, milk yield etc., in addition to popular traits such as coat color.

In Indonesia the private sector has not shown willingness to enter areas where any portion of public good remains, such as artificial insemination (AI) for the beef industry. In contrast to the geographically confined and private sector market dependent smallholder dairy industry, beef AI remains in government control. Private sector organizations have not shown interest in commercializing AI services, possibly because the main benefits of involvement are not the fees for routine services in AI but the huge productivity improvement available from cross breeding, which is captured by the smallholder rather than the operator of the service. Thus the AI service, in an era of decentralization and reduced budgets for agriculture at local level, remains in local government hands and is largely under funded. Privatization has occurred in actual delivery of semen to smallholders, (although services are often unreliable) but investment in quality breeding animals and in performance recording is absent.

**Box 3.2 - The Way Forward in Privatization**

De Haan et.al (2001), have summarized the policy and organizational changes that are essential for growth of small scale private services. They include:

- Support for privatization of public services including full cost recovery of private good services provided by public institutions
- Increased training of part time farmer –veterinary auxiliaries (para professionals) supported by private veterinarians
- Adjustments to the legal and regulatory framework to allow and support the private practice of veterinary services
- Continued restructuring of public services to emphasize performance based salaries and increased training in public responsibilities (epidemiological surveillance, quality control of drugs, food safety, international trade, etc)
- Greater attention to risk and cost benefit in implementing animal health policy
- More emphasis on low cost technology such as heat tolerant vaccines suitable for use by village level technicians
- Creation of a regulatory mechanism for animal health either by private self regulation or directly by the public sector

Increasingly, the answers to provision of crucial services such as disease services are being found with para professionals and farmer group organization rather than government supplied services because of the private good nature of the service when epizootic disease spread (e.g. avian flu) is not the main concern. Nevertheless, the poor may still see provision of services as a government obligation. In Yunan Province, China
for example, vaccination of chickens costs about one Jiao (0.1 Yuan) and vaccination of pigs about one Yuan ($0.13). The poor in some counties of the north east maintain that they should not pay the veterinary fee for vaccination, but in an era of substitution of fees for taxes, the result is increasing mortality of village livestock from easily preventable disease.

Ashley, et. al. (1999) note the imperfections of the private sector, NGOs, local organizations and the public sector alike in provision of services and note that some element of institutional development, training, extension service improvement or planning has become a feature of newer projects. They conclude that a framework of institutions focused on the poor and supported by national level policy is essential for success in livestock projects. Examples include

- Farmer associations and cooperatives that supply inputs and services to members, provide marketing services or mediate access to natural resources
- New private sector enterprises such as animal health workers
- Credit and savings groups or new lending procedures in the formal financial sector which provide loans without collateral
- Rationalized delivery of state services to focus such services in areas on selected public good functions and reform of the incentives available to employees
- A market focus in planning projects

**Conclusions**

Past projects have suffered poor impact because they did not focus on the source of most demand for loans and grants from multilateral and bilateral agencies—poor households. Instead livestock development has occurred mainly in the large scale industrialized livestock sector in East Asia. Nevertheless, lessons learned from smallholder projects of the 1970s and 1980s have been applied and proven in more modern approaches of the 1990s. The biggest issue facing livestock projects of the future is how to support investments which spread the benefits of increased demand for livestock products more equitably and sustainably by improving access of smallholders to the benefits of livestock (see Kristensen, et. al., 2004). In this regard, some of the conclusions of Kristensen, et al. (2004) are relevant. Promotion of a better balance between industrialized and smallholder production should take place through:

- Improved regulation of industrialized livestock production using polluter pays principles and support for testing new means of collection and use of effluents by smallholders
- More emphasis on private sector provision of services in partnerships with government, supported by improved veterinary regulations to allow private practice and improve public health
- Support for modern smallholder production systems which meet demand for both quantity and quality, including both the mass market and the traditional “organically produced” products (or products perceived as ”natural” in the market)
• Support policies, infrastructure and smallholder organization to facilitate vertical integration with the industrialized livestock sector

Current Approaches to Livestock Sector Development

Despite the difficulties in delivering livestock sector interventions, current approaches to livestock sector development are doing more to meet the needs of the rural poor. The livestock sector in East Asia is highly varied—from pastoral systems in Mongolia to rapidly developing industrial production of poultry in China to integrated, often subsistence level production, in Laos. Among methods of livestock sector engagement discussed, addressing institutional change, increasing participatory process in livestock development, further exploring the livelihoods approach, and targeting smallholders are all important elements of new projects. These themes run across innovative approaches to livestock development are being implemented in many World Bank projects in East Asia to address key challenges to livestock sector development.

Participatory Approaches

Animal Health in Cambodia
A World Bank project in Cambodia has a livestock component: the Animal Health and Productivity Component of the Agricultural Productivity Improvement Project (APIP). Based on successful village-level NGO projects and addressing basic service provision, this Component was found to be successful, and likely to be sustainable after the project closed. The animal health and disease control subcomponents were especially found to be successful, partially based on willingness of farmers to pay user-fees and willingness of the government to privatize animal health services. This indicates that the project had high stakeholder commitment—from the government to farmers—and was demand-driven (Walsh, 2003). This Component includes disease control, basic animal health, and promotion of animal production components in four provinces. Village veterinarians and health providers have played a substantial role in the accomplishments of this Component (World Bank, 1996).

Livelihoods and Livestock in Mongolia
One of the most innovative projects that utilizes a livelihoods approach is ongoing in Mongolia, and has a large focus on the livestock sector. The Mongolia Sustainable Livelihoods Project (SLP) develops a livelihood-based approach to pasture management which was informed by a Participatory Living Standards Assessment (PLSA). The three main components of this project are pastoral risk management, micro-finance outreach, and a local initiative fund. This PLSA emphasized the increased insecurity and vulnerability of poor Mongolians, and recommended development of strategies that took into account the complex nature of poverty. Under this approach, the main livestock component is for pastoral risk management, and includes provision of infrastructure (wells, fodder storage). The other funds might also be used for livestock enterprises, if deemed the most viable by recipients (World Bank, 2002). A complementary project, the Index-based Livestock Insurance Project, was approved in May 2005 and will offer
insurance to herders based on livestock mortality indices. This project brings a highly innovative form of insurance to mitigate one of the most serious risks faced by livestock herders in Mongolia.

**Helping smallholders reach markets**

The *Smallholder Cattle Development Project* in China has helped enable smallholders to respond to developing markets for high-quality, safe beef. This project addresses the challenges of a weak marketing infrastructure and a weak market information system. The objectives of the project are to improve smallholder cattle production and to improve the quality and marketability of cattle to increase farmer income. The project supports policy development for the beef sector, development of market linkages for farmers, and expansion of slaughterhouses and processing plants. This includes construction of small live cattle markets that provide trade and market information, technical knowledge and access to veterinary services. The project provides mechanisms for farmers to respond to markets; the processors involved all are working towards achieving international food safety and quality standards (HACCP/ISO-9002), (World Bank, 2004a).

**Addressing externalities**

Environmental Externalities

The *Gansu and Xinjiang Pastoral Development Project* (China) combines environmental objectives with livelihood objectives through a systems approach. It has an objective of promoting sustainable natural resource management by establishing improved livestock production and marketing systems that would increase income of herders and farmers in project areas. Major activities include grassland management and forage improvement, livestock production improvement, market systems development, training and extension, and applied research (World Bank, 2003f).

Regional Level Environmental Issues

A GEF-funded project covering Thailand, Vietnam, and China, the *Livestock Waste Management in East Asia Project*, is under preparation and will lay the foundations for country and regional-level development of livestock waste management policies and practices. The objective is to decrease nutrient emission from livestock waste into the South China Sea and national-level bodies of water. The regional approach ensures that one country does not become a “haven” for polluting livestock farms. This project will focus on development of appropriate and replicable livestock waste management policies at the national level, regional coordination, and demonstrating livestock waste management best practice. This project also takes advantage of donor/institutional coordination. The World Bank is involved in the Livestock, Environment and Development (LEAD) Initiative, an inter-institutional project with the secretariat based in FAO. The work of the Initiative targets the protection and enhancement of natural resources affected by livestock production while maintaining the objective of poverty alleviation and LEAD will implement the regional coordination component of the project.

Transboundary Disease

After the advent of Avian Flu in Vietnam, the government requested the World Bank to prepare an emergency recovery project. This project is short term, spanning 2 years and
focuses on key institutional challenges. The preparation missions have worked closely with both FAO and ADF (*Agence Française de Développement*). The project has four components: (1) Strengthening diagnostic capacity, animal disease surveillance, and HPAI virus research, (2) Poultry sub-sector rehabilitation, (3) Public awareness and information campaign, and (4) Project Management (World Bank, 2004c). The project was prepared within 3 months to respond to the government’s urgent request for assistance. Emphasis is given on first developing national strategies and action plans for institutional-building that will address the Avian flu threat over the medium term.

**Donor Coordination (Africa)**

Coordination of donors in the livestock sector is key to Bank engagement in several regions, but most is most systematically pursued in Sub-Saharan Africa. The lessons learned are applicable to East Asia. The World Bank has recently initiated ALive, a multi-donor partnership for livestock development in Africa that aims to map existing programs and fill gaps between them, reduce poverty, promote economic growth, encourage trade and open markets, and create sustainable institutions. In Africa, a healthy and dynamic livestock sector can and should be an essential component of rural poverty reduction programs, minimizing the vulnerability of the rural poor to the vagaries of climate and their impoverished natural resource base. Moreover, due to the increasing demand for animal products in emerging urban markets of Sub-Saharan African, the development of the livestock sector offers probably one of best opportunities for economic growth in the rural areas of the region (World Bank, 2004b & 2004c).

**Moving Forward: Future Engagement in the East Asia Livestock Sector**

The time is right to increase emphasis on supporting the livestock sector in East Asia. After a decade of decline of support to the agricultural sector, the World Bank is “rediscovering” the importance of agricultural and rural development to poverty reduction and putting increasing emphasis—increasing lending levels—in these areas. There is also evidence that current livestock projects in East Asia are generally successful. Within the World Bank, there are a few projects in China that are largely focused on livestock and several throughout the region that have livestock components. These projects are listed in Annex 4 and all have internal ratings of satisfactory for the development objective.

Livestock sector development is an important part of poverty reduction in East Asia and new approaches are allowing for “smarter” and more effective livestock sector projects and analytical work. Given the strong likelihood of demand and supply growth in the livestock sector, as well as its strong poverty-reduction potential, there is significant scope for directly supporting livestock sector development in East Asia. This survey has highlighted the need for smallholder support, environmental management, livestock disease and health interventions, and improved sector services as well as best practice in delivering such support. Below are potential country-level areas of support based on the issues and approaches reviewed.
Cambodia
Widespread rural poverty and the positive impact the APIP component that targeted animal health indicate that broad support the livestock sector in Cambodia would have a wide impact on poverty reduction. The animal health component of APIP has proved to be successful; at the very least livestock sector activities should be included in broader rural and/or agricultural development projects. National-level capacity building for provision of sector services that might be part of a broader initiative may also be useful. The problems facing the livestock sector in Cambodia are basic—poor infrastructure, few services and high livestock mortality. Effective interventions could be livestock-specific or only indirectly related, such as rural roads or better governance (eg. of the growing industrialized livestock sector). Investment in extension services either by government or non government agencies is also a prerequisite to expansion.

China
The theme of “helping smallholders adapt to international trade and changing market conditions” provides a framework for engaging the livestock sector in China. Critical issues include integrating smallholders into markets, the environmental impact of livestock, and development of service and legal systems that support the sector, including one for increased food safety and quality. If environmental protection interventions increase as well as food safety, smallholders will have more difficulties with compliance. The impact of WTO accession is also a promising if still somewhat uncertain challenge for the Chinese livestock sector. China does have some favorable policies for supporting livestock development, but targeting towards the poor has been inadequate. Given livestock systems are characterized by both industrial and smallholder production, targeting would have to be an important part of increased livestock sector interventions in China. Many ‘poverty projects’ have included support of loans for livestock investments—livestock in China is a “good investment” and effective targeting would have a larger impact on rural poverty. Many interventions that would support the livestock sector come under larger initiatives for governance, agriculture, and rural areas. In the case of broader interventions, it will be important to include livestock sector interventions. This is especially true for agricultural interventions—livestock is a higher value product than many crops/commodities. Increased livestock production is an important strategy for farmer to diversify from lower-value crop production activities.

Indonesia
Many problems associated with food safety (of exports), animal disease (Avian flu has now been detected in the country), and post-crisis recovery require institutional and political solutions. Multiple types of production systems (traditional, semi-intensive, intensive) exist in Indonesia, and regional distribution of types and concentration of livestock is highly variable. Given this varied structure, two types of livestock sector intervention can be recommended. Local-level or region projects focused on a specific area or species, like the JICA project that assisted farmer poultry organizations, can have significant poverty reduction impacts at the local level. A recent Bank mission found that in Eastern Indonesia improved breeding research and extension as well as privatization of AI services would improve beef productivity. Some 90 percent of cattle are raised by smallholders and income from cattle contributes to 30 percent of farm household income.
Such targeted interventions could cause a significant increase in smallholder incomes. Secondly, national capacity and institutional building projects for areas such as environmental protection, animal health, improved services, and food safety that take into account smallholder impact would have a positive impact on sector development nationwide. The planned World Bank-funded Farmer Empowerment through Agricultural Technology and Information Project (FEATI) will provide a programmatic approach nationwide to restructuring and funding extension and research services, to make them more responsive to the poor. It will also investigate the appropriate entry points for public private partnerships, including partnerships between lot feeders and smallholder feeder cattle providers.

**Laos**

Discussion with World Bank staff and examination of rural development project documents in Laos has indicated that the World Bank is not currently targeting livestock sector development through its projects. The Country Program recognizes the important role of the Asian Development Bank in this sector. Studies of the livestock sector in Laos have shown that it is very important to the rural poor and the livestock sector lacks several essential livestock services that have public good characteristics under current circumstances. Given this finding, both national and region interventions that are livestock-specific or address livestock within a broader rural-development framework could have a broad impact on rural poverty reduction. Facilitating service provision, particularly livestock disease control by combining public and private services and developing a “village veterinarian” structure are strong priorities. Lessons learned from the Participatory Livestock Project implemented by CIAT will be key to developing future projects.

**Mongolia**

Current World Bank engagement in the livestock sector in Mongolia is based on improving rural livelihoods. This type of involvement can have a large impact on poverty reduction and the results and impact of the Sustainable Livelihoods Project and the Index-Based Livestock Insurance Project will indicate how such interventions might be replicated. Mongolia is also making efforts at the national level to increase livestock sector production and improve services. Facilitating market-based livestock production, such as semi-intensive dairy, is an important area for further support. As previously discussed, any improvements in the cashmere sector, such as improvement of quality, facilitating trade, etc., could have a significant poverty reduction impact. Environmental protection and land tenure issues will still be issue for years to come and improving pasture management is crucial for the viability of the livestock industry. Provision of sector services will enable producers to increase productivity and access markets. Targeting of smallholders, given current inequalities in the livestock sector, would be a key element of future support.

**Philippines**

Given the current level of development and continued income, urbanization, and population growth, the livestock sector in the Philippines will most likely continue to

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6 This section is largely based upon work by Catelo, 2002; Costales & Delgado, 2002; and Rola, 2002.
grow. Thus the nature of this growth is a critical issue—especially if the livelihood of smallholders and environmental sustainability are to be prioritized. Many public policy options that impact the livestock sector to this end can be pursued: trade liberalization, market reform, environmental regulation, and smallholder participation. Regarding environmental sustainability and food safety (market integration/development) issues, enforced strict regulations with other interventions under current conditions could threaten smallholders. The main issue in future development of livestock in The Philippines is the need to regulate the sector so as to provide a better balance of industrialized and smallholder production. For example, tariffs on imported feed grain for smallholders are almost double those of the industrialized sector (World Bank, 2005). Smallholders remain in small scale pig fattening because of a lack of employment alternatives rather than because of a more supportive policy environment. The Philippines also faces challenges of disease control in the beef sub sector. With the advent of live imports of cattle from Brazil (where FMD is endemic), control of live exports and smuggling in the region will be essential to prevent spread of FMD.

Vietnam
The World Bank Rural Development Strategy for Vietnam prioritizes (1) market-oriented reforms, (2) natural resource management for livelihood security and (3) poverty reduction through inclusion and empowerment. From this approach, the Vietnamese livestock sector would benefit from increased support in several areas. Livestock sector development can benefit the rural poor through diversifying the incomes of the poorest households. Market reforms and improved natural resource management are also key to livestock sector development. IFPRI (2000) has recommended the following interventions for Vietnam:

- **Vertical integration and private-public partnerships**: creation of institutions to allow smallholders to be linked with both input suppliers and livestock processors;
- **Improvement of extension and research that targets smallholders**: greater funding for research and extension that is accessible to smallholders;
- **Fostering of an improved market**: allowing for farmers to benefit from increased productivity;
- **Addressing externalities**: environmental problems caused by commercial livestock production, and regulating livestock health and product quality;

Some of the interventions would fit into broader agricultural/rural reforms/development initiatives; others could be livestock specific. A stand-alone livestock project could have a large impact on rural poverty; otherwise it will be important to emphasize livestock in larger agricultural/rural development projects.
ANNEX 1. MILK AND EGG CONSUMPTION

Graph A1.1. Egg Consumption Per Capita in East Asia, 1980-2001, kg/capita

Graph A1.2. Milk Consumption Per Capita in East Asia, 1980-2001, kg/yr

Source: FAOSTAT, 2004
Graph A2.1. East Asia Poultry Meat Consumption Per Capita, 1980-2001, kg/yr

Graph A2.2. Pigmeat Consumption Per Capita in East Asia, 1980-2001, kg/capita

8 Source: FAOSTAT, 2004
Graph A2.3 East Asia Bovine Meat Consumption Per Capita, 1980-2001, kg/yr
### Table A3.1: LIVESTOCK SECTOR INVOLVEMENT OF RURAL HOUSEHOLDS IN THAILAND

<table>
<thead>
<tr>
<th>Rural Household Quintiles</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal income (Baht/mo.)</td>
<td>30</td>
<td>29</td>
<td>56</td>
<td>120</td>
<td>168</td>
<td>81</td>
</tr>
<tr>
<td>Farm income (Baht/mo.)</td>
<td>1498</td>
<td>1903</td>
<td>2145</td>
<td>2736</td>
<td>2902</td>
<td>2237</td>
</tr>
<tr>
<td>Share of animal income</td>
<td>0.5%</td>
<td>0.4%</td>
<td>0.6%</td>
<td>0.6%</td>
<td>0.6%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Share of farm income</td>
<td>28.8%</td>
<td>27.2%</td>
<td>25.6%</td>
<td>21.7%</td>
<td>13.8%</td>
<td>23.4%</td>
</tr>
<tr>
<td>Proportion of livestock households</td>
<td>11.6%</td>
<td>10.5%</td>
<td>6.8%</td>
<td>6.0%</td>
<td>4.1%</td>
<td>7.8%</td>
</tr>
</tbody>
</table>

**Notes:**

1) Household quintiles are calculated from per capita expenditure  
2) Animal income is profit from farming of family member whose primary or secondary occupation is market-oriented animal producer and related worker  
3) Farm income is the total profit from farming of a household  
4) Livestock household is a household that reports type of enterprise as "Livestock"  
5) Based on the sub-sample of rural households

**Source:** World Bank Household Surveys, 2003
# ANNEX 4

## Table A4.1: EASRD LIVESTOCK PROJECTS AND COMPONENTS

<table>
<thead>
<tr>
<th>Project</th>
<th>FY Approved</th>
<th>Loan/Grant size</th>
<th>Latest PSR DO&lt;sup&gt;9&lt;/sup&gt; Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Livestock Projects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China-Smallholder Cattle Development Project</td>
<td>FY00</td>
<td>93.5 million</td>
<td>S</td>
</tr>
<tr>
<td>China-Gansu and Xinjiang Pastoral Development Project</td>
<td>FY04</td>
<td>66 million</td>
<td>S</td>
</tr>
<tr>
<td>Vietnam-Avian Influenza Emergency Recovery Project</td>
<td>FY05</td>
<td>5 million</td>
<td>S</td>
</tr>
<tr>
<td>China-Heilongjiang Dairy Project</td>
<td>FY05 (expected)</td>
<td>100 million</td>
<td>S</td>
</tr>
<tr>
<td>Livestock Waste Management in East Asia Project</td>
<td>FY05 (expected)</td>
<td>7 million</td>
<td>S</td>
</tr>
<tr>
<td>Mongolia Index-Based Livestock Insurance</td>
<td>FY05</td>
<td>7.5 million</td>
<td>S</td>
</tr>
<tr>
<td><strong>Livestock Components or Sector Theme</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China-Anning Valley Agricultural Development-Livestock Development Component</td>
<td>FY99</td>
<td>8.5 million</td>
<td>S</td>
</tr>
<tr>
<td>Mongolia-Sustainable Livelihoods Project-Pastoral Risk Mgt. Component</td>
<td>FY02</td>
<td>4.1/18.7 million</td>
<td>S</td>
</tr>
<tr>
<td>Jiangxi Agricultural Modernization Project – Animal Production Sector Theme</td>
<td>FY04</td>
<td>100 million</td>
<td>S</td>
</tr>
<tr>
<td>China-Sustainable Coastal Resources Development – Animal Production Sector Theme (fisheries)</td>
<td>FY98</td>
<td>100 million</td>
<td>S</td>
</tr>
<tr>
<td>East Timor – Third Agricultural Rehabilitation Project-Animal Production Sector Theme</td>
<td>FY04</td>
<td>4.2 million(trust funds)</td>
<td>S</td>
</tr>
<tr>
<td>China-Loess Plateau Watershed Rehabilitation Project – Animal Production Sector Theme</td>
<td>FY99</td>
<td>150 million</td>
<td>S</td>
</tr>
<tr>
<td>Vietnam-Agricultural Diversification Project – Animal Production Sector Theme</td>
<td>FY98</td>
<td>66.9 million</td>
<td>S</td>
</tr>
<tr>
<td>Cambodia-Agricultural Productivity Improvement-Animal Health &amp; Production Component</td>
<td>FY97</td>
<td>4.9 base cost/27 million loan</td>
<td>S</td>
</tr>
</tbody>
</table>

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<sup>9</sup> Project Status Report Development Objective
REFERENCES


