IW93-1

LIVESTOCK INVENTORY AND FEEDSTUFFS REQUIREMENTS IN SOUTHEAST ASIA AND CHINA: PROJECTIONS TO 2025

By

James R. Simpson

IW93-1 January 1993

INTERNATIONAL WORKING PAPER SERIES

FOOD AND RESOURCE ECONOMICS DEPARTMENT
Institute of Food and Agricultural Sciences
University of Florida
Gainesville, Florida 32611

LIVESTOCK INVENTORY AND FEEDSTUFFS REQUIREMENTS IN SOUTHEAST ASIA AND CHINA: PROJECTIONS TO 2025

by

James R. Simpson
Professor
Food and Resource Economics Department
University of Florida
Gainesville, Florida, USA

Invited paper for the

Sixth Animal Science Congress

of

The Asian-Australian Association of Animal Production Societies (AAAP)

Bangkok, Thailand
23-28 November, 1992

December 9, 1992

Livestock Inventory and Feedstuffs Requirements in Southeast Asia and China: Projections to 2025*

by

James R. Simpson**

Livestock industry development is a planning process which rests on careful evaluation of demand and supply. The primary purpose of this paper is to articulate the various factors involved in the development and use of feedstuffs projections. Projections of animal feedstuffs requirements for Southeast Asia (defined as Bangladesh, Bhutan, Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Nepal, the Philippines, Sri Lanka, Thailand and Viet Nam[1])and China (Peoples Republic of China or PRC) in the years 2000, 2010 and 2025 are presented. Finally, principles about livestock industry development and planning are set forth.

Urbanization and Mechanization

Increases in population are an important aspect in the design of development strategies for Asian livestock industry improvement. The degree of urbanization, which has a major impact on the relative importance of livestock systems varies considerably by country (Simpson, 1990). For example, Malaysia has experienced a 17 percent growth in urban population since

---

*Invited paper presented at the Sixth Animal Science Congress of the Asian-Australian Association of Animal Production Societies (AAAP) in Bangkok, Thailand, 23-28 November, 1992.

**Professor, Livestock Economics, Food and Resource Economics Department, McCarty Hall, University of Florida, Gainesville, 32611.

[1]The decision to include these countries is based on the notion that India should be separate as should the geographically very different countries of the grouping called Western Asia and North Africa (WANA).

the early 1960s and is expected to be nearly 67 percent urbanized by 2025. Indonesia's urban proportion will grow from 30 percent today to 55 percent in 2025 (Table 1). Thailand will jump from 23 percent at present to 49 percent in 2025. The PRC, where the distinction between rural and urban is blurred due to rapid development of rural industry, will also witness increasing urbanization, climbing from 21 percent to 44 percent in 2025 according to official United Nations projections (1991). China's urbanization rate would probably be much closer to 60 or 70 percent in 2025 if adjustments were to be made for rural families engaged in part-time farming and rural industry.

The total population of Southeast Asia will increase from about 585 million people at the end of the 1980's to nearly one billion in 2025 (Table 1). That is a 71 percent increase over the three and a half decade period. During this interval, urban population will increase 232 percent. In contrast -- and this is crucial for livestock industry planning -- rural populations will only grow 17 percent, from 436 million in 1988-90 to 510 million in 2025. Furthermore, Southeast Asia's total rural population will actually decline after 2010. China's rural population will grow only slightly between 1988-90 and 2000, and will decline after that.

The implications of rapid urbanization are numerous. Clearly, crop and livestock producers will have to be increasingly productive. The demand for commodities will change and more mechanization is expected. The shift from extractive systems to more intensive ones will expand the demand for grain, especially for milk production from higher producing dairy cattle, and in poultry and the pig production. The implication, and argument in this paper, is that limited development funds will increasingly have to be directed toward market oriented producers.

Evaluation of macro-economic data indicates that low per capita income is associated with a low level of urbanization (Simpson, 1991). When urbanization reaches approximately 60 percent per capita, income increases rapidly with small changes in urbanization. While heavy urbanization is not necessarily associated with per capita income gains over the short term, particularly where there is heavy migration and high population growth rates, it is a necessary condition to reach relatively high levels of per capita income in the longer term. Higher per capita income is associated with greater demand for livestock products.

Projection Model

Dense population in most of Southeast Asia and China are cause for concern about feedstuffs use and availability in the coming decades, especially as demand for these commodities grows. There are several ways to make projections related to livestock and livestock products, depending on objectives and time frame. Because there are many kinds of feedstuffs and types of animals, common denominators are necessary when projecting them. Energy and protein are most often used as they are the main determinants or measures of feedstuffs. The purpose of the projection exercise provided in this paper is not to make forecasts of supply and demand for livestock products. Rather, the intention is to determine the amount of additional feedstuffs that will be required given certain assumptions about human consumption of livestock products and changes in the major input parameters resulting from adoption of technologies or management changes.

The model chosen has 210 variables for which data are inputted and about 1,000 parameters (Simpson, Cheng Xu and Miyazaki, 1992). There are two major projection

approaches for inventory; one for draft or transport animals, i.e., a supply side approach where meat or milk are joint or secondary products, and one for animals in which meat or milk are the primary products (Figure 1). In the former case, (which includes donkeys, buffalo, camels, horses and mules) evaluation is made relative to each type animal regarding the impact from mechanization, urbanization and past experience to make projections of animal numbers. Inventory of cattle, sheep, goats, pigs and poultry are made by multiplying per capita consumption projections of the principal commodities by population to estimate total consumption. Consumption is essentially equivalent to production due to a negligible impact on total consumption in Southeast Asia from extra-regional trade. Inventory is then calculated by computations involving dressing percent, live animal weight, offtake and a substantial series of production coefficients, especially for pigs and poultry. Inventory and production data are from FAO while national data are used for China.

Once animal inventories are calculated, total metabolizable energy (ME) and crude protein (CP) requirements are determined by multiplying inventory by ME and CP per head. Large animals as well as sheep and goats each have four performance levels -- maintenance, minimal growth, adequate performance, and a high level of performance -- one of which is chosen for the current and projection years. Energy and protein requirements for pigs are determined by obtaining a weighted (by size, sex, etc.) dry matter requirement per pig in inventory and then multiplying that requirement by the number of pigs in inventory. Poultry requirements are determined in a similar fashion.

There are two systems for pigs and poultry, commercial and backyard, each with its own set of parameters. The term commercial does not necessarily mean large scale, only that it is intensive and employs "modern" production techniques.

Economic Performance as a Base for the Projections

There are two projections, titled "robust economy" and "sluggish economy." The robust projection is based on the economy of the country or region performing well. This high growth alternative includes major investment in agriculture, both in capital and human resource development. As part of government's considerable emphasis on agriculture, policies are appropriate and conducive to technology development, transfer and adoption. The general economy stimulates the agricultural sector to produce more -- and to increase productivity.

Efficiency in production has a major influence on the quantity of food animal products consumed. If producers are quite efficient then cost will be reduced which, when passed through to consumers, leads to a greater quantity consumed. This is especially true of the so-called "superior" goods such as livestock commodities. Animal productivity, i.e. physical efficiency, is a human rather than animal based phenomenon since it is humans who develop technology, evaluate it for appropriateness under given conditions, promote its adoption and are, of course, the ultimate providers of technology and management practices. The impact of management can be measured by production variables such as slaughter weight, offtake, eggs per hen, mortality, etc.

Economic growth goes hand-in-hand with expanded research, an improved extension service, closer links between research and extension, and provision of more adequate credit.

Evaluation of developed countries demonstrates that in a growth economy there is a shift to greater commercialization and more reliance on a market oriented system. The path to development includes improvement of government agencies to better disseminate information as well as carry out research. These efforts result in reduced production costs which then lead to lower commodity prices. Consumers respond by expanding purchases of these commodities -- and economic development continues its upward spiral.

The "sluggish economy" projection is based on relatively low economic growth. This alternative is characterized by occasional periods of political and economic instability, and a re-active rather than pro-active approach to agriculture. Consequently, agriculture modernizes at a slower pace than in the "growth" projection resulting in less productive efficiency. Production costs decline more slowly than in the robust projection and, as a result, prices to consumers do not fall as fast leading to lower levels of consumption. Slow economic growth also implies slower shifts in tastes and preferences to livestock products from more traditional commodities such as grains. Agriculture is mechanized at a slower pace than in a growth economy so work animal inventory continues at a relatively high level.

The two projections have been set forth in recognition that animal productivity is the primary determinant of livestock inventory apart from human population and per capita production of products. Seventeen variables quite sensitive to change, such as live animal weights, offtake rate, and milk production per animal, along with production per capita have been chosen for presentation in Table 2 as key indicators of changes made in the model. As discussed, the parameters and resultant projections are not intended as forecasts. However, they are based on well-reasoned analysis. This simulation model is particularly robust as productivity

changes are incorporated with demand side analysis. The two projections, and the parameters chosen, provide an indication of the upper and lower bounds of animal inventory and feed requirements for the three projection years chosen, 2000, 2010 and 2025.

Southeast Asia Feedstuffs Requirements Projections

Production per capita projections for Southeast Asia are based on income elasticities developed for the region (Simpson, 1992) and an evaluation of the impact of changes in production technology and industry structure or prices. More specifically, as income increases, demand for most animal products increases, which is indicated by an outward shift in the demand curve. As a result, prices increase in the short term, but over the longer term the additional demand leads to changes in structure of industry and improved management practices. For some of these practices, scale economies are important which means an inevitable increase in size. As costs are reduced, relative retail prices decline providing further incentive for expanded consumer purchases of those commodities.

As urbanization takes place, and mechanization increases along with changes in relative production costs, per capita consumption of livestock commodities grows at different rates. Great cost savings are possible in poultry production. Therefore, per capita consumption of poultry meat and eggs is expected to grow rapidly, even in the economy sluggish projection. On the other hand, international experience shows that as income increases, per capita consumption of commodities like goat meat stagnates or declines. Substantial cost reductions are possible in modernized pork production while much less cost reduction is possible in beef

production. Consequently, as shown in Table 2, per capita production of beef increases only slightly relative to pork.

The supply side parameters, also provided in Table 2, are quantitative indicators of technology and management adoption. Offtake, for example, embodies such diverse variables as marketing strategies, changes in production systems and daily gain. Each of the parameters reflects a judgement based on past experience in the region, lessons from other regions, economic based rationale, and demand side considerations. As indicated, the parameters are not forecasts but rather judgements which form a range of relationships based on economic logic rather than the simplistic choice of high and low projections. An objective in the projections is to obtain a balance between the demand and supply side. Thus the parameters should be viewed as a whole when evaluating the results.

Total red meat and poultry meat production in the thirteen Southeast Asian countries increased 50 percent in the 10 years from 1969-71 to 1979-81. It then increased 54 percent from 1979-81 to 1988-90 and is projected to grow another 54 percent by the year 2000 in the sluggish economy projection (Table 3). The robust economy projection is for 65 percent more production of red meat and poultry by the year 2000. The sluggish alternative is for red meat and poultry production to increase three and a half times between 1988-90 and 2025, from 5.9 million tons to 20.8 million tons as compared to the robust projection for 25.7 million tons; 24 percent more than the sluggish projection.

The number of cattle and buffalo are projected to only increase from 89 million head in 1988-90 to 103 million head in 2025 in the sluggish projection, and 108 million head in the robust projection despite substantial regional increases in meat production (Table 4). This is

explained by expanded productivity in cattle as they are increasingly viewed as meat rather than work animals, and a reduction in buffalo numbers due to mechanization. Cattle productivity increases from 14.0 kg per head inventory in 1988-90 to 22.6 kg in the sluggish economy projection, and 27.5 kg in the robust economy projection (Table 5).

The inventory projections are provided on an animal unit (AU) basis in Table 6 because the differences in sizes of animals makes comparisons somewhat difficult. The 96 million AU in Southeast Asia in 1969-71 grew to 104 million AU in the two decades to 1988-90. Both the sluggish and robust projections are for growth to 124 million AU in 2025. At present, large animals make up about 92 percent of total AU. That proportion is projected to decline to 88 percent in the sluggish economy alternative in 2025, and to 91 percent in the robust economy projection.

Total metabolizable energy requirements were 471 billion Mcal (471×10^9 Mcal) in 1988-90. The ME requirement in the sluggish economy projection is calculated to grow 25 percent during the 1990s and 95 percent from 1988-90 to the year 2025 (Table 7). Crude protein requirements are calculated to have been 22 million tons in 1988-90 and are also projected to grow 25 percent during the current decade. They are expected to grow 88 percent by 2025. Metabolizable energy requirements in the robust economy projection are 4 percent, 1 percent and 10 percent more than the sluggish ones in the years 2000, 2010 and 2025. Protein requirements are 6, 3 and 10 percent greater in the robust than the sluggish alternative.

China Feedstuffs Requirements Projections

Per capita production of red meat is projected to increase from 20.8 kg in 1988-90 in the Peoples Republic of China (i.e. excluding Taiwan) to 25.7 kg in the sluggish economy projection in 2025 and 33.7 kg in the robust economy projection (Table 8). Comparable figures for Southeast Asia show an increase from 6.5 kg to 10.0 and 11.9 kg, respectively. Total red meat and poultry production is projected to grow from 27 million tons in 1988-90 to 51 million tons in 2025 for the sluggish economy alternative, and 73 million tons in 2025 for the robust economy alternative. The comparable projections for Southeast Asia are for 20 and 26 million tons, i.e. about half the project levels of China.

Significant decreases, or only minimal increases depending on the animal and projection year, are projected in draft and transport animal numbers due to expected major increases in mechanization even under the sluggish economy alternative. The significant influence of economic conditions on the projections is highlighted in cattle inventory where draft/beef type numbers are projected to grow from 77 million head in 1988-90 to 114 million head in the sluggish economy projection, but to just 86 million head in the robust alternative (Table 9). If China's economy is robust (as characterized by the past decade) the demand for beef will increase dramatically, from 0.7 kg in 1988-90 to 2.2 in 2025 (Table 10). Robust economy per capita production of 2.2 kg (versus 1.6 kg in the sluggish alternative) is expected in spite of low inventory because of industry structural change and greatly expanded productivity. As an example, a robust economy in China will lead to grasslands being used mainly for cow/calf and sheep raising with cattle fattening increasingly taking place in crop areas.

Enormous productivity gains are possible through structural changes, as well as from expanded government investment in research, extension service, credit facilities, improved transportation and communication, and societal change. Even casual observation of statistics and rural areas reveals the tremendous changes which have taken place in the past decade, and the past 5 years in particular. In 1979-81, i.e. about the time China opened to the West, there was only 3.2 kg of beef produced per head of cattle in national inventory (Table 11). By 1988-90, productivity had grown to 10.5 kg. It is projected to be 21.8 kg in 2025 under the sluggish economy projection and 38.3 kg under the robust projection. There is no comparison in the systems or economies, but as a benchmark of what is technically feasible, the United States produced 108 kg of beef per head of inventory in the late 1980s.

The substantial gains in productivity which have taken place in China over the past decade are projected to continue. Pig productivity was 61 kg of pork per head of inventory in 1988 (Table 11). It was 52 kg in Southeast Asia, but 131 kg in the United States. The projection for China in 2025 is 103 kg and 118 kg under the sluggish and robust alternatives, respectively. The increases in productivity and shifts in demand are reflected in small ruminant inventory which is projected to increase from 42 million AU in 1988-90, to about 65 million AU in both projections (Table 12). About 24 percent of total AUs are now made up of small ruminants. Their proportion is projected to increase to 28 percent and 32 percent under the two alternatives, respectively.

China's animal feed energy requirements are estimated to have been 1.4×10^{12} million Mcal in 1988-90 (Table 13). They are expected to increase 19 percent by the year 2000, and 36 percent by the year 2025. The two projection alternatives, sluggish and robust, are nearly

identical in all projection years despite substantial differences in parameters on both the demand and supply side.

China Feedstuffs Availability Projections

The human population of China is projected to reach nearly 1.6 billion people in 2025. This growth, coupled with substantial increases in demand for animal products, has led to great concern over the country's ability to produce sufficient feedstuffs for both humans and animals. Space does not permit review of feedstuffs projections carried out by the author using another 1,000 parameter model (Simpson, Cheng Xu and Miyazaki, 1992). Suffice it to say that because animal productivity increases will keep energy and protein requirements from drastically increasing, and since crop yields will increase and there will be shifts by humans from a starch based diet to animal products, it is projected that China can meet its feedstuffs needs even under the most severe circumstances. In fact, it is likely there will continue to be surpluses for export, at least for another decade. Clearly, there will be years when crop productions shortfalls could necessitate feedstuffs imports, but the conclusions do hold over the longer term.

Summary and Conclusions

The projections provided in this paper are meant to serve as a source of dialogue and as a basis for planning. They are not forecasts. However, they are reasonable and it is likely that total energy and protein projections of the sluggish and robust projections can be used with confidence as a range (low and high) of requirements.

Special attention has been given to providing parameters and productivity results because they serve to highlight where and how development efforts should take place. It is fair to say that for the past quarter century the attention of the international community has been focused on small producers in Asia based on the assumption that the rural sector would continue to predominate. There seems to have been an attitude that migration to urban areas was somehow "bad," and also that every effort should be made to promote animal power over mechanization. But, as shown in this paper, urbanization will take place--with the rural population of Southeast Asia increasing only 17 percent between 1988-90 and 2025. Total rural population in China in 2025 will be at the same level as in 1988-90. The analyses presented in this paper indicate that a rethinking of development focus is called for, with emphasis placed on ways to increase productivity per head and reduce feedstuffs requirements per kg of product produced. This strategy is quite different than one aimed at retaining people in rural areas and attempting to provide employment for them regardless of the impact on productivity and animal feed use.

If appropriate macro economic policies are developed and instituted to bring about strong, stable economic growth, the demand for animal products will grow and with it the resources and structural changes to significantly enhance animal production. Much of the production of cow milk, poultry meat, eggs, and pork will move to larger scale, cost efficient operations. The demand for higher quality human and physical inputs will increase. Much remains to be done to improve the productivity of other animals. In sum, future decades hold an aura of excitement, challenge and promise for those people engaged in Asia's livestock industry.

References

FAO, Production Yearbook, various issues.

Simpson, James R. "Global Livestock Industry Development." Unpublished report provided to Winrock International, December, 1990.

Simpson, James R., Cheng Xu and Akira Miyazaki. "China's Livestock Industry: Animal Inventory and Feed Projections to 2025." Book manuscript in process.

Simpson, James R. "Driving Forces: Economics of Animal Agriculture in Relation to Natural Resources." Food and Resource Economics Department, International Working Paper Series IW-11, November, 1991.

United Nations, Department of International Economic and Social Affairs. World Population Prospects, 1990. Population Studies Number 190, New York, 1991.

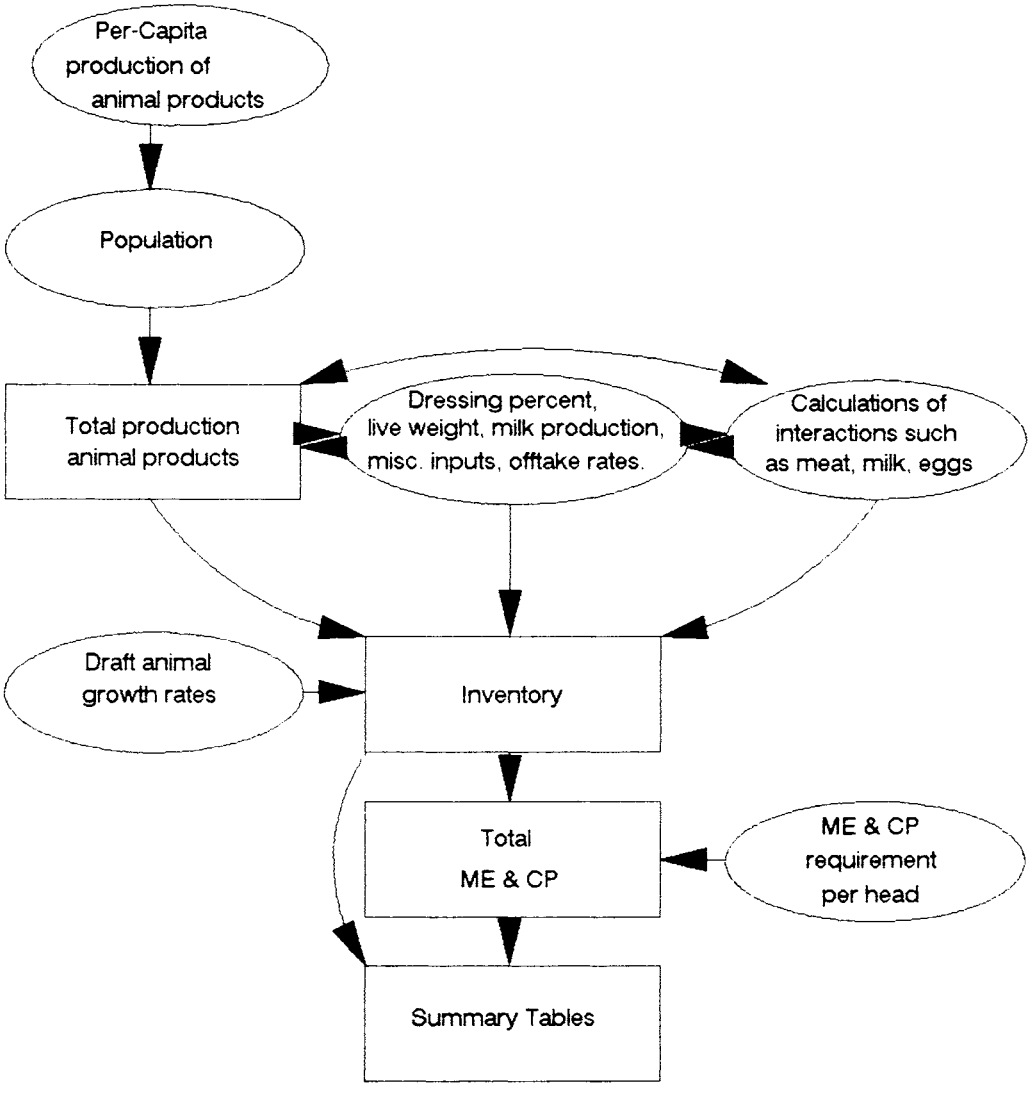

Figure 1. Model Structure for Inventory & Feedstuffs Requirement Projections

TABLE 1. HUMAN POPULATION IN SOUTHEAST ASIA AND CHINA, 1969-71 TO 2025

ITEM	BANGLA-DESH	BHUTAN	BRUNEI	CAM-BODIA	INDO-NESIA	LAOS	MALAYSIA	MYANMAR	NEPAL	PHILIP-PINES	SRI LANKA	THAI-LAND	VIET NAM	SOUTH-EAST ASIA	CHINA
								MILLION							
TOTAL															
1969-71	66.7	1.1	0.1	6.9	120.3	2.7	10.9	27.1	11.5	37.5	12.5	35.8	42.7	375.9	816.0
1979-81	88.2	1.2	0.2	6.4	151.0	3.2	13.8	33.8	14.9	48.3	14.8	46.7	53.7	476.2	979.0
1988-90	112.6	1.5	0.3	7.8	180.8	4.0	17.4	40.8	18.7	60.9	17.0	54.9	65.3	582.1	1,127.0
2000	150.6	1.9	0.3	10.0	208.3	5.1	20.9	51.1	24.1	77.4	19.4	63.7	83.0	716.0	1,303.0
2010	188.2	2.4	0.4	11.5	232.0	6.2	23.7	60.6	28.9	92.0	21.5	71.6	98.0	837.0	1,422.0
2025	235.0	3.1	0.4	14.0	263.3	7.7	27.9	72.6	35.0	111.4	24.4	80.9	118.0	993.6	1,591.0
URBAN															
1969-71	5.3	0.0	0.1	0.8	20.5	0.3	2.9	6.2	0.5	12.4	2.8	4.6	7.7	64.1	163.0
1979-81	8.8	0.0	0.1	0.6	33.2	0.4	4.7	8.1	0.9	17.9	3.3	7.9	10.2	96.2	196.0
1988-90	15.8	0.1	0.1	0.9	52.4	0.8	7.3	10.2	1.9	25.6	3.6	12.6	14.4	145.7	237.0
2000	27.1	0.2	0.2	1.5	77.1	1.3	10.4	14.3	3.4	37.9	4.7	18.5	22.4	218.9	326.0
2010	45.2	0.3	0.2	2.3	104.4	2.1	13.7	21.2	5.8	51.5	6.7	26.5	34.3	314.1	455.0
2025	84.6	0.6	0.3	4.2	147.4	3.5	18.7	34.1	10.8	73.5	10.5	39.6	55.4	483.4	700.0
RURAL															
1969-71	61.4	1.1	0.0	6.1	99.9	2.4	7.9	20.9	11.0	25.1	9.8	31.1	35.1	311.7	653.0
1979-81	79.4	1.2	0.1	5.8	117.7	2.8	9.1	25.7	14.0	30.4	11.6	38.8	43.5	380.0	784.0
1988-90	96.8	1.4	0.1	6.9	128.4	3.3	10.1	30.6	16.8	35.3	13.4	42.3	50.9	436.4	890.0
2000	123.5	1.8	0.1	8.5	131.2	3.9	10.4	36.8	20.7	39.5	14.7	45.2	60.6	497.0	977.0
2010	143.0	2.1	0.1	9.2	127.6	4.2	10.0	39.4	23.1	40.5	14.8	45.1	63.7	522.8	967.0
2025	150.4	2.5	0.1	9.8	115.8	4.3	9.2	38.5	24.1	37.9	13.9	41.3	62.5	510.3	891.0
								PERCENT							
PERCENT URBANIZATION															
1969-71	8	3	62	12	17	10	27	23	4	33	22	13	18	17	20
1979-81	10	4	60	10	22	13	34	24	6	37	22	17	19	20	20
1988-90	14	5	58	12	29	19	42	25	10	42	21	23	22	25	21
2000	18	8	59	15	37	25	50	28	14	49	24	29	27	31	25
2010	24	11	64	20	45	33	58	35	20	56	31	37	35	38	32
2025	36	19	73	30	56	45	67	47	31	66	43	49	47	49	44
PERCENT INCREASE															
TOTAL															
1969-71 TO 1989	69	35	98	14	50	48	61	51	63	62	36	54	53	55	38
1988-90 TO 2025	109	107	57	78	46	93	60	78	87	83	44	47	81	71	41
URBAN															
1969-71 TO 1989	195	125	86	14	156	181	150	64	306	107	30	172	87	127	45
1988-90 TO 2025	437	687	98	346	181	356	155	235	480	187	194	214	286	232	195
RURAL															
1969-71 TO 1989	58	32	119	14	29	33	28	47	52	41	38	36	45	40	36
1988-90 TO 2025	55	77	1	42	-10	31	-9	26	43	7	4	-2	23	17	0

SOURCE: UNITED NATIONS, 1991.

TABLE 2. PRINCIPAL PARAMETERS FOR LIVESTOCK INVENTORY AND FEED REQUIREMENTS, SOUTHEAST ASIA, SLUGGISH AND ROBUST ECONOMY PROJECTIONS

VARIABLE	UNITS	1979-81 TO 1988-90	ECONOMY SLUGGISH 1990 2000	2000 2010	2010 2025	ECONOMY ROBUST 1990 2000	2000 2010	2010 2025
		COMPOUND ANNUAL GROWTH RATE						
PRODUCTION PER CAPITA								
BEEF	PCT	0.6	0.6	0.7	0.8	1.0	1.5	2.0
PORK	PCT	3.3	2.0	1.5	1.5	2.5	2.0	2.0
MUTTON & LAMB	PCT	5.2	3.0	2.0	1.0	3.0	2.0	1.0
GOAT MEAT	PCT	0.4	2.0	1.0	0.0	1.5	0.0	-1.5
BUFFALO MEAT	PCT	-0.9	(1)	(1)	(1)	(1)	(1)	(1)
POULTRY MEAT	PCT	4.0	3.5	3.5	3.5	4.5	4.2	4.0
EGGS	PCT	3.0	4.0	4.0	4.0	5.5	4.0	4.0
MILK								
COW	PCT	1.6	2.0	3.0	3.0	3.0	4.0	5.0
GOAT	PCT	0.3	0.2	0.2	0.2	0.2	0.1	0.1
BUFFALO	PCT	0.4	(1)	(1)	(1)	(1)	(1)	(1)
		1988-90	2000	2010	2025	2000	2010	2025
PRODUCTION PER CAPITA (1)								
BEEF	KG	1.565	1.671	1.792	2.020	1.746	2.026	2.727
PORK	KG	3.886	4.832	5.607	7.011	5.099	6.215	8.365
MUTTON & LAMB	KG	0.089	0.123	0.150	0.174	0.123	0.150	0.174
GOAT MEAT	KG	0.294	0.366	0.404	0.404	0.346	0.346	0.276
BUFFALO MEAT	KG	0.625	(1)	(1)	(1)	(1)	(1)	(1)
POULTRY MEAT	KG	3.625	5.292	7.465	12.507	5.883	8.877	15.987
TOTAL MEAT	KG	10.084	12.284	15.419	22.116	13.197	17.615	27.530
EGGS	KG	2.201	3.388	5.016	9.033	3.966	5.871	10.574
MILK								
COW	KG	7.204	8.957	12.038	18.755	9.972	14.761	30.687
GOAT	KG	0.806	0.824	0.841	0.866	0.824	0.832	0.845
BUFFALO	KG	1.498	(1)	(1)	(1)	(1)	(1)	(1)
DRESSING PCT, DRAFT/BEEF	PCT	50	51	53	54	51	54	55
LIVE ANIMAL WEIGHTS								
MILK CATTLE	KG	320	350	355	360	350	360	370
DRAFT/BEEF CATTLE	KG	235	235	250	270	235	260	300
SHEEP	KG	24.5	25.0	26.0	27.0	26.0	27.0	28.0
GOATS	KG	23.0	26.0	27.0	28.0	27.0	28.0	29.0
BROILERS, COMMERCIAL	KG	1.9	2.0	2.1	2.2	2.0	2.1	2.2
OFFTAKE RATES								
DRAFT/BEEF CATTLE (2)	PCT	13.6	15.0	16.0	18.0	15.5	17.0	19.0
SHEEP	PCT	56.8	57.0	57.0	57.0	57.0	58.0	59.0
GOATS	PCT	48.9	47.0	49.0	51.0	48.0	50.0	52.0
POULTRY								
LAYERS								
COMMERCIAL	PCT	72	72	72	72	72	72	72
BACK YARD	PCT	86	86	86	86	86	86	86
BROILERS, COMMERCIAL	PCT	400	475	525	575	525	575	600
OTHER	PCT	400	425	500	500	475	500	500

(1) PER CAPITA CALCULATED FROM INVENTORY PROJECTIONS. (2) CALCULATED IN PROGRAM.

CONT

TABLE 2. PRINCIPAL PARAMETERS FOR LIVESTOCK INVENTORY AND FEED REQUIREMENTS, SOUTHEAST ASIA, SLUGGISH AND ROBUST ECONOMY PROJECTIONS

			ECONOMY SLUGGISH			ECONOMY ROBUST		
VARIABLE	UNITS	1988-90	2000	2010	2025	2000	2010	2025
CALF CROP, DRAFT/BEEF	PCT	45	50	53	55	52	55	57
MILK PRODUCTION PER:								
COW IN LACTATION	KG	521	600	900	1500	800	1300	2500
BUFFALO IN INVENTORY	KG	36	40	45	50	45	50	60
EGG PRODUCTION PER MATURE HEN								
IN COMMERCIAL PRODUCTION	KG	11.0	13.0	14.0	14.5	13.5	14.0	15.0
COMMERCIAL (VERSUS BACKYARD)								
CHICKENS FOR MEAT	PCT	50	65	75	85	70	85	90
CHICKEN LAYERS	PCT	20	30	40	55	35	50	60
PORK, PCT OF CONSUMPTION	PCT	20	30	50	60	35	60	70
FEEDER PIGS								
LITTERS PER YEAR								
COMMERCIAL	NO	1.8	1.9	1.9	2.1	1.9	2.0	2.2
BACK YARD	NO	1.5	1.5	1.5	1.5	1.5	1.5	1.5
WEANED PER LITTER								
COMMERCIAL	HD	6.2	6.3	6.4	6.5	6.5	7.0	7.3
BACK YARD	HD	6.0	6.0	6.1	6.2	6.2	6.5	6.7
WEANING AGE								
COMMERCIAL	DAYS	60	55	40	35	50	35	30
BACK YARD	DAYS	60	58	55	50	55	50	45
SLAUGHTER HOGS								
SALE WEIGHT OF HOGS								
COMMERCIAL	KG	75	77	80	85	78	85	88
BACK YARD	KG	65	67	68	70	67	69	71
SALE AGE OF HOGS								
COMMERCIAL	DAYS	260	250	240	230	245	235	225
BACK YARD	DAYS	317	316	315	310	315	313	305

		1979-81 TO	1990 TO	2000 TO	2010 TO	1990 TO	2000 TO	2010 TO
WORK ANIMAL INVENTORY COMPOUND		1988-90	2000	2010	2025	2000	2010	2025
ANNUAL GROWTH RATES								
ASSES	PCT	0.6	0.0	-0.1	-0.5	-0.1	-0.5	-1.0
CAMELS	PCT	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HORSES	PCT	1.1	0.5	0.0	-0.5	0.5	-1.0	-1.5
MULES	PCT	2.0	1.5	0.5	-0.5	1.0	-0.5	-1.0
BUFFALO	PCT	-0.5	-0.5	-0.5	-0.5	-0.1	-1.0	-2.0
ME & CP PER HEAD								
HORSES, MULES, DONKEYS	LEVEL	MIN	MIN	ADEQ	ADEQ	MIN	ADEQ	ADEQ
CAMELS	LEVEL	MIN	MIN	MIN	MIN	MIN	MIN	MIN
SHEEP, GOATS	LEVEL	MIN	MIN	ADEQ	ADEQ	MIN	ADEQ	ADEQ
CATTLE								
MILK	LEVEL	MIN	ADEQ	ADEQ	HIGH	ADEQ	ADEQ	HIGH
DRAFT/BEEF	LEVEL	MIN	MIN	ADEQ	ADEQ	MIN	ADEQ	ADEQ
BUFFALO, MILK	LEVEL	MIN	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ

TABLE 3. PER CAPITA LIVESTOCK PRODUCTION AND TOTAL PRODUCTION, SOUTHEAST ASIA, ECONOMY SLUGGISH AND ROBUST PROJECTIONS TO 2025

12/14/92

ITEM	BASE MIDPOINT OF THREE YEAR AVG 1988-90	ECONOMY SLUGGISH ANNUAL POPULATION GROWTH RATE 1.33	0.86	0.76	ECONOMY ROBUST ANNUAL POPULATION GROWTH RATE 1.33	0.86	0.76	DIFFERENCE ROBUST OVER SLUGGISH		
		2000	2010	2025	2000	2010	2025	2000	2010	2025
	MILLION				MILLION			PERCENT		
HUMAN POPULATION	582	704	801	923	704	801	923			
	KG				KG					
PER CAPITA PRODUCTION										
BEEF	1.6	1.7	1.8	2.0	1.7	2.0	2.7	4.5	13.1	35.0
PORK	3.9	4.8	5.6	7.0	5.1	6.2	8.4	5.5	10.8	19.3
MUTTON	0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.0	0.0	0.0
GOAT	0.3	0.4	0.4	0.4	0.3	0.3	0.3	-5.3	-14.2	-31.6
BUFFALO	0.6	0.6	0.5	0.4	0.6	0.5	0.3	5.8	0.6	-19.9
TOTAL RED MEAT	6.5	7.5	8.4	10.0	7.9	9.2	11.9	4.7	9.3	18.5
POULTRY	3.6	5.3	7.5	12.5	5.9	8.9	16.0	11.2	18.9	27.8
TOTAL RED MEAT AND POULTRY	10.1	12.8	15.9	22.5	13.8	18.1	27.9	7.4	13.8	23.7
FISH	-	-	-	-	-	-	-			
MILK										
COW	7.2	9.0	12.0	18.8	10.0	14.8	30.7	11.3	22.6	63.6
GOAT	0.8	0.8	0.8	0.9	0.8	0.8	0.8	0.0	-1.0	-2.5
BUFFALO	1.5	1.3	1.2	1.1	1.5	1.4	1.0	19.0	11.8	-3.9
EGGS	2.2	3.4	5.0	9.0	4.0	5.9	10.6	17.1	17.1	17.1

	1969-71	1979-81	1988-90	ECONOMY SLUGGISH 2000	2010	2025	ECONOMY ROBUST 2000	2010	2025	DIFFERENCE ROBUST OVER SLUGGISH 2000	2010	2025
TOTAL PRODUCTION	1000 MT											
BEEF	586	706	911	1,177	1,436	1,864	1,229	1,623	2,517	4.5	13.1	35.0
PORK	1,102	1,383	2,262	3,402	4,492	6,471	3,590	4,979	7,721	5.5	10.8	19.3
MUTTON	23	27	52	87	121	161	87	121	161	0.0	0.0	0.0
GOAT	89	135	171	257	323	372	244	277	255	-5.3	-14.2	-31.6
BUFFALO	257	322	364	390	384	387	413	387	310	5.8	0.6	-19.9
TOTAL, RED MEAT	2,057	2,573	3,760	5,313	6,756	9,256	5,563	7,386	10,964	4.7	9.3	18.5
POULTRY	470	1,215	2,110	3,726	5,980	11,544	4,142	7,110	14,756	11.2	18.9	27.8
TOTAL RED MEAT AND POULTRY	2,527	3,788	5,870	9,039	12,735	20,800	9,704	14,497	25,720	7.4	13.8	23.7
MILK	2,146	4,036	5,534	7,791	11,284	19,108	8,677	13,572	30,062	11.4	20.3	57.3
COW	1,279	2,975	4,193	6,306	9,642	17,310	7,020	11,823	28,323	11.3	22.6	63.6
GOAT	292	372	469	580	673	799	580	666	779	0.0	-1.0	-2.5
BUFFALO	575	689	872	906	969	999	1,078	1,083	960	19.0	11.8	-3.9
EGGS	514	804	1,281	2,385	4,017	8,336	2,792	4,702	9,759	17.1	17.1	17.1

TABLE 4. LIVESTOCK INVENTORY, SOUTHEAST ASIA , ECONOMY SLUGGISH AND ROBUST PROJECTIONS TO 2025

12/14/92

				ECONOMY SLUGGISH			ECONOMY ROBUST			DIFFERENCE ROBUST OVER SLUGGISH		
SPECIES	1969-71	1979-81	1988-90	2000	2010	2025	2000	2010	2025	2000	2010	2025
	1000 HEAD									PERCENT		
ASSES	15	17	18	18	18	17	18	17	15	-1.4	-5.3	-12.2
CAMELS	0	0	0	0	0	0	0	0	0	-	-	-
HORSES	1,209	1,297	1,427	1,530	1,530	1,419	1,530	1,384	1,103	0.0	-9.6	-22.3
MULES	15	15	18	22	23	22	21	20	17	-6.7	-15.6	-21.7
SHEEP	6,232	6,310	8,303	13,571	18,098	23,315	13,049	17,127	21,720	-3.8	-5.4	-6.8
GOATS	20,546	25,164	31,659	43,844	50,898	54,338	39,166	41,252	35,179	-10.7	-19.0	-35.3
CATTLE												
MILK COWS	4,116	6,707	8,050	10,509	10,713	11,540	8,775	9,095	11,329	-16.5	-15.1	-1.8
DRAFT/BEEF	56,429	56,942	57,036	65,458	67,719	71,039	68,379	68,007	80,298	4.5	0.4	13.0
SUBTOTAL	57,061	58,546	65,086	75,968	78,432	82,578	77,154	77,102	91,627	1.6	-1.7	11.0
BUFFALO	24,208	25,510	24,286	22,640	21,533	19,974	23,948	21,658	15,996	5.8	0.6	-19.9
TOTAL,CATTLE,BUFF	81,269	84,056	89,372	98,608	99,966	102,552	101,102	98,760	107,623	2.5	-1.2	4.9
PIGS												
COMMERCIAL			6,424	13,305	27,200	42,750	15,917	33,721	56,656	19.6	24.0	32.5
BACKYARD			37,196	46,766	43,057	47,421	45,687	37,418	41,218	-2.3	-13.1	-13.1
TOTAL	29,403	29,652	43,620	60,071	70,257	90,171	61,604	71,139	97,874	2.6	1.3	8.5
	MILLIONS JANUARY 1											
POULTRY												
LAYERS, (HENS, ALL KINDS) (1)			197	300	416	768	332	470	851	10.5	13.0	10.8
LAYERS, PULLETS & HENS, ALL KINDS			689	927	1,092	1,782	991	1,190	1,903	6.9	9.0	6.8
COMMERCIAL			47	111	234	532	143	294	643	29.0	25.5	20.8
BACKYARD			545	688	711	1,014	706	731	998	2.7	2.7	-1.5
OTHER (2)			96	129	146	236	142	165	262	10.5	13.0	10.8
BROILERS												
COMMERCIAL			147	278	456	883	301	564	1,160	8.5	23.8	31.4
BACKYARD			147	167	160	179	143	114	155	-14.6	-28.2	-13.7
OTHER (2)			25	38	47	79	38	56	102	-0.4	19.6	29.5
TOTAL			319	483	662	1,141	482	734	1,417	-0.2	10.9	24.2
TOTAL												
CHICKENS	382	490	887	1,243	1,561	2,608	1,293	1,704	2,956	4.0	9.1	13.3
OTHER	86	89	121	167	193	315	180	221	364	8.1	14.6	15.5
TOTAL	468	579	1,008	1,410	1,754	2,924	1,473	1,924	3,321	4.5	9.7	13.6
	MILLIONS PRODUCED IN THE YEAR											
CULL LAYERS												
COMMERCIAL			24	55	117	268	71	147	323	29.0	25.5	20.8
BACKYARD			112	154	171	262	158	176	258	2.7	2.7	-1.5
OTHER (2)			29	39	47	79	43	53	88	10.5	13.0	10.8
BROILERS												
COMMERCIAL			588	1,320	2,393	5,077	1,583	3,244	6,962	19.9	35.6	37.1
BACKYARD			588	711	798	896	678	572	774	-4.6	-28.2	-13.7
OTHER (2)			99	161	233	396	179	279	512	11.4	19.6	29.5
TOTAL			1,441	2,439	3,759	6,977	2,712	4,471	8,916	11.2	18.9	27.8

(1)MATURE LAYERS IN PRODUCTION. (2) OTHER IS DUCKS, GEESE AND TURKEYS.

TABLE 5. PRODUCTION PER HEAD OF INVENTORY, SOUTHEAST ASIA, ECONOMY SLUGGISH AND ROBUST PROJECTIONS TO 2025

12/14/92

				ECONOMY SLUGGISH			ECONOMY ROBUST			ROBUST OVER SLUGGISH		
SPECIES	1969-71	1979-81	1988-90	2000	2010	2025	2000	2010	2025	2000	2010	2025
	KG OF MEAT PER HEAD OF INVENTORY									PERCENT		
SHEEP	3.7	4.3	6.3	6.4	6.7	6.9	6.7	7.0	7.4	4.0	5.7	7.3
GOATS	4.3	5.4	5.4	5.9	6.4	6.9	6.2	6.7	7.2	6.1	5.8	5.6
CATTLE	10.3	12.1	14.0	15.5	18.3	22.6	15.9	21.1	27.5	2.9	15.0	21.7
BUFFALO	10.6	12.6	15.0	17.2	17.8	19.4	17.2	17.8	19.4	0.0	0.0	0.0
PIGS	37.5	46.6	51.9	56.6	63.9	71.8	58.3	70.0	78.9	2.9	9.5	9.9
POULTRY (JAN 1 INV	1.0	2.1	2.1	2.6	3.4	3.9	2.8	3.7	4.4	6.4	8.4	12.5
	KG OF MILK PER HEAD OF INVENTORY											
GOATS	14.2	14.8	14.8	13.2	13.2	14.7	14.8	16.2	22.2	11.9	22.2	50.7
MILK COWS	311	444	521	600	900	1,500	800	1,300	2,500	33.3	44.4	66.7
BUFFALO	23.8	27.0	35.9	40.0	45.0	50.0	45.0	50.0	60.0	12.5	11.1	20.0

TABLE 6. INVENTORY ON AN ANIMAL UNIT BASIS, SOUTHEAST ASIA, ECONOMY SLUGGISH AND ROBUST PROJECTIONS TO 2025

12/14/92

				ECONOMY SLUGGISH			ECONOMY ROBUST			ROBUST OVER SLUGGISH		
SPECIES	1969-71	1979-81	1988-90	2000	2010	2025	2000	2010	2025	2000	2010	2025
	1000 ANIMAL UNITS									PERCENT		
LARGE ANIMALS												
ASSES	11	12	13	13	12	12	12	12	10	-1.4	-5.3	-12.2
BUFFALO	29,050	30,612	29,143	27,168	25,840	23,968	28,738	25,990	19,195	5.8	0.6	-19.9
CAMELS	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0
CATTLE												
MILK	4,116	6,707	8,050	10,509	10,713	11,540	8,775	9,095	11,329	-16.5	-15.1	-1.8
DRAFT/BEEF	56,429	56,942	57,036	65,458	67,719	71,039	68,379	68,007	80,298	4.5	0.4	13.0
HORSES	1,451	1,556	1,712	1,836	1,836	1,703	1,836	1,661	1,324	0.0	-9.6	-22.3
MULES	18	18	22	27	28	26	25	24	20	-6.7	-15.6	-21.7
TOTAL	91,074	95,847	95,976	105,011	106,149	108,287	107,765	104,788	112,177	2.6	-1.3	3.6
SMALL RUMINANTS												
GOATS	4,109	5,033	6,332	8,769	10,180	10,868	7,833	8,250	7,036	-10.7	-19.0	-35.3
SHEEP	1,246	1,262	1,661	2,714	3,620	4,663	2,610	3,425	4,344	-3.8	-5.4	-6.8
TOTAL	5,356	6,295	7,992	11,483	13,799	15,530	10,443	11,676	11,380	-9.1	-15.4	-26.7
TOTAL AU	96,430	102,142	103,968	116,494	119,948	123,818	118,208	116,464	123,557	1.5	-2.9	-0.2
	PERCENT											
PROPORTION OF TOTAL LIVESTOCK UNITS												
LARGE	94.4	93.8	92.3	90.1	88.5	87.5	91.2	90.0	90.8	1.1	1.7	3.8
SMALL	5.6	6.2	7.7	9.9	11.5	12.5	8.8	10.0	9.2	-10.4	-12.9	-26.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0			

ASSES=0.7; BUFFALO=1.2; CAMELS=1.7; CATTLE=1.0; HORSES=1.2; MULES=1.2; GOATS ND SHEEP=0.2.

TABLE 7. METABOLIZEABLE ENERGY AND CRUDE PROTEIN REQUIREMENTS BY SPECIES GROUPS, SOUTHEAST ASIA, ECONOMY SLUGGISH AND ROBUST PROJECTIONS TO 2025

12/14/92

	ECONOMY SLUGGISH				ECONOMY ROBUST				DIFFERENCE	
	TOTAL REQUIREMENTS		SPECIES PROPORTION		TOTAL REQUIREMENTS		SPECIES PROPORTION		ROBUST OVER SLUGGISH	
SPECIES	ME	CP	ME	CP	ME	CP	ME	CP	ME	CP
	-M Mcal-	-1000 MT-	-------PCT--------		-M Mcal-	-1000 MT-	-------PCT--------			
					1988-90					
LARGE ANIMALS	305,769	14,512	64.9	65.0	305,769	14,512	64.9	65.0	-	-
SHEEP AND GOATS	19,899	943	4.2	4.2	19,899	943	4.2	4.2	-	-
SUBTOTAL	325,668	15,455	69.1	69.2	325,668	15,455	69.1	69.2	-	-
PIGS	81,264	3,930	17.2	17.6	81,264	3,930	17.2	17.6	-	-
POULTRY	64,497	2,939	13.7	13.2	64,497	2,939	13.7	13.2	-	-
TOTAL	471,429	22,324	100.0	100.0	471,429	22,324	100.0	100.0	-	-
					2000					
LARGE ANIMALS	354,802	16,236	60.0	58.3	372,954	17,319	60.5	58.5	5.1	6.7
SHEEP AND GOATS	30,715	1,352	5.2	4.9	28,588	1,228	4.6	4.1	-6.9	-9.2
SUBTOTAL	385,517	17,588	65.2	63.2	401,542	18,547	65.2	62.7	4.2	5.5
PIGS	114,413	5,458	19.4	19.6	117,586	5,620	19.1	19.0	2.8	3.0
POULTRY	91,248	4,803	15.4	17.2	97,179	5,425	15.8	18.3	6.5	13.0
TOTAL	591,178	27,848	100.0	100.0	616,307	29,593	100.0	100.0	4.3	6.3
					2010					
LARGE ANIMALS	450,560	17,309	59.8	53.0	450,098	16,980	59.1	50.5	-0.1	-1.9
SHEEP AND GOATS	45,991	1,621	6.1	5.0	39,730	1,368	5.2	4.1	-13.6	-15.6
SUBTOTAL	496,551	18,930	65.9	57.9	489,828	18,348	64.4	54.5	-1.4	-3.1
PIGS	139,229	6,503	18.5	19.9	142,431	6,648	18.7	19.8	2.3	2.2
POULTRY	117,669	7,253	15.6	22.2	128,798	8,641	16.9	25.7	9.5	19.1
TOTAL	753,449	32,686	100.0	100.0	761,056	33,637	100.0	100.0	1.0	2.9
					2025					
LARGE ANIMALS	485,112	17,920	52.8	42.8	548,395	18,439	54.2	40.2	13.0	2.9
SHEEP AND GOATS	52,743	1,818	5.7	4.3	38,709	1,323	3.8	2.9	-26.6	-27.2
SUBTOTAL	537,855	19,739	58.6	47.1	587,104	19,762	58.0	43.1	9.2	0.1
PIGS	182,069	8,427	19.8	20.1	200,080	9,252	19.8	20.2	9.9	9.8
POULTRY	198,321	13,702	21.6	32.7	224,551	16,856	22.2	36.7	13.2	23.0
TOTAL	918,244	41,868	100.0	100.0	1,011,735	45,870	100.0	100.0	10.2	9.6

TABLE 8. PER CAPITA LIVESTOCK PRODUCT PRODUCTION AND TOTAL PRODUCTION, CHINA, ECONOMY SLUGGISH AND ROBUST PROJECTIONS TO 2025

ITEM	BASE MIDPOINT OF THREE YEAR AVG 1988-90	ECONOMY SLUGGISH — ANNUAL POPULATION GROWTH RATE 1.33 2000	0.86 2010	0.76 2025	ECONOMY ROBUST — ANNUAL POPULATION GROWTH RATE 1.33 2000	0.86 2010	0.76 2025	DIFFERENCE ROBUST OVER SLUGGISH 2000	2010	2025
	MILLION				MILLION			PERCENT		
HUMAN POPULATION	1127	1303	1420	1591	1303	1420	1591			
	KG				KG					
PER CAPITA PRODUCTION										
BEEF	0.7	1.1	1.4	1.6	1.3	1.8	2.2	11.1	28.6	38.4
PORK	19.0	20.3	21.3	22.6	22.4	25.5	30.0	10.3	19.4	32.5
MUTTON	0.4	0.6	0.7	0.7	0.7	0.8	0.9	11.2	22.7	32.2
GOAT	0.4	0.5	0.6	0.6	0.5	0.5	0.4	-5.3	-14.2	-31.6
BUFFALO	0.2	0.2	0.2	0.2	0.2	0.2	0.2	-6.7	-9.5	-12.2
TOTAL RED MEAT	20.8	22.8	24.1	25.7	25.0	28.7	33.7	9.8	19.0	31.1
POULTRY	2.8	4.1	5.3	6.6	4.6	6.9	12.5	11.2	31.0	88.7
TOTAL RED MEAT AND POULTRY	23.6	26.9	29.4	32.3	29.6	35.6	46.2	10.0	21.1	42.9
FISH	-	0.0	0.0	0.0	-	-	-			
MILK	-	7.3	9.0	10.9	8.7	12.6	21.7	19.3	41.0	99.5
COW	3.4	4.9	6.6	8.8	6.5	10.6	20.0	32.8	61.0	128.3
GOAT	0.5	0.6	0.8	0.8	0.6	0.6	0.5	-15.0	-26.7	-37.0
BUFFALO	1.7	1.7	1.6	1.3	1.6	1.5	1.2	-6.7	-9.5	-12.2
EGGS	6.5	8.3	9.2	9.9	8.6	10.0	10.7	3.3	8.5	8.5

	1979-81	1984-86	1988-90	ECONOMY SLUGGISH 2000	2010	2025	ECONOMY ROBUST 2000	2010	2025	DIFFERENCE ROBUST OVER SLUGGISH 2000	2010	2025
TOTAL PRODUCTION	1000 MT											
BEEF	170	343	829	1,476	1,960	2,550	1,640	2,520	3,531	11.1	28.6	38.4
PORK	11,080	16,318	21,405	26,434	30,281	36,021	29,155	36,153	47,731	10.3	19.4	32.5
MUTTON	237	308	481	770	927	1,119	856	1,137	1,479	11.2	22.7	32.2
GOAT	198	309	462	664	800	896	629	686	613	-5.3	-14.2	-31.6
BUFFALO	79	133	266	316	324	316	295	294	277	-6.7	-9.5	-12.2
TOTAL, RED MEAT	11,764	17,411	23,443	29,660	34,292	40,902	32,575	40,791	53,631	9.8	19.0	31.1
POULTRY	1,725	2,336	3,184	5,375	7,498	10,504	5,975	9,825	19,825	11.2	31.0	88.7
TOTAL RED MEAT AND POULTRY	13,489	19,747	26,627	35,035	41,790	51,405	38,549	50,616	73,456	10.0	21.1	42.9
MILK	2,787	4,567	6,329	9,463	12,740	17,275	11,291	17,960	34,457	19.3	41.0	99.5
COW	1,167	2,528	3,877	6,407	9,384	13,944	8,510	15,107	31,828	32.8	61.0	128.3
GOAT	240	412	556	844	1,067	1,195	717	782	753	-15.0	-26.7	-37.0
BUFFALO	1,380	1,627	1,896	2,212	2,289	2,136	2,064	2,072	1,876	-6.7	-9.5	-12.2
EGGS	2,566	5,071	7,366	10,821	13,026	15,729	11,175	14,134	17,066	3.3	8.5	8.5

TABLE 9. LIVESTOCK INVENTORY, CHINA , ECONOMY SLUGGISH AND ROBUST PROJECTIONS TO 2025

SPECIES	1979-81	1984-86	1988-90	ECONOMY SLUGGISH 2000	ECONOMY SLUGGISH 2010	ECONOMY SLUGGISH 2025	ECONOMY ROBUST 2000	ECONOMY ROBUST 2010	ECONOMY ROBUST 2025	DIFFERENCE ROBUST OVER SLUGGISH 2000	DIFFERENCE ROBUST OVER SLUGGISH 2010	DIFFERENCE ROBUST OVER SLUGGISH 2025
	1000 HEAD									PERCENT		
ASSES	7,879	10,355	11,129	13,708	13,572	12,589	11,934	10,793	7,971	-12.9	-20.5	-36.7
CAMELS	615	522	470	408	388	383	344	327	327	-15.7	-15.7	-14.4
HORSES	11,053	11,016	10,336	10,336	10,233	9,492	8,365	7,565	6,031	-19.1	-26.1	-36.5
MULES	4,171	4,958	5,417	6,672	6,672	5,739	6,227	5,922	5,094	-6.7	-11.2	-11.2
SHEEP	106,220	96,167	112,298	166,894	184,197	195,945	178,470	209,914	233,159	6.9	14.0	19.0
GOATS	79,841	64,034	95,432	113,245	125,918	130,707	111,577	107,993	86,281	-1.5	-14.2	-34.0
CATTLE												
MILK COWS	632	1,604	2,480	3,560	3,128	3,099	4,255	4,316	6,366	19.5	38.0	105.4
DRAFT/BEEF	52,920	65,309	76,514	100,933	115,905	113,698	84,870	84,834	85,711	-15.9	-26.8	-24.6
SUBTOTAL	53,552	66,913	78,994	104,492	119,033	116,797	89,125	89,150	92,077	-14.7	-25.1	-21.2
BUFFALO	18,556	19,959	21,384	24,580	24,093	21,358	22,931	21,809	18,757	-6.7	-9.5	-12.2
TOTAL,CATTLE,BUFF	72,108	86,872	100,378	129,073	143,127	138,155	112,056	110,959	110,835	-13.2	-22.5	-19.8
PIGS												
COMMERCIAL			94,854	128,137	184,704	234,897	167,435	229,735	335,102	30.7	24.4	42.7
BACKYARD			257,626	259,849	161,759	115,895	222,025	150,094	69,916	-14.6	-7.2	-39.7
TOTAL	306,279	325,128	352,480	387,987	346,463	350,791	389,460	379,830	405,018	0.4	9.6	15.5
	MILLIONS JANUARY 1											
POULTRY												
LAYERS, (HENS, ALL KINDS) (1)			743	956	1,088	1,208	960	1,131	1,252	0.4	3.9	3.6
LAYERS, PULLETS & HENS, ALL KINDS			2,013	2,463	2,584	2,638	2,401	2,600	2,632	-2.5	0.6	-0.2
COMMERCIAL			267	411	613	836	471	716	978	14.8	16.8	16.9
BACKYARD			1,439	1,705	1,627	1,449	1,580	1,555	1,381	-7.3	-4.5	-4.8
OTHER (2)			307	348	343	352	350	329	273	0.4	-4.1	-22.3
BROILERS												
COMMERCIAL			129	227	373	619	283	580	1,299	24.6	55.3	109.8
BACKYARD			86	147	159	148	148	133	202	0.8	-16.5	37.0
OTHER (2)			44	70	91	96	71	117	176	0.5	27.8	82.9
TOTAL			259	444	624	863	501	830	1,677	12.9	33.0	94.4
TOTAL												
CHICKENS	860	1,442	1,922	2,489	2,773	3,053	2,482	2,984	3,860	-0.3	7.6	26.4
OTHER	251	291	350	418	435	448	420	446	449	0.4	2.6	0.3
TOTAL	1,111	1,733	2,272	2,907	3,208	3,500	2,902	3,429	4,309	-0.2	6.9	23.1
	MILLIONS PRODUCED IN THE YEAR											
CULL LAYERS												
COMMERCIAL			133	205	307	421	235	358	492	14.8	16.8	16.9
BACKYARD			371	454	448	411	421	428	392	-7.3	-4.5	-4.8
OTHER (2)			109	123	122	125	124	117	97	0.4	-4.1	-22.3
BROILERS												
COMMERCIAL			646	1,361	2,389	4,180	1,724	3,769	9,095	26.7	57.8	117.6
BACKYARD			431	733	796	738	739	665	1,011	0.8	-16.5	37.0
OTHER (2)			218	351	456	481	353	583	880	0.5	27.8	82.9
TOTAL			1,908	3,228	4,518	6,355	3,596	5,920	11,966	11.4	31.0	88.3

(1)MATURE LAYERS IN PRODUCTION. (2) OTHER IS DUCKS, GEESE AND TURKEYS.

TABLE 10. LIVESTOCK INVENTORY AND FEED REQUIREMENT PROJECTIONS, PRINCIPAL PARAMETERS FOR CHINA, ECONOMY SLUGGISH AND ROBUST PROJECTIONS TO 2025

12/14/92			ECONOMY SLUGGISH			ECONOMY ROBUST		
VARIABLE	UNITS	1979-81 TO 1988-90	1990 2000	2000 2010	2010 2025	1990 2000	2000 2010	2010 2025
			COMPOUND ANNUAL GROWTH RATE					
PRODUCTION PER CAPITA								
BEEF	PCT	17.4	4.0	2.0	1.0	5.0	3.5	1.5
PORK	PCT	4.0	0.6	0.5	0.4	1.5	1.3	1.1
MUTTON & LAMB	PCT	5.0	3.0	1.0	0.5	4.0	2.0	1.0
GOAT MEAT	PCT	8.2	2.0	1.0	0.0	1.5	0.0	-1.5
BUFFALO MEAT	PCT	12.7	(1)	(1)	(1)	(1)	(1)	(1)
POULTRY MEAT	PCT	5.4	3.5	2.5	1.5	4.5	4.2	4.0
EGGS	PCT	10.7	2.2	1.0	0.5	2.5	1.5	0.5
MILK								
COW	PCT	12.5	3.3	3.0	1.9	6.0	5.0	4.3
GOAT	PCT	8.1	2.5	1.5	0.0	1.0	0.0	-1.0
BUFFALO	PCT	2.2	(1)	(1)	(1)	(1)	(1)	(1)
		1988-90	2000	2010	2025	2000	2010	2025
PRODUCTION PER CAPITA (1)								
BEEF	KG	0.736	1.133	1.381	1.603	1.258	1.775	2.219
PORK	KG	18.995	20.287	21.324	22.640	22.375	25.460	30.000
MUTTON & LAMB	KG	0.427	0.591	0.653	0.703	0.657	0.801	0.930
GOAT MEAT	KG	0.410	0.510	0.563	0.563	0.483	0.483	0.385
BUFFALO MEAT	KG	0.236	(1)	(1)	(1)	(1)	(1)	(1)
POULTRY MEAT	KG	2.826	4.125	5.281	6.602	4.585	6.919	12.461
TOTAL MEAT	KG	23.629	26.645	29.201	32.112	29.359	35.438	45.995
EGGS	KG	6.537	8.304	9.173	9.886	8.576	9.953	10.727
MILK								
COW	KG	3.441	4.917	6.608	8.764	6.531	10.638	20.005
GOAT	KG	0.493	0.647	0.751	0.751	0.550	0.550	0.473
BUFFALO	KG	1.683	(1)	(1)	(1)	(1)	(1)	(1)
DRESSING PCT, DRAFT/BEEF	PCT	50	51	53	54	53	56	58
LIVE ANIMAL WEIGHTS								
MILK CATTLE	KG	320	350	355	360	350	360	370
DRAFT/BEEF CATTLE	KG	232	235	240	275	250	315	375
SHEEP	KG	24.5	25.0	26.0	27.0	26.0	28.0	30.0
GOATS	KG	23.0	26.0	27.0	28.0	25.0	27.0	29.0
BROILERS, COMMERCIAL	KG	1.3	1.5	1.8	2.0	1.5	1.8	2.0
OFFTAKE RATES								
DRAFT/BEEF CATTLE (2)	PCT	9.3	12.2	13.3	15.1	14.6	16.8	18.9
SHEEP	PCT	38.8	40.0	42.0	46.0	41.0	43.0	47.0
GOATS	PCT	43.9	45.0	46.0	48.0	47.0	49.0	51.0
POULTRY								
LAYERS								
COMMERCIAL	PCT	72	72	72	72	72	72	72
BACK YARD	PCT	86	86	86	86	86	86	86
BROILERS, COMMERCIAL	PCT	580	600	630	680	610	650	700
OTHER	PCT	500	500	500	500	500	500	500

(1) PER CAPITA CALCULATED FROM INVENTORY PROJECTIONS. (2) CALCULATED IN PROGRAM.

CONT

TABLE 10. LIVESTOCK INVENTORY AND FEED REQUIREMENT PROJECTIONS, PRINCIPAL PARAMETERS FOR CHINA, ECONOMY SLUGGISH AND ROBUST PROJECTIONS TO 2025

12/14/92

VARIABLE	UNITS	1988-90	ECONOMY SLUGGISH 2000	ECONOMY SLUGGISH 2010	ECONOMY SLUGGISH 2025	ECONOMY ROBUST 2000	ECONOMY ROBUST 2010	ECONOMY ROBUST 2025
CALF CROP, DRAFT/BEEF	PCT	45	50	53	58	55	58	62
MILK PRODUCTION PER:								
COW IN LACTATION	KG	1563	1800	3000	4500	2000	3500	5000
BUFFALO IN INVENTORY	KG	89	90	95	100	90	95	100
EGG PRODUCTION PER MATURE HEN								
IN COMMERCIAL PRODUCTION	KG	13.9	14.0	14.5	15.5	14.0	15.0	16.0
COMMERCIAL (VERSUS BACKYARD)								
CHICKENS FOR MEAT	PCT	60	65	75	85	70	85	90
CHICKEN LAYERS	PCT	30	35	45	55	40	50	60
PORK, PCT OF CONSUMPTION	PCT	42	50	70	80	60	75	90
FEEDER PIGS								
LITTERS PER YEAR								
COMMERCIAL	NO	1.8	1.9	1.9	2.1	1.9	2.0	2.2
BACK YARD	NO	1.6	1.7	1.7	1.8	1.7	1.8	1.9
WEANED PER LITTER								
COMMERCIAL	HD	7.0	7.4	7.8	8.0	7.5	8.0	8.5
BACK YARD	HD	6.5	6.7	6.9	7.2	6.8	7.1	7.4
WEANING AGE								
COMMERCIAL	DAYS	60	55	40	35	50	35	30
BACK YARD	DAYS	60	58	55	50	55	50	45
SLAUGHTER HOGS								
SALE WEIGHT OF HOGS								
COMMERCIAL	KG	101	104	108	112	105	110	115
BACK YARD	KG	97	99	101	103	98	100	105
SALE AGE OF HOGS								
COMMERCIAL	DAYS	250	240	222	215	237	219	210
BACK YARD	DAYS	480	470	435	400	450	400	370

WORK ANIMAL INVENTORY COMPOUND ANNUAL GROWTH RATES		1979-81 TO 1988-90	1990 TO 2000	2000 TO 2010	2010 TO 2025	1990 TO 2000	2000 TO 2010	2010 TO 2025
ASSES	PCT	3.9	1.9	1.4	-0.1	0.5	-1.0	-2.0
CAMELS	PCT	-2.9	-1.0	0.0	0.0	-2.2	-0.5	0.0
HORSES	PCT	-0.7	0.0	-0.1	-0.1	-1.5	-1.0	-1.5
MULES	PCT	2.9	1.5	0.5	0.0	1.0	-0.5	-1.0
BUFFALO	PCT	1.6	1.5	1.0	0.0	0.5	-0.5	-1.0
ME & CP PER HEAD								
HORSES, MULES, DONKEYS	LEVEL	MIN	MIN	ADEQ	ADEQ	MIN	ADEQ	ADEQ
CAMELS	LEVEL	MIN	MIN	MIN	MIN	MIN	MIN	MIN
SHEEP, GOATS	LEVEL	MIN	MIN	ADEQ	ADEQ	MIN	ADEQ	ADEQ
CATTLE								
MILK	LEVEL	MIN	ADEQ	ADEQ	HIGH	ADEQ	ADEQ	HIGH
DRAFT/BEEF	LEVEL	MIN	MIN	ADEQ	ADEQ	MIN	ADEQ	ADEQ
BUFFALO, MILK	LEVEL	MIN	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ	ADEQ

TABLE 11. PRODUCTION PER HEAD OF INVENTORY, CHINA, ECONOMY SLUGGISH AND ROBUST PROJECTIONS TO 2025

				ECONOMY SLUGGISH			ECONOMY ROBUST			ROBUST OVER SLUGGISH		
SPECIES	1979-81	1984-86	1988-90	2000	2010	2025	2000	2010	2025	2000	2010	2025
	KG OF MEAT PER HEAD OF INVENTORY									PERCENT		
SHEEP	2.2	3.2	4.3	4.6	5.0	5.7	4.8	5.4	6.3	4.0	7.7	11.1
GOATS	2.5	4.8	4.8	5.9	6.4	6.9	5.6	6.4	7.1	-3.8	0.0	3.6
CATTLE	3.2	5.1	10.5	14.1	16.5	21.8	18.4	28.3	38.3	30.3	71.7	75.6
BUFFALO	4.3	6.7	12.4	12.9	13.5	14.8	12.9	13.5	14.8	0.0	0.0	0.0
PIGS	36.2	50.2	60.7	68.1	87.4	102.7	74.9	95.2	117.8	9.9	8.9	14.8
POULTRY (JAN 1 INV	1.6	1.3	1.4	1.8	2.3	3.0	2.1	2.9	4.6	11.4	22.6	53.3
	KG OF MILK PER HEAD OF INVENTORY											
GOATS	3.0	6.4	5.8	7.4	8.5	9.1	6.4	7.2	8.7	-13.7	-14.6	-4.5
MILK COWS	1,846.5	1,576.1	1,563.0	1,800.0	3,000.0	4,500.0	2,000.0	3,500.0	5,000.0	11.1	16.7	11.1
BUFFALO	74.4	81.5	88.7	90.0	95.0	100.0	90.0	95.0	100.0	0.0	0.0	0.0

TABLE 12. INVENTORY ON AN ANIMAL UNIT BASIS, CHINA, ECONOMY SLUGGISH AND ROBUST PROJECTIONS TO 2025

				ECONOMY SLUGGISH			ECONOMY ROBUST			ROBUST OVER SLUGGISH		
SPECIES	1979-81	1984-86	1988-90	2000	2010	2025	2000	2010	2025	2000	2010	2025
	1000 ANIMAL UNITS									PERCENT		
LARGE ANIMALS												
ASSES	5,515	7,249	7,790	9,596	9,500	8,812	8,354	7,555	5,580	-12.9	-20.5	-36.7
BUFFALO	22,267	23,951	25,661	29,496	28,912	25,630	27,517	26,171	22,509	-6.7	-9.5	-12.2
CAMELS	1,046	887	799	694	660	650	585	557	557	-15.7	-15.7	-14.4
CATTLE												
MILK	632	1,604	2,480	3,560	3,128	3,099	4,255	4,316	6,366	19.5	38.0	105.4
DRAFT/BEEF	52,920	65,309	76,514	100,933	115,905	113,698	84,870	84,834	85,711	-15.9	-26.8	-24.6
HORSES	13,264	13,219	12,403	12,403	12,280	11,390	10,038	9,078	7,237	-19.1	-26.1	-36.5
MULES	5,005	5,950	6,500	8,007	8,007	6,886	7,472	7,107	6,112	-6.7	-11.2	-11.2
TOTAL	100,649	118,169	132,148	164,689	178,392	170,166	143,091	139,617	134,071	-13.1	-21.7	-21.2
SMALL RUMINANTS												
GOATS	15,968	12,807	19,086	22,649	25,184	26,141	22,315	21,599	17,256	-1.5	-14.2	-34.0
SHEEP	21,244	19,233	22,460	33,379	36,839	39,189	35,694	41,983	46,632	6.9	14.0	19.0
TOTAL	37,212	32,040	41,546	56,028	62,023	65,331	58,009	63,582	63,888	3.5	2.5	-2.2
TOTAL AU	137,861	150,209	173,694	220,717	240,415	235,497	201,100	203,199	197,959	-8.9	-15.5	-15.9
	PERCENT											
PROPORTION OF TOTAL LIVESTOCK UNITS												
LARGE	73.0	78.7	76.1	74.6	74.2	72.3	71.2	68.7	67.7	-4.6	-7.4	-6.3
SMALL	27.0	21.3	23.9	25.4	25.8	27.7	28.8	31.3	32.3	13.6	21.3	16.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0			

ASSES=0.7; BUFFALO=1.2; CAMELS=1.7; CATTLE=1.0; HORSES=1.2; MULES=1.2; GOATS ND SHEEP=0.2.

TABLE 13. METABOLIZEABLE ENERGY AND CRUDE PROTEIN REQUIREMENTS BY SPECIES GROUPS, CHINA, ECONOMY SLUGGISH AND ROBUST
PROJECTIONS TO 2025

	ECONOMY SLUGGISH				ECONOMY ROBUST				DIFFERENCE	
	TOTAL REQUIREMENTS		SPECIES PROPORTION		TOTAL REQUIREMENTS		SPECIES PROPORTION		ROBUST OVER SLUGGISH	
SPECIES	ME	CP	ME	CP	ME	CP	ME	CP	ME	CP
	-M Mcal-	-1000 MT-	-------PCT--------		-M Mcal-	-1000 MT-	-------PCT--------			
					1988-90					

LARGE ANIMALS	455,182	21,588	32.3	32.7	455,182	21,588	32.3	32.7	-	-
SHEEP AND GOATS	97,497	4,768	6.9	7.2	97,497	4,768	6.9	7.2	-	-
SUBTOTAL	552,679	26,356	39.2	40.0	552,679	26,356	39.2	40.0	-	-
PIGS	709,847	33,153	50.3	50.3	709,847	33,153	50.3	50.3	-	-
POULTRY	147,518	6,422	10.5	9.7	147,518	6,422	10.5	9.7	-	-
TOTAL	1,410,044	65,931	100.0	100.0	1,410,044	65,931	100.0	100.0	-	-
					2000					

LARGE ANIMALS	570,297	27,781	34.0	34.8	512,540	24,205	31.4	31.3	-10.1	-12.9
SHEEP AND GOATS	136,876	6,400	8.2	8.0	141,482	6,615	8.7	8.6	3.4	3.4
SUBTOTAL	707,173	34,181	42.2	42.9	654,022	30,820	40.0	39.9	-7.5	-9.8
PIGS	781,148	36,586	46.6	45.9	789,076	36,879	48.3	47.7	1.0	0.8
POULTRY	188,613	8,990	11.2	11.3	190,821	9,601	11.7	12.4	1.2	6.8
TOTAL	1,676,933	79,757	100.0	100.0	1,633,919	77,300	100.0	100.0	-2.6	-3.1
					2010					

LARGE ANIMALS	746,236	29,957	40.1	36.8	588,731	23,613	32.9	29.4	-21.1	-21.2
SHEEP AND GOATS	192,946	7,086	10.4	8.7	194,485	7,223	10.9	9.0	0.8	1.9
SUBTOTAL	939,182	37,043	50.5	45.5	783,216	30,836	43.8	38.4	-16.6	-16.8
PIGS	707,388	32,949	38.1	40.5	776,178	36,230	43.4	45.1	9.7	10.0
POULTRY	212,428	11,389	11.4	14.0	228,162	13,241	12.8	16.5	7.4	16.3
TOTAL	1,858,999	81,380	100.0	100.0	1,787,555	80,306	100.0	100.0	-3.8	-1.3
					2025					

LARGE ANIMALS	735,938	28,743	38.4	34.2	591,029	22,717	30.7	25.6	-19.7	-21.0
SHEEP AND GOATS	213,903	7,460	11.2	8.9	202,205	7,215	10.5	8.1	-5.5	-3.3
SUBTOTAL	949,841	36,204	49.6	43.0	793,234	29,932	41.2	33.7	-16.5	-17.3
PIGS	727,687	33,550	38.0	39.9	847,006	38,989	44.0	43.9	16.4	16.2
POULTRY	237,787	14,394	12.4	17.1	283,504	19,959	14.7	22.5	19.2	38.7
TOTAL	1,915,315	84,148	100.0	100.0	1,923,743	88,880	100.0	100.0	0.4	5.6