

The State of Meat Production in Developing Countries: 2002

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CHAPTER

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Introduction

Billions of animals are killed for food annually in developing countries, more than half of them without the benefit of stunning (a procedure that induces an unconscious state through administration of a severe blow to the skull or the application of an electrical charge).

The slaughter process begins most often with food animals crowded into inadequate vehicles with little protection from the elements and transported long distances without water over harsh roads. In a typical developing country, few slaughter facilities have any government oversight of sanitation or veterinary care. Animals may be stunned by repeated hammer blows to the head. They may be stabbed with sharp knives until they collapse. While the animals are still conscious, their throats are cut, and they die from excessive blood loss after minutes of struggling.

These brutal methods cause immense animal suffering. They also have significant economic impact: bruising of the meat renders it unfit for human consumption; damage to the hides causes loss of product; and worker injuries result in decreased productivity. At the same time, unsanitary methods spread such diseases as salmonellosis, cholera, *E.coli* poisoning, and *Listeria* and cause contamination of the meat, a serious public health concern.

More humane transport, handling, and slaughter practices and the introduction of modern systems and equipment in the slaughter process not only decrease animal suffering but also provide economic benefits for the human population, as the amount of meat and hide wasted is reduced. At the same time, worker and meat safety is greatly increased.

Two organizations—one dedicated to the elimination of animal suffering and the other to encouraging sustainable agriculture and rural development—have joined forces to address animal welfare issues in the global livestock industry. The mission of The Humane Society of the United States (HSUS) and its international arm, Humane Society International (HSI), is to create a humane and sustainable world for all animals, including people, through education, advocacy, and the promotion of respect and compassion. The Food and Agriculture Organization (FAO) of the United Nations has as a specific priority to increase food production and food security while conserving and managing natural resources. The aim is to meet the needs of both present and future generations by promoting development that does not degrade the environment and is technically appropriate, economically viable, and socially acceptable.

Since 1994 HSI has worked with the FAO to introduce techniques and equipment for humane transport, handling, and slaughter of food animals in developing areas. The most important of these techniques is the use of the captive bolt stunner (see sidebar on page 181).

HSI has underwritten the cost of FAO slaughter-training workshops, providing equipment, and/or participating in presentations in Asia and the Caribbean. HSI also has produced a laminated poster for FAO use in its training workshops, cosponsored the publication of a booklet (*Guidelines for Humane Handling, Transport, and Slaughter of Livestock*), and begun development of a training video for distribution worldwide.

As part of this collaboration with the FAO, HSI has solicited overviews on the various aspects of animal welfare and the livestock industry in Latin America (contributed by FAO representatives Jose Luis Garcia de Siles and Peter W. Ormel); the Asia-Pacific region (contributed by FAO consultant Gunter Heinz); and South Africa (through a case study of the status of livestock contributed by Morgane James of the National Council of SPCAs).

Table 1
World Livestock Population, 1961–2001 (in million heads)

Species	1961	1971	1981	1991	2001	Percent Overall Growth	Percent Annual Growth
Cattle and Buffaloes	954	1,106	1,236	1,331	1,516	59	1.5
Pigs	348	551	707	791	923	166	4.1
Poultry	4,082	5,729	8,158	12,319	18,734	359	9.0
Sheep and Goats	1,203	1,301	1,435	1,635	1,743	45	1.1

Overview/ Latin America

Introduction

Food security has been defined as access by all people at all times to adequate quantities of safe food required for a healthy and active life. Although food availability has increased noticeably during the last thirty years in developing countries, there currently are more than 800 million people without adequate access to food, and more than 24,000 people die each day because of lack of adequate food supply.

In developing countries, where diets are composed of a few staple foods, meat and meat products are especially important in preventing malnutrition and contributing to food security.

In developing countries some traditional methods of handling, processing, and marketing of meat under-

mine quality, and poor sanitation leads to considerable loss of product as well as to the risk of food-borne diseases (Garcia de Siles et al. 1997).

The safety of meat calls for control from the farm until the time the meat is consumed. It is recognized that stock handling, slaughtering conditions, carcass dressing, and meat handling as well as the hygienic and environmental surroundings, contribute to the nutritional properties and commercial value of the finished products.

Evolution of Meat Production

As shown in Table 1, the world livestock population¹ has grown steadily for all major species involved² over the last forty years.

In terms of slaughter, the global view is very similar, with moderate increases in the number of ruminants slaughtered and larger increases in the total numbers of pigs and poultry

slaughtered (see Table 2).

The increase in the number of animals slaughtered per year led to a 280 percent increase in the production of meat at the world level over the last forty years.

Regional Comparison

The number of animals slaughtered worldwide per region³ is presented in Table 3. For each species involved, Asia leads the world in terms of number of animals slaughtered per year.

Livestock Evolution in Latin America and the Caribbean

In Latin America and the Caribbean, the cattle and buffalo population more than doubled from 1961 to 2001 (see Table 4).

During this same period, the total meat production in Latin America and the Caribbean increased from 7.9 million metric tons to more than

Table 2
Animals Slaughtered Worldwide, 1961–2001 (in million heads)

Species	1961	1971	1981	1991	2001	Percent Overall Growth	Percent Annual Growth
Beef and Buffaloes	155	181	212	236	299	93	2.3
Pigs	313	533	680	861	1,172	274	6.9
Poultry	6,367	11,122	18,528	27,367	45,926	621	15.5
Sheep and Goats	364	432	507	646	788	117	2.9

Table 3
Animals Slaughtered Worldwide
Per Region: 2001 (in million heads)

Region	Cattle and Buffaloes	Pigs	Poultry	Sheep and Goats
Africa	29	12	2,539	151
Asia	98	678	17,396	439
Europe	53	294	7,440	98
Latin America and the Caribbean	65	62	8,581	31
North America	41	119	9,525	4
Oceania	12	8	510	66
World	298	1,173	45,991	789

31.7 million metric tons. This increase was caused mainly by the increase in the production of poultry meat, and to a much lesser extent, by the increase in beef and pork production (see Figure 1).

Subregional Comparison in Latin America and the Caribbean

The number of animals slaughtered in the Latin American/Caribbean⁴ sub-region is presented in Table 5. Brazil leads the region in terms of number of animals slaughtered for cattle and buffaloes, pigs, and poultry, whereas the most sheep and goats are slaugh-

tered in the Merco Sur and the Andean countries.

Livestock Revolution

Over the past decade, the International Food Policy Research Institute, the FAO, and the International Livestock Research Institute have combined their efforts to produce a global view of the developments in the livestock sector to 2020 against the background of world globalization.

A revolution is taking place in livestock production that could have vast implications for people and the environment in both developed and developing countries. This livestock revolution is being caused by population growth, urbanization, and income

growth in developing countries, which have led to a massive increase in the demand for products of animal origin, such as meat, milk, and eggs. However, unlike the so-called green (or environmentally-conscious) revolution, which was supply driven, the livestock revolution is demand driven.

The increased demand for meat and meat products has come from a growing urban population with changing diets and sufficient income to increase animal products in their diets.

A major change of this revolution is a shift in the balance of meat consumption from developed countries to developing countries. The developed countries showed an annual growth in meat consumption of only 1.0 percent from 1982 to 1994. At the same time, the developing countries increased their meat consumption by 5.4 percent annually. In 2020 people in developing countries are expected to consume a total of 188 million metric tons of meat, whereas people in developed countries are expected to consume 115 million metric tons.

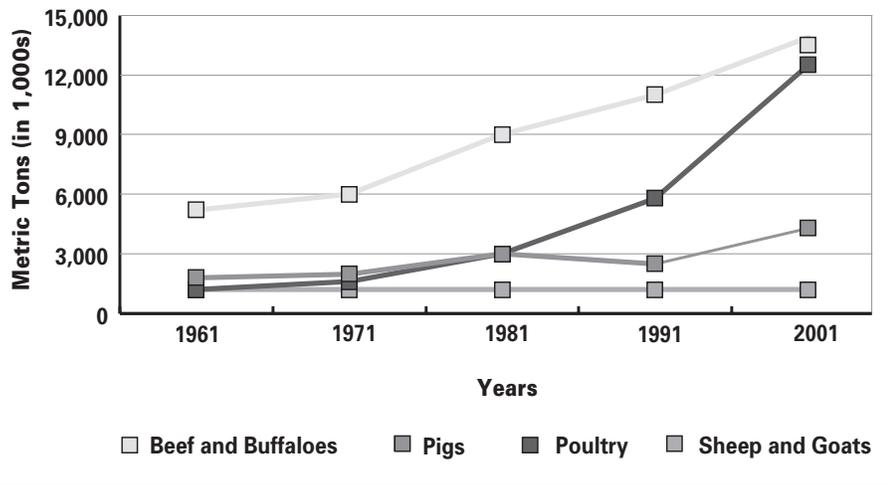
These expected consumption increases will lead to equivalent increases in production, with production of livestock products growing most rapidly in areas where consumption grows (Table 6).

Total meat production for developing countries in 2020 is expected to reach 183 million metric tons; for developed countries the projected

Table 4
Livestock Population in Latin America and the Caribbean, 1961–2001 (in million heads)

Species	1961	1971	1981	1991	2001	Percent Overall Growth	Percent Annual Growth
Cattle and Buffaloes	176	224	294	330	360	105	2.6
Pigs	50	65	74	76	81	61	1.5
Poultry	359	577	1,071	1,461	2,513	601	15.0
Sheep and Goats	155	148	143	146	117	(25)	(0.6)

Figure 1
Latin America and the Caribbean
Meat Production: 1961–2001



total production in the same year is 121 million metric tons. However, the rapid growth in products of animal origin has not been, nor is it expected to be, evenly distributed across or within countries.

The livestock revolution will produce a drastic increase in the capacity of existing production and distribution systems and have possible effects in such key areas as environmental pollution, public health, food safety, and animal welfare. The changes that are inherent to the livestock revolution can be seen both as threats and as opportunities for the sustainable development of developed and developing countries.

When not managed well, these changes could give rise to various problematic situations, with negative effects for animal welfare, public health, and the environment. Animal welfare is a growing ethical concern, especially in developed countries. There, public awareness of environmental contamination of natural resources (air, water, and land) by intensive livestock production systems is high. Many countries have established rules and regulations to mitigate and compensate for the effect these production systems have on the environment. However, developing countries generally have much less experience with the negative

environmental and public health effects of these systems. This might explain a general absence of policies and regulations in many developing countries with regard to monogastric production systems. Given the drastic increase these systems will suffer in the near future and their general proximity to urban centers, this regulatory vacuum easily could lead to substantial environmental problems and important increased dangers for public health.

Several basic aspects of the livestock revolution offer threats as well as opportunities to the sustainable development of countries and regions (Delgado et al. 1999):

- (1) the revolution implies a substantial increase in livestock production in the near future;
- (2) the majority of this increase will be in developing countries;
- (3) the function of livestock will change from non-tradable, multipurpose to more market-oriented functions;
- (4) people will continue to substitute grains for meat and milk in their diets;
- (5) the rapid increase in monogastric production systems will lead to a rapid increase in the use of cereal feeds;
- (6) the stress on grazing systems and expansion of monogastric production systems close to urban centers will increase;
- (7) rapidly changing technologies will be incorporated into intensive production systems.

The livestock revolution is a demand-driven process that cannot be stopped. The final overall effects (positive and negative) for the rural poor, the environment, public health, and

Table 5
Number of Animals Slaughtered in Latin America and the Caribbean, 2001
(in million heads)

Region	Cattle and Buffaloes	Pigs	Poultry	Sheep and Goats
Brazil	30	25	4,641	7
Mexico	7	14	1,107	5
Andean Countries	8	9	1,204	8
Caribbean	0	1	157	0
Central America	3	5	604	1
Merco Sur	17	9	868	10
Latin America and the Caribbean	65	63	8,581	31

animal welfare depend on the willingness of developing countries to regulate the projected changes.

Slaughtering Meat Animals in Developing Countries

Both meat quality and quantity are very much affected by pre-slaughter conditions. In developing countries meat animals are transported from the farm to the slaughterhouse on foot, by road, or by rail. Frequently livestock must travel on foot for several days to reach the abattoir. Since the distances involved often are quite substantial and the management of the animals during this process is poor, transportation has deleterious effects that result in significant food losses.

Livestock who have traveled long distances on foot or in transport frequently are insufficiently rested

before slaughter, negatively affecting the quality of the meat. Often holding pens are overcrowded, causing unnecessary stress to the animals.

The quality and condition of the carcass and its storage depend greatly on the care taken prior to slaughter. Nervous, tired, and excited animals may have a raised body temperature, causing imperfect bleeding. Muscular fatigue reduces glycogen content in the blood, which after slaughter changes into lactic acid, thus causing favorable conditions for spoilage and the growth of food-borne bacteria. Fatigue and excitement also cause penetration of bacteria from the intestinal tract to the meat.

Holding animals in vehicles or lairages without adequate litter and/or drainage frequently results in fecal soiling of the skin. Cattle entering slaughterhouses often are very

dirty, their legs covered with manure. In these cases, the knife used for bleeding and de-hiding will have to cut through manure and fecal residues, resulting in a great possibility for meat contamination.

Slaughter methods vary widely and include, among others, simple decapitation (in India), severing the medulla (in some Latin American countries), and severing of the major blood vessels with or without previous stunning.

Animals going to slaughter should be rendered unconscious in order to make death as stress-free and painless as possible. Nevertheless, in the Jewish (kosher) and the Muslim (halal) slaughter of livestock, stunning generally is not allowed, and the animal is bled directly, using a sharp knife to cut the throat and sever the main blood vessels. This results in sudden and massive loss of blood, with loss of

Table 6
Projected Trends in Production of Various Livestock Products, 1993–2020

Region/Product	Projected Annual Growth of Total Production 1993–2020 (percent)	Total Production		Per Capita Production	
		1993	2020	1993	2020
(million metric tons)					
Developed Countries					
Beef	0.6	35	38	26	28
Pork	0.4	37	41	29	29
Poultry	1.2	27	36	21	26
Meat	0.7	100	121	78	87
Developing Countries					
Beef	2.6	22	44	5	7
Pork	2.7	39	81	9	13
Poultry	3.0	21	47	5	7
Meat	2.7	88	183	21	29

Source: Delgado et al. 1999

Notes: Total and per capita production for 1993 are calculated from FAO (1998). Projections are updated figures, following the same format as that reported in Rosegrant et al. 1997. Meat includes beef, pork, mutton, goat, and poultry. Milk is cow and buffalo milk and milk products in liquid milk equivalents. Metric tons and kilograms are three-year moving averages centered on the two years shown.

consciousness and death. These types of slaughtering can be very unsatisfactory since the animal may not be rendered unconscious and may suffer considerable discomfort and pain in the slaughter process. Many Muslim authorities permit some form of pre-slaughter stunning such as electric stunning of cattle, sheep, and poultry (see sidebar on page 181) (Chambers and Grandin 2001).

The use of humane methods in the handling of livestock prevents needless suffering, results in safer working conditions, reduces meat losses, and improves meat quality. However, cruelty to animals exists in developing countries because of unsatisfactory slaughtering procedures and infrastructures. Animals may be pulled, beaten, or dragged on their way to slaughter and are allowed to see other animals being slaughtered. Animals frequently are slaughtered without being stunned. These practices need to be examined, since people in many developing countries take cruelty to animals for granted and its prevention is often an acquired concept (Mann 1984).

Dressing the carcass, which is defined by the Codex Alimentarius (a collection of international food standards adopted by the Codex Alimentarius Commission, responsible for execution of the FAO/WHO Food Standards Program) as the progressive separation of an animal into a carcass (or sides of a carcass), other edible parts, and inedible parts, is the next step in the slaughter process.

The essential problem in many developing countries is the failure to provide for hoists or hooks, hardware which permits the dressing of carcasses to take place off the floor. The contamination resulting from floor dressing of carcasses is considerable, especially where the removal of hides and the cleaning of stomachs are carried out in the same location as the dressing of the carcass itself.

Rural Slaughter

In developing countries, a high percentage of animal slaughter takes place in rural areas under very primitive conditions that do not meet even minimal technical and hygienic requirements. Animals are slaughtered in all kinds of places, such as converted buildings or rooms, under the shade of trees, and on open, bare ground.

Because of the level of bacterial contamination, meat produced under such conditions can deteriorate easily and lead to food poisoning. Since there is no meat inspection, meat from sick or parasite-infested animals may well be a vector in spreading disease, affecting human beings as well as animals. In addition, unsatisfactory slaughtering techniques can cause unnecessary losses of meat and valuable by-products. Such losses constitute a major constraint in increasing animal production.

The simplest structure used in slaughtering and dressing livestock is the gantry hoist. Animals who have been slaughtered on the ground are then hoisted via the gantry so that the carcass can be dressed. One step better than the gantry method is utilization of a slaughter slab, an area of concrete on which the animal is slaughtered and dressed. When rural slaughtering takes place on relatively small premises, very simple equipment, such as hooks or ropes for hanging animals and chopping blocks for breaking down carcasses, may be available. However, it remains a common practice to dress carcasses on the building floor.

Under these conditions, the utilization of animal by-products generally is low or nonexistent, since the by-products are considered a nuisance. Improved slaughter methods can result in edible by-products which, properly utilized, may be a source of animal protein for human consumption. They can assist in increasing living standards in rural communities by improving the nutritional level, and at the same time increasing employment possibilities.

Urban Slaughter

Many of the large-scale slaughterhouses in developing countries are in poor condition. These usually are located in or around large cities and may be categorized as follows:

- (a) Old and dilapidated slaughterhouses established originally on the outskirts of cities but now found within the city limits due to rapid expansion of the urban area. These slaughterhouses present a serious environmental hazard, in addition to using unsanitary slaughtering and meat handling practices;
- (b) Slaughterhouses built in the last two decades, with an excessively high level of technical equipment. Problems with ongoing maintenance, inadequate staff training, and high energy consumption have resulted in much of the specialized equipment being shut down. Consequently, many of these plants now resemble the ones mentioned under category (a); and
- (c) Slaughterhouses for export, which are technically and hygienically of a very high standard, since they have to comply with export requirements. The local population usually does not benefit from these quality meat-producing plants because their products are too expensive and are directed to external markets.

Even in larger towns, abattoirs that have been designed specifically to supply meat to the expanding centers of urban population all too often are unsatisfactory from a hygienic viewpoint.

Once the meat leaves the abattoir, its hygienic quality also is influenced by careless and poor handling. Carcasses, quarters, unwashed offal, and other items are placed together on the floor of the market or on dirty concrete or wooden tables in meat shops, increasing the microbiological contamination of the meat.

Humane Stunning: Two Techniques

Captive Bolt Stunning

The captive bolt stunner is used commonly in stockyards, slaughterhouses, and packing plants where animals are slaughtered for food. The primary objective of the captive bolt stunner is immediately to induce an unconscious state by administering a severe blow to the skull. The captive bolt is a humane stunner—not a humane killer—and stunning must always be followed immediately by bleeding out.

Captive bolt stunners are comprised of a steel bolt with a flange and a piston at one end that is held in the barrel. The piston fits tightly into the breech and the bolt is free to move forward and backward in the barrel. Upon firing, the expansion of gases, produced by the explosion of the charge, propels the piston forward, and the bolt projects through an aperture in the front of the barrel. The bolt remains captive in the barrel, however, because the flange at the rear prevents it from passing through the hole. The impact of the flange at the front of the barrel is absorbed by either cellular buffers (also known as recuperator sleeves) or a grease collar, depending on the type of stunner.

There are two types of captive bolt stunners: penetrating and non-penetrating. Penetrating stunners cause unconsciousness as a result of a concussive blow to the skull and the physical damage caused by the entry of the bolt into the brain. They are generally preferred, as they result in more rapid unconsciousness and death. Non-penetrative stunners have a "mushroom-headed" bolt which comes in contact with the

skull but does not enter the brain. They cause unconsciousness due to concussive force alone and should only be used on cattle.

Both types of stunner are powered by blank cartridges. Cartridges vary in strength and are classified according to the amount of propellant they contain, as measured in grains. It is most important that the correct cartridges be used for each model of stunner.

It also is essential that the correct cartridge be used for the size and species of animal being stunned. In emergency situations, it is acceptable to use a cartridge designed for a larger species, but never one designed for a smaller species. To obtain maximum effect, the muzzle of the captive bolt stunner must be held firmly against the head of the animal.

Electrical Stunning

Electrical stunning involves passing (by means of voltage, or electrical pressure) an electric current (the rate of flow of electricity) through the brain, severely disrupting the brain's normal electrical activity and causing an immediate state of unconsciousness and insensibility to pain.

Electrodes must be placed on the animal in a manner to ensure good electrical contact, and they must span the brain, enabling the current to pass through it. The animal remains unconscious while his or her throat is cut and dies from loss of blood. It is important to note that an animal may recover from a stun if his or her throat is not cut quickly.

Physiological Effects of Stunning

The initial effect on the animal is immediate unconsciousness, accompanied by what is known as "tonic" activity. The animal collapses, stops breathing, and becomes rigid. This period of rigidity normally lasts for ten to twenty sec-

onds following stunning. The forelegs may be flexed initially and then gradually straighten out, but this depends on the species and the severity of the blow. Tonic activity is followed by a period of involuntary kicking, which gradually subsides.

If an animal is stunned properly, he or she collapses immediately. There is no rhythmic breathing, no blinking, no corneal reflex, and no vocalizing. The animal has a fixed, glazed expression and relaxed jaw, and the tongue is hanging out.

Bleeding Out

To prevent the risk of recovery, animals must be bled out (sometimes referred to as "sticking" or exsanguination) as soon as possible after stunning, ideally while the animal is still in the tonic (rigid) phase. Bleeding out involves severing the carotid arteries and jugular veins of the ventral neck and thorax region. The animal then dies from loss of blood. It is important that all major blood vessels are severed. If only one carotid artery is cut, the animal may take over a minute to die.

Whenever an animal is stunned using a captive bolt stunner, he or she must be bled out within fifteen seconds to ensure a rapid and painless death. A maximum stun-to-stick interval of fifteen seconds is essential for all species in the field.

The most practical method of bleeding out is to make a deep transverse cut with a six-inch knife across the animal's throat at the angle of the jaw (i.e., a cut across the throat). The cut should be deep, severing the blood vessels, trachea and esophagus, and continue until the blade of the knife touches the spine. The intention is to sever the carotid arteries and the jugular veins.

—Neil Trent

When meat is sold on one or two market days, meat stalls often are crowded, and customers lean on the stall; the meat becomes contaminated through contact with their hands, bank notes, baskets, clothes, and other objects. The behavior of butchers is not always the most appropriate from a hygienic point of view and may contribute to the problem.

In urban areas the traditional marketing of meat begins with early morning slaughter and delivery of the unchilled meat to the marketplace a few hours later. The FAO recommends that in the long term this be improved to a complete "cold chain" system, with the meat being cooled down at the slaughterhouse and then transported in refrigerated trucks to controlled butcher outlets. The development of the meat sector, in particular in the rapidly expanding population centers, will have to move in this direction for both public health and environmental reasons (Garcia de Siles et al. 1997).

The availability of shelf-stable meat products is very important for a continuous supply of animal protein and essential minerals during periods when there is no fresh meat available. Shelf life ranging from a few days to a number of months can be achieved, depending on the processing methods. Meat processing therefore is essential to enhance food security and cope with periodic deficits in meat supply.

However, in many developing countries the hygienic conditions of the manufacturing process are generally very poor. Machinery is obsolete, places are dirty, and meat is handled carelessly.

The FAO Contribution

Dramatic changes in the current situation of the meat sector are difficult to achieve in the short to medium term, as they would require considerable investment in facilities and infrastructure. Developing countries cannot afford this capital investment.

The FAO addresses this issue through technical strategies and technology packages that include *inter alia* assistance for improved hygiene, handling, and preservation of livestock products; development of appropriate processing technologies, including development of low-cost and shelf-stable meat products; and establishment of small-scale meat processing plants.

1. Slaughter Facilities

It is evident that unsatisfactory slaughtering techniques and lack of appropriate slaughtering facilities may cause unnecessary losses in meat as well as in valuable by-products. Under these circumstances, commonly found in developing countries, the establishment of slaughter facilities of a sufficiently high standard but still simple and inexpensive would improve the above conditions. For these reasons the FAO has developed a model project in which the main component is a small-scale, modular slaughterhouse. In addition, designs have been prepared for the construction of a meat market in order to facilitate the integration of production, processing, and marketing. Further details of this slaughterhouse design and operation can be found in FAO publications (FAO 1988, 1994).

2. Processing

Taking into consideration that an uninterrupted cold chain for meat cannot be expected in many developing countries in the near future, the FAO is assisting developing countries in the use of existing national and alternative regional meat preservation.

3. Training

The lack of adequately trained personnel in the meat and dairy industry has been recognized as one of the main constraints limiting the improvement of the hygienic and technical quality of meat. Training is therefore a prioritized integral component of FAO projects for meat and dairy sector development. For strategic delivery of training, FAO focuses

on regional training of trainers courses to stimulate the multiplier and catalytic effect at member country level.

Animal Welfare in the Livestock Sector in Asia-Pacific

Asia, which is home to almost half of the world's human population, traditionally has also been a region with a large livestock population. Year 2000 statistics reveal that, of the global livestock population, Asia—including the Pacific countries—rears 35 percent of cattle, 97 percent of buffaloes, 59 percent of pigs, 42 percent of sheep, 59 percent of goats, 46 percent of chickens, and 88 percent of ducks.

Over the last decades, Asia had average annual growth rates in livestock production of up to 7 percent. In the medium term, Asia will continue to display the world's highest growth rates for livestock, approximately 3 percent, compared with 1.7 percent annual global growth.

The Asia-Pacific region comprises three developed countries—Japan, Australia, and New Zealand—and twenty-seven developing countries. Animal welfare issues usually are higher on the agenda in the developed Asian-Pacific countries than in the developing countries. In particular, New Zealand and Australia have stringent animal welfare laws and detailed rules and regulations.

However, even in well-organized animal welfare environments, unprecedented animal suffering may occur. Australia exports not only meat from cattle and sheep but also live animals. Although the numbers of livestock sent to not-too-distant Southeast Asian countries such as Indonesia and the Philippines are high, no major animal suffering has been reported, as transport distances are relatively short.

The situation is different when

lucrative Near East markets are supplied with sheep and cattle for slaughtering upon arrival according to the Moslem halal method—cutting the throat without pre-stunning. In the past many animals did not survive the long voyage. To shorten transport distances, it is now required that these shipments disembark exclusively from Western Australian seaports. (As a consequence of loss of life due to extreme high temperatures in the summer of 2002, Australia announced it would ban cattle transport until cooler weather returned.) New Zealand banned all live animal shipments to overseas markets some years ago.

In Japan animal welfare is governed by economic and public health factors. *Guidelines for Industrial Livestock Rearing* (Cabinet Office of Japan 1987) and *Slaughter Methods for Livestock* (Cabinet Office of Japan 1995) have been introduced. Due to the emergence of food poisoning from enterotoxins produced by microorganisms in meat, slaughter guidelines were strengthened in 2000, and more stringent requirements for livestock transports and holding pens at slaughterhouses must be followed.

In developing Asia the countries with the largest human population also account for the largest livestock numbers. Livestock is used for food (meat, milk), industrial products (mainly leather), and draft power for agriculture and transport. In rural areas manure from livestock still plays an important role as a fertilizer. In the pig and poultry sector of developing Asia, there is a strong trend toward industrial production.

China is by far the largest producer of pigs in Asia, due to the enormous demand created by more than one billion people. China also accounts for 55 percent of Asian chicken production and 78 percent of duck production.

Large and small ruminants in Asia are kept primarily under traditional rearing on pastureland. Around some large population centers, dairy cows may be kept under semi-industrial

conditions, and there are also a few feedlots for cattle fattening.

Cattle prevail in India (46 percent of Asia-Pacific's total), where they are used only for milk production. India also has the highest buffalo population in Asia, followed by Pakistan and China. Buffaloes in India, Pakistan, Nepal, and Bangladesh are of the riverine type kept predominantly for milk. Buffaloes in Southeast Asia are of the swamp type; they are not suitable for milk production but serve for draft power and are slaughtered for meat at the end of their working lives.

Regrettably, swamp buffalo populations in Southeast Asia have been declining rapidly over the last ten to fifteen years, being replaced by motorized vehicles. It is feared that this development will work against small farmers and deprive many of their livelihood, as buffaloes may be more cost-effective than motorized vehicles, and buffalo manure is the much-needed fertilizer for agriculture.

Small ruminants (sheep and goats) in developing Asia are kept for meat only.

Industrial livestock production of so-called short-cycle animals (pigs and chicken) for meat and eggs is increasing greatly in and around the population centers, as per-capita meat consumption in urban areas is increasing. The impact on livestock production is best illustrated by the example of China. Over the last two decades, the annual per-capita meat consumption in China has gone up from 5 kilograms to more than 30 kilograms. Egg production accounts for comparable increases. Growth rates in most other Asian countries also are high, and one can imagine the challenges faced by industrial livestock producers regarding procurement of feed, environmental problems with animal waste, and proper organizing of livestock marketing and slaughtering.

From the animal welfare point of view, the arguments against industrial livestock production in Asia are the same as those voiced worldwide: sows confined for piglet production in narrow boxes and layer hens confined in

small cages. In Asia, where duck eggs are very popular, layer ducks may also be kept this way.

Traditional livestock production systems generally create reasonable conditions for animal well-being. However, there are problem areas. For example, millions of cows in India, who have their role in socio-cultural tradition, are otherwise little used for agricultural production, and are not adequately cared for, fed, and watered. Buffaloes play an important role in India as milk-producing livestock, but there is little interest in young male buffaloes, who are unused for meat production. Consequently, the rural practice is to separate male buffalo calves from their mothers shortly after birth and abandon them to die.

In Asian countries with cold winters, the traditional livestock sector suffers from very different problems. In Mongolia, for example, during the course of two consecutive winters, millions of livestock died of starvation during snowstorms. It is clear that action must be taken to provide better shelters and basic feed reserves for the animals during the winter.

The above are a few examples of livestock suffering on traditional farms. More pronounced and widespread suffering—and not infrequent cruelty—occurs in Asian countries, as elsewhere in the developing world, from the moment when livestock is selected for slaughtering. This stressful and often torturous period lasts from the farm gate to the slaughterhouse. The poorer the infrastructure in the livestock marketing and slaughterhouse sector, the more animal suffering occurs.

The vast majority of Asian livestock is kept in China. China has made enormous progress in the abattoir sector, in particular through provision of large-scale and rather efficient slaughterhouses in the population centers. During the past two decades, transport of livestock by road, rail, and boat also has been improved. The Ministry of Agriculture is the central authority responsible for the supervision and control of abattoirs and pro-

vides recommended best practices for hygiene, transport, and animal welfare. While such guidelines are very helpful, training of meat sector personnel in techniques and humane treatment of animals still is lacking, nor is the subject of animal welfare adequately covered at veterinary and agricultural universities. Nevertheless, all large abattoirs have been equipped with tools, such as captive bolt pistols and electrical tongs, for stunning of livestock. In some cases, technically advanced boxes for electrical cattle stunning have been introduced. In China's vast rural areas, there remains scope for modernization of the meat sector and improvements in humane treatment of livestock.

Indonesia also has a reasonable infrastructure in the slaughterhouse sector. Although Indonesia is a predominantly Moslem country, a rather liberal approach is taken toward pre-stunning of animals; efficient electrical stunning equipment (for cattle) and captive bolt pistols are widely used.

The situation for slaughter animals in the other two large countries in the region, India and Pakistan, is very different. India has a number of slaughterhouses producing buffalo meat for export. These abattoirs must comply with export requirements by using adequate livestock transport by rail or truck, good holding pens, and pre-stunning with captive bolt pistols prior to bleeding. However, for the rest of the slaughter animals, centuries-old conditions prevail, the only difference being that, because of the high demand for meat, all facilities for transport, holding, and slaughtering are hopelessly over their capacity.

Small animals, such as pigs, and large and small ruminants generally are transported in trucks, most loaded well over capacity. Over shorter distances, these animals may be made to walk. For millions of large ruminants (mostly buffalo) in India, the typical range for the journey to the slaughterhouse can be as far as 300–400 kilometers, during the course of which they lose as much as 5 percent or more of their weight.

Some years ago there was a report from India describing how the legs of young buffaloes were broken deliberately by livestock handlers in order to immobilize the animals in waiting pens or transport facilities.

One special aspect of large slaughter animals on the Indian subcontinent is the cross-border transport of cattle and buffalo from India to Pakistan. India has the world's largest cattle population. The cow is a sacred animal to Hindus and cannot be slaughtered. Due to lack of resources in India, however, the cow cannot be fed adequately either. Up to 50 percent of Pakistan's large slaughter animals come from India during certain periods of the year. Some of the animals entering Pakistan illegally travel up to 1,000 kilometers further, into Afghanistan, many dying en route as they traverse this desert region without adequate food and water.

Most slaughterhouses in the subcontinent are obsolete. Stunning equipment is not used. Ritual Moslem slaughter in Pakistan does not permit pre-stunning. In other areas, due to overcapacity and poor infrastructure, slaughtering is carried out very inhumanely and in full view of other live animals. Furthermore, as slaughterhouse waste disposal systems also are obsolete, animals often are kept waiting for slaughter amidst mountains of waste—such as intestinal content, manure, and inedible carcass parts—dumped around the slaughterhouses.

In the other countries of the subregion, Bangladesh and Nepal, there is almost no abattoir infrastructure, and animals are slaughtered along roadsides and rivers under the most primitive conditions. In Nepal overcrowded road transports of buffaloes across several mountain passes in one long journey, with the animals hardly able to stand and in many cases lying virtually on top of each other, pose an additional animal welfare problem.

The slaughterhouse sector in Southeast Asian countries (Myanmar, Thailand, Vietnam, Malaysia, Philippines) is better organized. Malaysia, in particular, has a good slaughterhouse infrastructure with efficient

sanitary inspection and proper transport and handling of livestock. Pre-stunning is acceptable in this predominantly Moslem country. Thailand and Vietnam have completed new slaughterhouse projects where pre-stunning using proper equipment is carried out. Thailand has a thriving poultry export industry which complies with international standards for animal welfare. In Thailand's domestic slaughter sector, special government entities have been set up that deal with guidelines for humane treatment of slaughter animals; however, binding laws have not yet been published.

Regarding animal welfare laws and legislation, the Philippines is one of the most advanced countries of the region. An animal welfare act, as well as several codes and regulations, are in place. In each major slaughterhouse, one member of the veterinary staff is responsible for animal welfare issues. The Philippine government's commitment is evidenced by the fact that the international Manila Conference on Animal Welfare, an initiative of the Department of Agriculture, was to be held in 2003. The conference goal was to produce a Manila Declaration on Animal Welfare, recognizing animal welfare as a common objective for all people and all nations.

Many are of the opinion that standards for animal welfare are perceived differently in Asia than in the West. Consequently, there is fear that it may be difficult to make a major impact in the Asian animal welfare sector. It is true that laws and regulation on animal welfare, which have been established in almost all countries of the region, are not strongly enforced at present by the authorities.

On the other hand, there are encouraging developments—and considerable progress—in a number of Asian countries toward the humane treatment of slaughter animals. It must be acknowledged that much of the progress was triggered by economic factors and considerations for easier animal handling. The desirable side effect, however, is less suffering for the animals.

In Southeast Asia some peculiar methods are used to transport live small animals to market. Chickens and ducks are tied head-down to bicycles, rickshaws, and motorbikes. Fortunately, such methods will disappear automatically with the change of marketing systems, away from the traditional markets, where chicken are slaughtered in front of the customer, toward the newly emerging supermarkets. The increasing popularity of supermarkets will have other indirect positive repercussions for animal welfare. Meat will have to meet certain hygienic standards when a longer shelf life must be guaranteed, thus requiring that supplies come from properly controlled slaughter plants.

Pigs in Southeast Asia are squeezed into baskets and transported on bicycles, etc., to market and slaughter facilities. In the absence of any alternative transport means, this method probably is acceptable, since the pigs are released upon arrival and the transport distances usually are short.

However, another method for individual transport of pigs, practiced in the small to medium slaughterhouse sector in Thailand, inflicts great suffering on the animals. Pigs being moved to slaughterhouses are forced into crates made of steel bars. These crates are so small as to allow almost no movement. Pigs are kept waiting inside the crates, sometimes from morning to night, without water and ventilation. They will be killed, still confined to the crate, by sticking a long knife into their necks. Fortunately, this method of transport and killing, which is very labor-intensive, will disappear gradually with the introduction of industrialized pig slaughtering. It is more economical to transport pigs collectively on trucks and keep the whole group together in a holding pen before slaughtering.

In large-animal slaughtering, efficient immobilization must be coupled with immediate unconsciousness of the animal. Most industrial cattle slaughterhouses in Asia use captive bolt pistols for this purpose; a few even use electrical stunning in spe-

cially designed boxes. Both methods are recommended from the technical and animal welfare point of view.

The adequate electric stunning of cattle using electrodes to heart and nose is absolutely painless and of particular interest to Moslem countries. However, the equipment is costly and hence only warranted for larger slaughter operations.

All cattle/buffalo slaughterhouses in Asia outside the Moslem sphere of influence, and even occasionally there, have no objections to using captive bolt pistols, since their use results in the immediate collapse and unconsciousness of the animal, so that slaughtering can start without risk for the slaughter men. However, most medium and small slaughterhouses cannot cover the costs of captive bolt pistols or, more importantly, do not have access to cartridges and spare parts. Instead, they must resort to the inhumane methods of using a sharp-pointed knife to sever the spinal cord or bringing the animal down with a hammer blow.

In camel slaughtering, also daily practice in some parts of Asia, a very inhumane method is the severing of the Achilles' tendons, which leads to the collapse of the animal in full consciousness. The animals may also be immobilized by bending the joints of the fore and hind legs. This forces the animal into a painful position, where he or she may remain for many hours before the Halal throat cut is carried out.

In Moslem ritual slaughtering, cattle and buffaloes are thrown on the ground with a sudden pull, their necks stretched, and the large blood vessels cut with a big, sharp knife. In many Moslem communities, electrical stunning or use of non-penetrative captive bolt stunners is acceptable; others, however, are adamant in refusing any kind of pre-stunning. Time is ripe for Moslem authorities to discuss the issue and to study and evaluate available new technical methods for stunning.

Jhatka is a ritual slaughter method practiced by Sikhs in northern India on sheep and goats only. The head is

chopped off the animal with one stroke. In traditional Indian pig slaughtering without pre-stunning, the pig is thrown on his or her back. A short rope is tied round the muzzle to prevent biting and to help press the head of the animal to the ground. A straight, clean cut is made anterior to the sternum, which severs the jugular vein, and with another cut the heart is punctured. In the rest of Asia, where no proper method for pig stunning is available, pigs are knocked down with the blow of a pole, hammer, or axe.

In the course of industrial Asian livestock production and slaughtering, prospects are good that efficient, scientifically developed stunning methods will be employed on a larger scale in Asia. At present the main constraints affecting the widespread introduction of stunning equipment are the cost and the challenge of importing the equipment and spare parts from overseas. Efforts in some Asian countries to manufacture stunning equipment locally and at cheaper prices have not been successful. Currently new approaches are being taken by veterinary authorities in some countries. The assistance of development projects and NGOs is envisaged.

In the Philippines national veterinary authorities, in cooperation with engineering departments, developed a program to manufacture electrical tongs for pigs, captive bolt pistols for bovines, and the ammunition necessary for captive bolt pistols. The FAO, in cooperation with some other donor organizations and HSI, is committed to cooperate in the project.

It would be most beneficial if inexpensive electrical stunning equipment for pigs could be made available. The economic benefits of import versus in-country development of captive bolt pistols need to be analyzed, and, whether the pistols are imported or not, a supply of suitable ammunition for them must be assured. Responsible veterinary authorities in the individual countries should become involved in the distribution of the ammunition to the slaughterhouses.

Table 7
Livestock Population in South Africa, 1961–2001 (in million heads)

Species	1961	1971	1981	1991	2001	Percent Overall Growth
Cattle	12.527	11.234	13.2	13.5	13.74	9.68
Pigs	1.492	1.205	1.348	1.539	1.540	3.22
Poultry	.0187	.0263	.0313	.0883	.1193	537.97
Sheep and Goats	37.9	33.1	31.6	32.6	28.8	(24.01)
Goats	5.13	5.36	5.79	6.2	6.55	27.68

If such a system could be brought into function, a great step forward toward humane treatment of slaughter animals in Asia would be made.

Humane Slaughter in South Africa

Introduction

South Africa is a vast and diverse country; however, only 12 percent is arable. Lack of water is one of the most severe constraints faced by the farming community. Because of this, crop production is not a viable activity over large parts of the country, and extensive livestock (especially sheep) production is undertaken in the drier areas, particularly in the western and central parts of the country (Table 7).

Species Utilized for Slaughter

Poultry, pigs, cattle, and sheep represent the largest numbers of animals slaughtered for commercial production in abattoirs. The number of goats slaughtered is difficult to determine because in rural areas many are kept and slaughtered for home consumption (Table 8).

Although not bred for this purpose, equines also are slaughtered. Surplus, unwanted, and non-viable equines are purchased and slaughtered for export

to Europe, for provision to local niche markets or for feeding to captive predators, such as lions.

There is a variety of farming systems in South Africa, from very traditional and extensive to intensive and modern (Table 9). The diverse cultures influence how many animals are farmed.

The vast majority of poultry are farmed under intensive systems for both egg and meat production. In recent years there has been an increase in the production of free-range products; although this still is a relatively small niche market, consumers are becoming more aware and opting to purchase these products despite their higher cost.

The majority of pigs also are farmed under intensive systems. The tethering of sows is not permitted. Phase-out of existing tethering systems has been nearly completed, with only two producers still using a limited number of tethers.

Although some sheep are fattened in feedlots, the majority are farmed under extensive grazing systems. The vast majority of goats are farmed

under extensive grazing systems, many in communal grazing areas.

While high numbers of cattle are fattened in feedlots, a large number also are kept in extensive grazing systems.

Legislation

In 1962 South Africa's first animal welfare legislation, the Animals Protection Act No. 71, was promulgated. This act covers all animal species and does not exclude any sector of animal utilization (Table 10).

Other acts relating to animals, such as the Livestock Brands Acts 1962 (Act No. 87 of 1962), do not necessarily incorporate welfare requirements. The SPCA (society for the prevention of cruelty to animals) movement enforces specific welfare legislation, with qualified and authorized inspectors trained through a national course to perform these functions. Investigations are undertaken and, where appropriate, offenders are charged and prosecuted. Under certain sections of the Animals Protection Act and regulations pertaining to the act, authorized inspec-

Table 8
Number of Animals Slaughtered in South Africa, 2001 (in million heads)

Cattle and Buffaloes	Pigs	Poultry	Sheep and Goats
2.79	2	.3689	10.71

tors have the power to arrest, seize relevant evidence, and seize animals in need of immediate care.

Codes of Practice

A number of codes of practice exist and, while they are not legally enforceable, they are accepted as the norm as underwritten by the different sectors of the livestock industry. The Animals Protection Act is enforceable in all situations where animals are utilized, kept, or slaughtered. Although specific requirements are set down in the relevant abattoir legislation, charges can be made against perpetrators of cruelty as defined by the Animals Protection Act. Conviction on charges of animal cruelty can result in fines, imprisonment, and confiscation of animals.

The Department of Agriculture has appointed inspectors who monitor the conditions at abattoirs, but the focus is on hygiene, of both the facility and the carcasses. These inspectors also are in a position to ensure that the abattoir regulations are adhered to in terms of facilities, handling, and slaughter methods. Failure to comply with the legislation can result in fines and either temporary or permanent closure of the abattoir (Table 10).

Table 9
**Commercially Utilized Species/
Products in South Africa**

Species	Main Product Farmed for (excluding by-products)
Cattle	Meat Milk Hides and other by-products
Sheep	Meat Wool/pelts
Goats	Meat Mohair
Calves	Veal/calf meat
Poultry	Eggs Meat
Ostriches	Feathers Skin Meat
Pigs	Meat
Rabbits	Meat Pelts
Game	Meat Trophies/tourism

Slaughter Requirements

South Africa has a wide range of cultures and beliefs; eleven official language groups represent this diversity.

The manner in which animals are slaughtered is as diverse as these groups, and the slaughtering of animals for ritual as well as food purposes is very important to many (Table 11).

However, in order to ensure meat

Table 10
South African Legislation Incorporating Animal Welfare

Name of Legislation	Purpose of Legislation
The Animals Protection Act No. 71 of 1962	Protect animals Define offenses Define responsibilities of animal owners
The Meat Safety Act, 2000 (Act No. 40 of 2000) and regulations	Define acceptable practices associated with the slaughtering of animals
The Performing Animals Protection Act No. 25 of 1935	Protection of animals Relating to animals used for safe-guarding and entertainment
Standing Regulations under the Animal Slaughter, Meat, and Animal Products Hygiene Act, 1967 (Act No. 87 of 1967)	To define the manner in which animals are handled, held, and slaughtered To ensure standards set out are adhered to in the production of animal products
The Societies for the Prevention of Cruelty to Animals Act, 1993 (Act No. 169 of 1993)	To provide controls over societies for the prevention of cruelty to animals. To define specific standards that must be adhered to

sold to the public conforms to recognized standards, products offered for sale must be derived from animals slaughtered in approved abattoirs and in compliance with specific conditions set down in legislation. Abattoirs operate according to a grading system, with A grade being the highest. The system dictates the number and type of animals that may be slaughtered on a daily basis, and the facilities required. The manner in which animals may be handled, off-loaded, and held-over prior to slaughter are specified in the regulations, which currently are being revised. Pre-stunning of animals (including poultry) in abattoirs is a legal requirement, although exemption from pre-stunning may be granted in cases of animals slaughtered for religious purposes, i.e., kosher and halal.

In order to accommodate the formerly disadvantaged sectors of the community, much smaller grade abat-

toirs, which slaughter only a few animals per week, have been approved. These small abattoirs are not required to have the same infrastructure as the larger abattoirs. They supply meat directly to their local communities, “warm” off the hook. Cold rooms, etc., are not required; however, pre-stunning is required (Table 12).

Slaughtering of animals outside abattoirs is permitted only for home consumption and not for commercial use or gain. In such cases the abattoir legislation does not apply, but the Animals Protection Act remains enforceable. Illegal slaughter does occur—individuals may set up “bush” abattoirs, where animals are slaughtered and the carcasses filtered into the commercial market.

Stock theft is rife in South Africa. In an attempt to curb this, the Livestock Brands Act has been revised to make marking of stock mandatory.

The majority of halal slaughter in

abattoirs is undertaken in the same manner as slaughter for commercial purposes, and animals are pre-stunned.

Kosher Slaughter

The pre-stunning of animals is unacceptable for meat to be considered kosher. Through negotiations with the Jewish community, advances have been made concerning the manner in which animals are restrained prior to slaughter and in achieving post-stunning of cattle and calves in twenty seconds.

As much as slaughter without pre-stunning is of concern, the manner in which animals are handled and presented for cutting of the throat is in many cases of equal or greater concern. Shackling and hoisting of live animals is totally unacceptable in South Africa and is a prosecutable offense.

Table 11
Slaughter Methods Used by Different Cultural Groups and Others in South Africa

Type	Most Commonly Used Species	Brief Description of Slaughter Methods
Kosher (Jews)	Cattle, calves, sheep, poultry	Animals are restrained using specific equipment and have their throats cut without pre-stunning. Post-stunning is undertaken in most instances. Slaughter normally takes place in an abattoir.
Halal (Moslems)	Cattle, sheep, poultry, goats	Most halal slaughter is undertaken in the same manner as for commercial slaughter, and pre-stunning is undertaken. In some instances no pre-stunning is undertaken and the throats are cut. Slaughter normally takes place in an abattoir, however for certain occasions animals are slaughtered at communal site or at private homes, without pre-stunning.
Traditional (African)	Cattle, goats, sheep	Animals may sometimes be shot or pre-stunned. In most instances pre-stunning does not occur and cattle are poll stuck, then cast and their throats cut. Sheep and goats are cast and their throats cut. Other methods include stabbing, neck-breaking, etc. Slaughter takes place outside of abattoirs.
Home Consumption	All species	Animals, especially large stock, may be shot prior to bleeding. The majority of animals, such as sheep, have their throats cut without pre-stunning. Slaughter takes place outside of abattoirs.
Commercial	All species	Animals are pre-stunned and then bled. Slaughter takes place in a registered and approved abattoir.

Table 12
Stunning Methods in Abattoirs in South Africa

Species	Stunning Methods
Large stock—Cattle, horses, donkeys, large boars/sows	Captive bolt pistol Use of firearm in some circumstances
Small stock—Sheep, goats, pigs	Electrical stunning with the use of stunning tongs applied to the head Captive bolt in some circumstances/where there is no electricity
Poultry	Electrical stunning by positioning the head in a fixed head-stunning unit Electrical stunning via current in water bath
Rabbits	Electrical stunning by positioning the head in a fixed head-stunning unit
Ostriches	Electrical stunning with the use of stunning tongs Electrical stunning by positioning the head in a fixed head-stunning unit

The restraint method currently used for cattle is a rotating stun box, with feet clamps. The cattle are individually moved into a stun box and their feet are clamped together with hydraulically operated metal clamps. The box is then rotated, and the animal, lying on his or her side and prevented from moving by the restraint of the feet, is suspended by the feet. The head is pulled back with the aid of a “devil’s fork,” a semicircular metal frame which gives the operator leverage to hold the head and neck in an upside down, still position. This allows the *shochet* (a Jewish slaughterer) free access to the arched throat, providing relative safety for personnel but at great expense to the animal.

Attempts currently are being made to install an upright slaughter box, which will eliminate the need to rotate cattle for the cutting of the throat.

Traditional Slaughter

The slaughtering of animals plays an important role in traditional African culture. It is undertaken at various events, such as marriages, births, deaths, and initiation rites, and for numerous reasons, such as celebration and cleansing rites and communication with ancestors. Methods of traditional slaughter of farm animals vary according to the tribal group

undertaking the slaughtering, and the reason for the slaughter. Slaughter generally takes place on private property. In most cases the animals are restrained and cast, and the throat is cut. Restraint and casting of cattle often is attempted by stabbing the animal behind the poll to sever the spinal cord and render the animal immobile. Although still conscious, the animal has limited movement, and the cutting of the throat can be performed in relative safety.

Pre-stunning of animals is recommended and encouraged. In some cases participants have allowed the SPCA to pre-stun the animal by means of a captive bolt pistol. There remains, however, a great deal of resistance to pre-stunning.

In some cases the animal is required to vocalize prior to death to indicate that the ancestors have accepted it. While some animals, particularly goats, will vocalize readily, others are inhumanely treated until they do so.

Traditional festivals and occasions also may dictate the manner in which the animal is treated and killed. This is a very sensitive issue and, unfortunately, intervention by animal welfare in these ceremonies often is perceived (erroneously) as racially motivated and in conflict with constitutional rights of individuals and organizations.

Ostrich Slaughter

In 1993 South Africa was supplying approximately 90 percent of the world demand for ostrich products and the export of fertile eggs or live birds was not permitted. The single-channel marketing of ostrich and ostrich products ceased with deregulation in 1993, and the market consequently opened, although the export of breeding material still was strictly controlled. As a result, and with an increase in the demand for ostrich products, an increase in the number of producers and abattoirs was seen.

Eventually breeding stock was permitted to leave the country. Shipments of live birds have been investigated and monitored as far afield as Malaysia and the United Arab Emirates. This created concern in the international welfare community, as attempts were made to establish ostrich farming in various countries where climate, management, and specialist knowledge was not available.

While ostriches are valued for their skins, feathers, and meat, the manner in which some producers were harvesting the feathers was found to be unacceptable. Eventually a code of practice was drawn up with the industry, detailing the requirements for feather harvesting and making it illegal to pluck “green” feathers. Only certain “ripe” feathers may be plucked, and clipping of other feathers is permitted. The process is monitored and controlled.

Ostriches' physiological and behavioral requirements are different from those of other farm animals; consequently the manner in which they are held, handled, and slaughtered is more problematic. Due to the positioning and small size of the brain, stunning with a captive bolt pistol is not reliable; therefore ostriches are electrically stunned.

Ostriches are potentially very dangerous and can inflict life-threatening injuries with their powerful legs. This influences the manner in which they are restrained both before and after slaughter. The head of the bird must be held manually for correct placement of the stunning tongs or placed in a small stunning box and restrained prior to electrical current being switched on. Following stunning the ostrich collapses into a sitting position and the legs and feet thrash wildly. In most abattoirs the stunning area is partitioned with steel sheets to protect workers from the powerful, spontaneous kicking of the unconscious bird. Immediately following stunning, after the bird has dropped, a hinged, heavy metal bar is placed over the legs and secured in position. This is to minimize kicking and allow the workers the opportunity to place the shackle over the legs so that the ostrich can be hoisted and bled. Investigation into improved restraint and stunning methods is ongoing.

Slaughter of Game

Game—animals such as impala, springbok, blesbok, kudu, and warthogs—are presented at the abattoir in carcass form for dressing and processing. The stress (and costs) of live capture, the danger in handling, and the inability to restrain the animals humanely for slaughter dictate that these animals be shot on site and field dressed.

Shooting of game for commercial use generally is undertaken as a culling operation. The numbers involved and the fact that the animals

are not going to be used for trophy purposes means that shots to the brain are favored. Head shots also limit the damage to the carcass and the resultant loss in edible meat.

Crocodiles are farmed primarily for their valuable skin, which is used in the fashion industry. They are reared communally and, when they reach the desirable size, they are slaughtered. They are presented for slaughter by isolating an individual from the other animals, sometimes placing a sack loosely over the snout to calm the animal. Then the animal is shot in the brain with a firearm, at close range.

Exportation of Animals

Due, in part, to the vastness of the country and also for economic reasons, animals are moved great distances to central sale points or abattoirs. Transportation of livestock by rail is no longer permissible, so that ground transport is now undertaken by road. Large numbers of animals (predominantly sheep, goats, and cattle) are imported into South Africa from neighboring Namibia. Often these animals are in transit for up to three or four days, resulting in exhaustion, dehydration, bruising, injuries, and even death.

Domestic, wild, and farm animals routinely have been transported by air to various destinations and for various reasons. International Air Transport Association regulations specify the manner in which these animals can be handled, contained, and moved. Due to the high cost, moving animals by air generally is not undertaken for animals who are to be slaughtered, since they have a lower financial value than those destined for breeding.

In recent years, with the opening up of international trade, there has been a marked increase in the exportation of slaughter animals by sea, although this is undertaken on a relatively small scale compared with the numbers of animals exported from such countries as Australia. Task

teams have been formed to investigate this issue, and attempts have been made to encourage the government either to legislate against this practice or at the very least to regulate it. At the present time, the only controls exerted by the government are those relating to animal health and conditions imposed by the country of destination. Animal welfare is not a criterion. As a result a code of practice was drawn up by the NSPCA and other members of a subcommittee of the Livestock Welfare Coordinating Committee in 2000 to detail minimum requirements for live export.

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Notes

¹All data presented on the evolution of meat production have been obtained from FAOSTAT Statistics Database (FAO 2002).

²Cattle and buffaloes, pigs, poultry, and sheep and goats.

³Six world regions were defined: Africa, Asia, Europe, Latin America and the Caribbean, North America, and Oceania.

⁴Six subregions have been defined: Andean Countries, Brazil, Caribbean, Central America, Merco sur, and Mexico.

Literature Cited

- Cabinet Office of Japan. 1987. *Guidelines for industrial livestock rearing*. Tokyo.
- . 1995. *Slaughter methods for livestock*. Tokyo.
- Chambers, P.G., and T. Grandin. 2001. *Guidelines for humane handling, transport and slaughter of livestock*. Rome: FAO.
- Delgado, C., M. Rosegrant, H. Steinfield, S. Ehui, and C. Courbois. 1999. *Brief: Livestock to 2020: The next food revolution*. Washington, D.C.: International Food Policy Research Institute. At <http://>

- www.ifpri.org/pubs/catalog.htm.
- Food and Agricultural Organization (FAO). 1988. Standard design for small-scale modular slaughterhouses. FAO Animal Production and Health Paper 73. Rome: FAO.
- . 1994. Manual para la instalación del pequeño matadero modular de la FAO. FAO Animal Production and Health Paper 85. Rome: FAO.
- . 2002. FAOSTAT Statistics Database. Rome: FAO. *http://apps.fao.org*.
- García de Siles, J.L., G. Heinz, J.C. Lambert, and A. Bennett. 1997. Livestock Products and Food Security. World Congress on Food Hygiene, August 1997.
- Mann, I. 1984. Guidelines on small slaughterhouses and meat hygiene for developing countries. Geneva: World Health Organization.
- Rosegrant, M.W., M. Agcaoili-Sombilla, R.V. Gerpacio, and C. Ringler. 1997. Global food markets and U.S. exports in the twenty-first century. Paper presented at the Illinois World Food and Sustainable Agriculture Program conference "Meeting the Demand for Food in the 21st Century: Challenges and Opportunities for Illinois Agriculture," Urbana-Champaign, May 28.