GOATS - UNDervalued Assets in Asia

Proceedings of the APHCA-ILRI Regional Workshop on Goat Production Systems and Markets


Animal Production and Health Commission for Asia and the Pacific

International Livestock Research Institute
GOATS - UNDERVALUED ASSETS IN ASIA

PROCEEDINGS OF THE APHCA-ILRI REGIONAL WORKSHOP ON GOAT PRODUCTION SYSTEMS AND MARKETS

## Contents

<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction, overview and actions</td>
<td>GD Gray and H-G Wagner</td>
<td>1</td>
</tr>
<tr>
<td>Role of goats in sustainable rural livelihoods in India</td>
<td>SK Singh, MK Singh and NP Singh</td>
<td>5</td>
</tr>
<tr>
<td>Goat systems in Asia: responding to change and enabling enterprise development</td>
<td>GD Gray</td>
<td>9</td>
</tr>
<tr>
<td>Goat genetic resources and performance improvement initiatives in the Philippines</td>
<td>EC Villar</td>
<td>13</td>
</tr>
<tr>
<td>Goat raising in Viet Nam</td>
<td>NT Mui, DL Hang and DV Binh</td>
<td>17</td>
</tr>
<tr>
<td>Distribution, management, marketing and constraints of goat production in Cambodia</td>
<td>S San</td>
<td>21</td>
</tr>
<tr>
<td>Goat production in Lao PDR: potential, limitations and approaches of forage development</td>
<td>P Phengsavanh</td>
<td>26</td>
</tr>
<tr>
<td>Genetic improvement of dairy goats in the Democratic People’s Republic of Korea</td>
<td>H-G Wagner</td>
<td>30</td>
</tr>
<tr>
<td>Goat production systems and trade in Australia</td>
<td>M Nunn</td>
<td>34</td>
</tr>
<tr>
<td>Goat production in Lao PDR</td>
<td>S Keonouchanh and S Xaypha</td>
<td>37</td>
</tr>
<tr>
<td>Options for genetic improvement of goats by smallholders</td>
<td>C Nimbkar</td>
<td>41</td>
</tr>
<tr>
<td>Goat farming in Malaysia</td>
<td>G Sivasupramaniam</td>
<td>45</td>
</tr>
<tr>
<td>The goat sector in Pakistan</td>
<td>Q Ali</td>
<td>47</td>
</tr>
<tr>
<td>Bangladesh: where goat is a treasure</td>
<td>S Mahmud</td>
<td>50</td>
</tr>
<tr>
<td>Workshop programme</td>
<td></td>
<td>53</td>
</tr>
<tr>
<td>List of participants</td>
<td></td>
<td>56</td>
</tr>
</tbody>
</table>
Introduction, overview and actions
GD Gray and H-G Wagner

Rationale for the workshop
For the millions of goat keepers in Asia, there can be no doubt that their animals are highly valued as assets and as sources of income, food and manure. In several Asian countries, goats are very much recognized as a major livestock species and, in the case of Bangladesh, lauded as a “national treasure”.

The purpose of this workshop was to enable these countries to share their successes and failures and thus increase awareness of the considerable value of this livestock species in countries where goat production is a small sector, and among institutions such as the International Livestock Research Institute (ILRI) and the Food and Agriculture Organization (FAO) in which goats rank well behind large ruminants, pigs and poultry in rankings of global significance. The workshop, and its published proceedings, should draw attention to the range of expertise available in the region for goat research and development, and, of special importance to the meeting sponsors, the relationship between goat production and poverty.

With the exception of a few large-scale commercial enterprises, goats are often raised at the margins of communities. This is true in the physical sense that goats (and sheep with which they are often grazed) are well adapted to the harsh conditions and poor quality feed found at the interface between deserts, mountains and cultivable land, and on “waste” land within cropped areas where poor and landless people are also found. In a financial sense, and second only to poultry, goats and sheep represent the smallest investment needed for the poor to engage in livestock production as a new enterprise, especially where pig production is constrained for health or cultural reasons. Thirdly, in a nutritional sense, where the poor are on marginal levels of nutrition, dairy and dual-purpose goats can provide a regular supply of high value protein to the poor families, especially children, who raise them. This important aspect of the workshop was to raise awareness of goats as a livestock species that offers considerable potential to reduce poverty in Asia.

Goat systems and markets
Many of the workshop presentations provided an overview of the status of goat production in individual countries, and several addressed the changing demands of domestic markets. It is evident that goat numbers are increasing in all countries and at a very fast rate
in some. Although from a quite small base, there has been a dramatic increase in the last decade in Viet Nam, for example, with significant investment from national and international agencies and very high domestic demand. Internationally, there is very little trade in goat products — another reason why goat production tends to attract little attention in international forums. However, demand for goat meat is very high, and at current levels of production, prices can as much as double those of pig, poultry and large ruminant meat. Production systems are diverse, from the migratory systems of parts of South Asia to the sedentary smallholder systems found in all countries. There is difficulty in accessing technologies and policies that have been effective in accelerating growth of goat production. To our knowledge, for instance, this is the first time that any data on goats in Cambodia have been presented at an international forum.

Dairy goat farm, Thailand.

Initiatives and projects
The workshop did not intend to summarize all the works on goat research that have been carried out in the region, nor all the development projects that have been completed, are in progress or are planned for the future. There are good sources of formal research
results, notably the journal “Small Ruminant Research” (www.elsevier.com) and the proceedings of gatherings such as the Asian-Australasian Association of Animal Production Societies (AAAP) congress (www.parc.gov.pk). A consistent comment from participants in the workshop was the difficulty in accessing the lessons from development projects and the research that often precedes new projects but which remains unpublished in the files of implementing and funding agencies. There are good examples of enterprise development in the region. One notable presentation was on the rapidly expanding dairy goat sector in Thailand.

**Approaches to goat development**

Several presentations drew attention to national breeding programmes most of which are focused on the distinct breeds that have been developed for meat, milk or as dual-purpose animals. A consistent feature of discussions, however, was that most production of meat and milk came from animals that can be loosely described as “native” or “non-descript”. While recognizing that infusion of breeds with distinctive meat (for example the Boer) or milk (for example the Saanen), characteristics can be important in breeding programmes, there should be more attention paid to selection of breeding animals from within productive herds, involving their owners and keepers in the selection process.

There is a need to match genetic progress with improvements in management and feeding. The approach described by one of the papers from Lao PDR described the success of introducing forages to goat raising (and cattle and buffalo) communities where the selection of forages and the investments of time and money are all made by farmers with technical support. In these cases, the intervention was driven by demands from the goat raisers.

Three diseases were highlighted during the workshop: internal parasites, PPR and brucellosis. Internal parasites (mainly nematodes) are present in all production systems and can become severe if there is poor nutrition, poor housing, and treatments are not available, causing the animals to become heavily burdened. PPR is spreading eastward through South Asia, and its control through vaccination is dependent on private or public infrastructure to deliver effective vaccines. *Brucella melitensis* is currently concentrated in the Middle and the Near East but has the potential to spread eastward, and is of special concern as it can spread to humans.

The private-sector development of the dairy goat industry is a dramatic illustration of a common theme: that the development of goat
enterprises needs to be driven by the private-sector — companies, communities or individuals who can make reliable profits from selling animals or their products. Important parallel investment by the public sector is needed to ensure access to clear market signals, to support health control, provide training and engage directly with the poorest communities whose enterprises need to be “primed” or “kick-started”.

**Actions and recommendations**

The following is a list of action points and recommendations were drawn from the formal and informal discussions that took place throughout the workshop.

1. There is a widespread need for training in breeding, feeding and health control for goats.
2. There is a need for better understanding of markets for goats and goat products from lowest value (e.g. manure) to highest value (e.g. pharmaceuticals).
3. There are technical issues that can be solved through new research including appropriate species of legumes as feed for goats and the status and possible impact of negative selection in goat populations.
4. There is a good opportunity for networking among the private and public sector in goat dairy production.
5. Training in diagnosis and surveillance for PPR is an urgent priority.
6. Importation of breeds needs to be monitored carefully to ensure the breeds are appropriate and necessary. Contact among suppliers and users of appropriate goat breeds should be stimulated through a knowledge network.

**Acknowledgements**

The International Livestock Research Institute (ILRI) and the FAO Animal Production and Health Commission for Asia and the Pacific (APHCA) would like to acknowledge support from the Government of Lao PDR who hosted the workshop, members of APHCA and non-members who participated in the workshop, as well as the team from FAO Regional Office in Bangkok which handled the logistics and organization of the workshop. The proceedings are published with financial support from APHCA and ILRI.
Role of goats in sustainable rural livelihoods in India
SK Singh, MK Singh and NP Singh

Introduction
Developing countries raise 775 million of the 809 million goats in the world and 86 percent of them are in low-income countries with a food deficit (FAO, 2005). Sixty-five per cent of the global goat population is maintained in the developing countries of Asia and 29 percent in Africa. These statistics are a strong indication of the importance of goats in the livelihoods of people in developing and under-developed countries, especially in Asia. In 1961, Asia had a 59 percent share of goat population and increased its share to 62 percent in 1980, and 65 percent in 2005. The rate of population increase in Asia and Africa was slower between 1961 and 1980 but increased at a faster rate thereafter. China and India together have 39 percent of the world goat population. There are 16 countries with a goat population of more than 10 million. In Asia, these include China (195m), India (120m), Pakistan (57m), Bangladesh (37m), Iran (26m) and Indonesia (13m).

Land holdings
Goats have small land requirements, and their adaptability to harsh climates makes them suitable for landless and marginal farmers. Human population pressure and changes in social structure in the developing countries, including China and India, have increased the importance of goats to the poor families who maintain them for milk production and domestic consumption. These farmers lack space and money to invest in larger animals, such as cattle and buffaloes. This may explain the higher rate of increase in goat population compared to other livestock species in countries that have high densities of human population and relatively small land holdings.

Socio-economic conditions of goat raisers
Various surveys conducted by institutions in India revealed that 40-60 percent of goat farmers belong to landless or marginal communities. Income for these families derives mainly from daily wages. Men often migrate for work while women and children take care of livestock. In India, large herds of sheep and goats are maintained together in the states of Rajasthan, Gujarat, Himachal Pradesh, and Jammu and Kashmir. The farmers maintaining the Gaddi goat breed, for example, migrate from Tarai belts of Punjab to Himachal Pradesh close to the China border. Similarly, farmers from the arid zone of Rajasthan migrate along with goats and sheep from other states such as Uttar
Pradesh, Punjab, Haryana, Madhya Pradesh, Gujarat and Maharashtra, during the dry summer months. The flock size of such farmers may ranges from 50 to 500 and migration period lasts from late winter until after the onset of monsoon rains.

**Farming systems in India**
Goats in India are mostly maintained by pastoralists on very low inputs, with a tendency to graze animals on public lands, roadsides and in forests. Migration often occurs when larger herds are short of feed. During the migration, there is competition for feed with local village goats, and some conflicts are created by the fear of spreading diseases. The first positive aspect of migration is that the local farmers tend to purchase bucks from migratory farmers who have large herds. Selection of bucks from such herds becomes easy. The second benefit is that crop farmers can charge sheep and goat farmers for their animals grazing on fallow lands and on crop residues while the animals’ urine and faeces increase soil fertility.

![Indian woman and her goat with a bag on its udder.](image)

Other farmers maintain goats in small numbers, usually fewer than five, for milk production to fulfill family requirements. These farmers hire community goat caretakers who collect goats from households in the morning, take them to the grazing fields and return them in the evening. Lactating goats are milked before and after the grazing period. The farmers tie a bag on the udder so that the kids may not
suckle their mother and milk is saved for human consumption. The typical practice of these farmers is that they sell male kids at 4-6 months of age for slaughter. If these kids were maintained up to the recommended age of 9-12 months, they would attain optimum body weight with higher herd productivity. Sale of male kids at early ages also affects the selection and availability of bucks for breeding.

**Goat as an industry**

There are many agricultural universities, private institutions and International organizations promoting commercial goat farming by disseminating technologies through “lab to land” programmes and training in commercial goat farming. The Central Institute for Research on Goats (CIRG) alone has provided training to 29 groups of between 30 and 60 farmers. Even after such organized efforts, commercial goat farming has been slow to develop in India. In summary, the reasons may be:

- The majority of goats in India are raised on a ‘zero input’ basis, with farmers selling their goats at any price, making this highly attractive for middle-men.
- Goats are either maintained in large flocks under a free ranging system with migration or in small flocks on a stationary basis. Our experiences indicate that when goats from these rural farming systems are purchased and put in confinement under intensive and semi-intensive system of management they tend to suffer from contagious and communicable diseases.
- There is a lack of skilled labour to manage goats under intensive management systems.

**Future strategy and proposed plan:**

In a farming system in which farmers are from the poorest communities, have lower literacy, small land holdings and the least say in society, any programme for improvement cannot be successful without the cooperation of farmers and all stakeholders in the goat production system. The first step of any plan should be creating farmers’ groups and educating them about the potential of goats, breeding, feeding, health control technologies and marketing. The most important tasks are:

1. Identifying potential traditional goat farmers.
2. Creating of groups or societies of goat raisers/farmers.
3. Registering farmers.
4. Using an animal identification system.
5. Performing recording and genetic evaluations.
6. Using of prophylactic controlled measures e.g. de-worming and vaccination.
7. Creating of an information system dedicated to goat production management.
8. Creating of a national data bank of goat breeds.
9. Evaluating goat feed and fodder available in the area and scope of improvement in the quality and quantity of feed, including minerals and vitamins.
10. Identifying of threatened goat breeds and their conservation.
12. Marketing and value adding to the goat products such as meat, milk, fibre, skin and manure.
13. Managing risk, including insurance and subsidy in natural calamities.
14. Educating farmers about export and import practice opportunities and rules.

References
Goat systems in Asia: Responding to change and enabling enterprise development

GD Gray

Goat systems
Goats are the only medium-sized livestock species that provides: i) a means to accumulate assets through increases in numbers, ii) a regular source of income through sale of animals and manure, and iii) a regular source of household nutrition through consumption of milk. In many parts of Asia, goats are free of major endemic diseases and will thrive on locally available feed resources. Many well-adapted breeds are available in the region for smallholder and commercial-scale production. The range of technologies and approaches for the improvement of goat production systems is wide, especially if those developed for sheep improvement are included. There is a risk, however, that solutions developed for sheep are applied to goats without caution and the appropriate adaptive research to determine appropriate drug dose levels.

Drivers of change
Goats systems are changing throughout the region. There is increased demand for meat in general, and for goat meat in particular, especially in those areas where it is considered a delicacy. The market for goat milk is large and varies greatly throughout the region from a staple food in some parts of South Asia to a specialty for tourists in others. The nature and size of local and international markets of goat meat and milk is not well understood. There is pressure to avoid grazing in areas of high biodiversity value, where goats have a reputation for being destructive animals. There is increasing pressure to confine all livestock. For goats, this pressure is created by the damage they can cause to crops and gardens.

Entry points for change
Research to development
Most written material on ways to stimulate change in goat systems describes a pathway that starts with research and which leads to on-farm application and eventually to scaling-up, with variable development outcomes. Usually, the starting point for the research has been a constraint (such as parasitism) or an opportunity (such as a new breed) identified by researchers, with inputs from producers and others. There have been some successes in this approach, for
example, the improvement of goat production in Rajasthan (India), the use of local and exotic feed resources in Lao PDR, the creation of methods for sustainable parasite control in the Philippines, and in provision of assistance in establishing goat dairy enterprises in Viet Nam.

As the research in these examples became more oriented towards development, the projects embraced a much wider set of technologies, groups and institutions. This more holistic approach was required to achieve impact on the ground, and in all cases, the more ambitious technologies proposed initially were abandoned in favour of those which were relatively simple and available locally.

Grazing herd.

Development investment
Development initiatives alone have been used to stimulate change through large-scale investment in new enterprises and markets. Often funded by development banks, these have mostly been failures and have largely been abandoned. Government and non-government agencies, whose primary responsibility is rural poverty alleviation, have used goats to the immediate benefit of recipient households and also engage in stimulating new enterprises. When this latter approach has been successful, it has been a long-term investment backed by significant technical and policy support.
“Spontaneous” market-driven

Most change in goat systems takes place without inputs from research or external agencies and is “spontaneous”. It is not well understood as an entry point for change. Almost all breed development activities and innovations in management have been developed by farmers themselves in response to the needs of local markets and local risk factors. It is a challenge for the research and development community to better understand these, and to build our efforts upon them.

Approaches to innovation

Innovation along the market chain for goats and goat products occurs in response to change. Internal change may occur, for example, by reduced access to local forests for grazing. External change could be the introduction of a new disease such as PPR or the opening of a new road. Many people and institutions are important in responding effectively. Among these are the research and development institutions gathered at this APHCA meeting. How best can we contribute to the innovation processes that are occurring in goat systems and will need to occur in the future? We have several approaches available.

Technology transfer: although regarded by many as the “old” way, it can still be valuable where the problem is easily identified and the solution readily available. A good example for goats could be a long-acting vaccine against PPR.

Participatory technology development: has proven most useful where the problems are complex and solutions not obvious. A good example is where the use of new local feed resources requires adjustment of the whole farming system and farmer experimentation.

Enterprise-based approaches: this is useful where small enterprises can be better linked to existing markets and used to drive technology change. The dairy goat example in Viet Nam has provided many lessons and the “agro-enterprise” approach being tested in Lao PDR and Viet Nam is providing some good examples for cattle and buffalo production.

Role of research networks and international agencies

There are several ongoing networks and international agencies that can impact the usefulness of goat systems to rural development. The networks include the FAO Livestock, Environment and Development Initiative (LEAD), the Southeast Asian Forage Research and Development (SEAFRAD), the FAO Domestic Animal Diversity Information Service (DAD-IS) and the ILRI Domestic Animal Genetic
Resources Information System (DAGRIS) networks. The agencies with responsibility for goat health, production and marketing include the World Organisation for Animal Health (OIE), FAO, ASEAN and the Common Fund for Commodities (CFC). It is a major challenge to ensure that these networks and agencies are informed of each other’s plans and activities. Hopefully, this meeting of APHCA can identify some specific steps forward in this direction.

**Discussion and conclusions**

Many technologies, including introduction of appropriate breeds, are available in Asia but the crossover from sheep to goats, especially in disease control, is uncertain and requires more research. To achieve development outcomes from research on goats, we require a holistic approach, a well-defined entry point and realistic options. Much change in goat systems occurs without research and development agencies. We need to identify examples of where positive and negative change occurs and learn from them. There are large gaps in communication and cooperation among the institutions that support change in livestock systems. New policies to support effective collaboration are needed.

**References**


Goat genetic resources and performance improvement initiatives in the Philippines

EC Villar

Industry situation
Goats provide livelihood to about 15 million Filipinos. As its production requires low initial investment with small risks, it is an attractive undertaking among rural farm households and a sound option to augment the country’s programmes on livelihood development. At present, the goat population is estimated at 3.5 million, with 99 percent in the hands of backyard raisers and a meager 0.4 percent in commercial farms. Basically, the goat genetic resources in the country consist of the native, the exotic breeds (most notably the Anglo Nubian and the Boer), and the “upgrades”: crossbred among the native and exotic breeds.

Emerging value of goats
The Philippine native goats are traditionally sustained on unimproved management systems mostly through tethering and extensive grazing. Because of this, the native goat has low production performance, i.e., at market age it weighs only 10-12 kg, with an average daily gain of less than 50 gm.
Through the years, however, technologies have been generated that have paved the way for improved production systems. Because of improvements in income from goat enterprises brought about by the awareness of raisers of these improved technologies, and due to President Macapagal-Arroyo’s call to generate jobs for the poor, more and more local government units (LGUs) have considered goat production as a livelihood option for their constituents.
The need to supply the local market with slaughter goats that would bring income to the poor brought forth the need to produce more breeders. In view of this, several commercial goat farms began venturing into breeder goat production, elevating goat keeping into an economic enterprise.
At present, demand from both the smallholder and commercial raiser is so high that everybody is producing breeders to fill in the supply gap. This “hype” about goat raising has prompted more entrepreneurs to import sizable numbers of high quality genetics and different breeds of goat into the country, mostly from Australia, to hasten herd build-up in order to compete in producing the needed stocks for local raisers. From a predominantly backyard status, therefore, the current
enthusiasm has brought goat production to a level where investment from affluent raisers has become unrealistically high. Thus, the goat’s reputation of being a “poor man’s cow” could become history.

**Improving goat performance**

To improve the production performance of goats and promote goat-based enterprises as a major source of income among raisers, various initiatives have been started: among smallholders, at institutional farms and in commercial farms. These initiatives range from selecting and breeding the best among local strains, crossbreeding of the native stocks with upgraded and purebred goats, and importing exotic breeds from abroad. Performance of all these animals has been evaluated. Worth noting was the performance of the 3-way cross of the Anglo Nubian-native-Boer line which performed well in comparison with the exotic breeds under ordinary conditions. This triple cross is designed to produce slaughter animals in the future.

**Increasing breeder base**

At the moment the private sector, particularly the Federation of Goat and Sheep Producers and Associations of the Philippines, Inc., has taken the role of importing quality breeders to widen the breeder base available to local raisers. They have also organized themselves into a federation of goat raisers and entrepreneurs and recently set up a Market Board for Goats. This move was meant to: i) safeguard and ensure that the price of goats is dictated by the raisers and not the traders, and ii) make known to all raisers the current price information about goats. The Federation has also initiated the establishment of a Breeders’ Association to address concerns on breeding, particularly regarding local performance standards.

For its part, the Government, particularly the Department of Agriculture (DA), developed a “Roadmap for Small Ruminants”, and a long-term plan to assist the industry in meeting its goals. Likewise, it has provided a credit window for the goat sector. The Philippine Council for Agriculture, Forestry and Natural Resources and Development (PCARRD) of the Department of Science and Technology, for its part, has laid down initiatives to address the gaps in research and development. In collaboration with other stakeholders such as the LGUs, state colleges and universities and the national livestock agencies, PCARRD has coordinated research and disseminated the results to create awareness on the alternative integrated approaches to goat production. This led to a decline in pre-weaning goat mortalities from almost 100 percent to less than 5 percent in participating regions.
As the industry gears up for herd buildup to 2020, PCARRD is also setting in the pipeline another initiative called the “1000-Goat Farms Programme”, a strategic plan to fast-track goat production and boost goat population gradually to 6.6 million by 2020 to meet the projected increase in domestic demand.

All these initiatives by the private sector, the DA and PCARRD are meant to prepare the way for the realization of the 2020 forecast. Surely, by properly positioning science and technology, turmoil such as that created by the “Goat Revolution” in the Philippines can be positively churned to benefit the industry.

Philippines-ILRI-Australia collaboration on goat research

A new approach to parasite control in sheep and goats has been developed through collaborative research involving Philippines and Australian research institutions, ILRI and a network of regional researchers in Southeast Asia (Alo 2004). This approach, initially based on sustainable parasite control, has expanded the research focus from simple disease control to development of sustainable small ruminant enterprises. The technologies developed and modified by farmer participants are suitable for smallholder systems throughout tropical Asia. An information support system was developed comprising a website, written reports, databases and decision-making tools for extension workers and scientists. A regular newsletter was published and results presented to national and international workshops and conferences.

In the Philippines, the project developed a Farmer Livestock School that has been adopted by several provinces, leading to substantial interest in this approach across the region, and linking with similar efforts by ILRI in Africa.

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Goat raising in Viet Nam
NT Mui, DL Hang and DV Binh

Introduction
Goats are a significant part of livestock systems in Viet Nam. This animal is particularly important for very poor farmers with limited resources. Over the past thirty years, it has been realized that improving goat productivity is probably one of the most effective ways to increase the income and welfare of poor farmers in these impoverished regions (Norton, 2006). In Viet Nam, the demand for goat products has increased considerably in recent years. However, returns to farmers remain below potential due to low productivity associated mainly with poor feed quality. For the last 20 years, the Government of Viet Nam has placed high priority on the development of a viable goat industry in the whole country. Increasing access to goat breeding schemes and improving husbandry and feeding strategies are appropriate means of addressing poverty alleviation.

Goat production from 2001 to 2005
Goat production is traditional in Viet Nam but has not been as strong, in terms of herd size and production, as other Asian countries, i.e., China, India, Pakistan, Bangladesh and the Philippines. In the past five years, the national goat and sheep herd increased from about 570,000 heads in 2001 to 1.3 million in 2005. In 2005, the number of goats and sheep accounted for 3.5 percent of the total domestic livestock. Currently, the province with the biggest herd of goats and sheep is Ha Giang with 109,000 animals. Most goats are raised for meat and only about 2,000 animals are kept for milk.

Goat enterprises
The popular custom of raising goats and sheep in farming households is through extensive grazing on natural pasture, using household labour. However, in recent years, different models of goat and sheep raising for milk and meat have been established in some regions of the country. In Ha Tay province, about 80 households are raising crossbred dual-purpose goats and collecting milk. An average income of a milk goat raiser ranges between 7 and 8 million VND per year. In Hoa Binh province, the same model of goat raising provides an income of 5-7 million VND per year. Goat raising is thus a highly effective model for income generation and goats are considered the “milk cow of the poor” in poverty reduction models.
Markets for goat products

Global demand for sheep and goat products is very high. According to 2004 statistics by FAO, global goat meat production was 4 million tonnes, 1.6 percent of all meat production. Developing countries are the biggest goat meat producers, with an annual production of 3.9 million tonnes, representing 95.4 percent, of which the majority is from Asian countries (73 percent).

Total global milk production reached 600 million tonnes, to which goat milk contributed 12 million tonnes, again coming mainly from developing countries (78 percent). The leading countries in producing goat milk are India (2.6 million tonnes), Bangladesh (1.3 million tonnes) and Pakistan (1.3 million tonnes). In 2003, goats provided 825,000 tonnes of hides and skin (51 percent from Asia) and 103,210 tonnes of hair (FAO statistics, 2004).

In recent years, the domestic demand in Viet Nam has developed in both quantity and quality. Goat meat is considered to have high nutritional values with low cholesterol. Increased live goat prices are due to increased domestic demands. In 1996, the live goat price was 8,000 VND per kg, and rose to 23,000 VND per kg in 2003, nearly twice the price of pork. In 2005, the live goat price increased to 35,000 VND per kg. This has motivated the processes of improving goat herds, increasing herd sizes and quality, and technologies for processing products.

Domestic demand for goat milk has also increased. The price of goat milk in 2001 was 7,000 VND per litre (3,000 VND higher than cow milk) (Dinh Van Binh et al, 2002). At present, goat milk is sold for 16,000 VND per litre (in Hanoi) and 20,000 VND per litre (in Ho Chi Min City), 9,000-13,000 VND higher than cow milk.

Implemented policies promoting goat raising

Since 1998, the Government has issued many policies to encourage animal raising, including four Resolutions, and four Decisions on approving the programmes of animal and plant breeding in 2000-2005. Under the Ministry of Agriculture and Rural Development (MARD), so far, there have been some related decisions on animal breeds and new techniques in production. The Decision No. 2903 QD/BNN-KH on 22nd September 2004 by MARD established and provided operational guidance for Sub-Research Centre for Breeding Goats and Sheep in Ninh Thuan province and setting up a project to develop goat and sheep breeds.

The People’s Committees in some local areas have guided specialized units and community organizations such as the Agriculture Extension
System, Veteran’s Union, Women’s Union and Youth’s Union on how to implement solutions and policies encouraging goat and sheep raising. These include price support for imported males, supplementary feeds, training on goat raising and disease prevention.

A happy Vietnamese goat farmer.

Conclusions
Investing in goat production is not costly and has fast turnover. Moreover, the low labour cost and the fertile natural resources of many different ecological areas in Viet Nam are advantageous for goat production. As the result, goats are an appropriate species for poor farming households. Small ruminant production has significant benefits for poverty reduction programmes in comparison with cattle and buffalo. Raising large livestock requires greater investment, which exceeds the ability of most farmers, requiring longer capital turnover with its higher associated economic risks. Developing goat and sheep herds contributes to stabilizing society and the economy of the country, reducing poverty, increasing the contribution of livestock
sector to agriculture, and fulfilling the potential demands of the domestic market.

Goats are usually owned by the poorest farmers, and in the past, little investment was made to improve goat productivity. Improved technology and production systems have demonstrated impacts on poverty alleviation. Development priorities include building up numbers in concentrated breeding programmes, selecting for reproduction and meat production, and linking to traditional markets and marketing systems that can respond to the changing consumers’ preferences.

Product processing systems in the country are neglected and weak, and major economic benefits are associated with improvements in collection, handling, marketing, slaughter facilities and meeting consumers’ demands.

Cheap and effective medicines and vaccines are now available for treatment and prevention of most diseases of goats. Whole farm or village development packages offer designs and materials for inputs and outputs, i.e., construction of housing; disease diagnosis, treatment and management of infectious and parasitic diseases; seeds, planting materials and techniques to improve the quality and seasonal supply of feed; reproduction and breeding plans to optimize productivity of the indigenous goats; sources of exotic breeding stock to improve milk and meat production; information on development of new products (milk, cheese, packaged meat, etc.); as well as pricing policies and marketing. Affirmative large-scale development is necessary to shift from subsistence to market-oriented production in the whole farm systems, backed by institutional and policy support, and increased resource to increase production and directly benefit and improve the livelihoods of the poor.

References


Distribution, management, marketing and constraints of goat production in Cambodia

S San

Introduction

Small ruminants are only considered a secondary source of income to Cambodian farmers, and therefore, there is little available information on goat population, management, health and production. This includes a lack of information on herd structures, mortality rates, and epidemiology of diseases and parasites. There are goats in most provinces of Cambodia and most animals are kept and eaten by the Cham minority. However, there is no record on the distribution of goats in the country. In order to help to answer some of the questions, a survey was conducted on the management, distribution and health problems of goats in the 24 provinces of Cambodia.

Map of Cambodia.
Survey
A survey questionnaire was sent to all provincial Animal Health and Production offices in the country. Local and international NGOs were contacted for additional estimates of the goat population. The survey is estimated to have located 60 percent of the goat population in Cambodia. Questionnaires were returned from 17 out of 24 provinces and a total of 198 questionnaires were analyzed. Four provinces reported no goat population and three distant and newly recognized provinces did not answer due to the difficulty in communication. The total number of goats surveyed was 5,066 heads in 17 provinces. The largest number of goats was in Kampong Cham province, followed by Prey Veng and Battambang: 1,993, 726, and 390 heads, respectively, as shown in Table 1. The overall ratios of mature males : mature females : kids were 3 : 10 : 8.

Table 1: Number of goats in each province in Cambodia.

<table>
<thead>
<tr>
<th>Province</th>
<th>Number</th>
<th>Estimated no. of goats not surveyed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bantheay Meanchey</td>
<td>254</td>
<td></td>
<td>254</td>
</tr>
<tr>
<td>Battambang</td>
<td>290</td>
<td>100</td>
<td>390</td>
</tr>
<tr>
<td>Kandal</td>
<td>72</td>
<td></td>
<td>72</td>
</tr>
<tr>
<td>Kg. Preah Sihanouk</td>
<td>150</td>
<td></td>
<td>150</td>
</tr>
<tr>
<td>Kompong Cham</td>
<td>1,993</td>
<td></td>
<td>1,993</td>
</tr>
<tr>
<td>Kompong Chhnang</td>
<td>145</td>
<td></td>
<td>145</td>
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<tr>
<td>Kompong Speu</td>
<td>123</td>
<td></td>
<td>123</td>
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<tr>
<td>Kompong Thom</td>
<td>16</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Kr. Kep</td>
<td>88</td>
<td></td>
<td>88</td>
</tr>
<tr>
<td>Krache</td>
<td>37</td>
<td>150</td>
<td>187</td>
</tr>
<tr>
<td>Phnom Penh</td>
<td>237</td>
<td></td>
<td>237</td>
</tr>
<tr>
<td>Prey Veng</td>
<td>726</td>
<td></td>
<td>726</td>
</tr>
<tr>
<td>Pur Sat</td>
<td>131</td>
<td></td>
<td>131</td>
</tr>
<tr>
<td>Ratanakiri</td>
<td>22</td>
<td>150</td>
<td>172</td>
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<tr>
<td>Siem Reap</td>
<td>202</td>
<td></td>
<td>202</td>
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<tr>
<td>Takeo</td>
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<td>30</td>
</tr>
<tr>
<td>Koh Kong</td>
<td>0</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Preah Vihear</td>
<td>0</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Stung Treng</td>
<td>0</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>
Farm size
Farm size was classified into small size (<10 heads), medium (10-49 heads) and big (>49 heads). The survey showed that the majority of farmers had farms of medium size, followed by small and big: 130, 50 and 17 farms, respectively. In 2000-2001, there was an increase in herd size in 127 farms and a decrease in herd size in 47 farms.

Responsibilities for goat care
Responses from 163 farmers indicated that family members were responsible for goat care, whereas only 21 farmers said that employees were responsible. The study found that children were the most involved followed by husband, then wife, on 87, 74 and 27 farms, respectively.

Housing
Eighty-five farmers used pens to raise goats and 10 did not use them. In the wet season, 130 farmers used pens only at night and 61 farmers used them both at night and other times during the day. In the dry season, 151 farmers used pens only at night and 39 farmers used them both at night and other times during the day.

Feeding
Grass and other leaves are the common feed for goats in Cambodia during the wet and the dry seasons, with occasional use of rice straw and other agricultural by-products.

Income
Farmers' income came from a variety of sources. Rice farming was the main source of income for 80 farmers, fruit or vegetable production for 32 farmers, and fishing for a further 32 farmers. Seven farmers received income from abattoir work and 85 farmers gained income from “other sources”.

Diseases
Foot and mouth disease and “unknown cause of death” were the most frequently reported diseases. Twenty-eight farmers mentioned bloat as
an illness. The average mortality rate in year 2000 in big farms was 31 percent, medium farms 20 percent, and small farms 14 percent.

Marketing and prices
Farmers sold their goats to many different types of buyer: 78 sold to middlemen, 39 to restaurants, 37 to other farmers, and 26 to Cham (Muslim) buyers. Farmers sold their goats in different ways: per kg live weight, per head and price according to sex. The price varied from US$5 per kg to US$1 per kg live weight. Generally, male goats are more expensive than females.

Constraints
The most common problems reported were: “not enough feed and skinny” (100 respondents), followed by “low price” (51), “trouble with neighbours” (30), “none to buy” (20), and “not enough people to care for goats” (15).

Discussion
During the course of study, it was found that some goat populations moved to different locations frequently for many reasons. Seasonal flooding was one of the most important reasons. Goat distribution varied markedly between provinces. Kampong Cham, where there are many Cham communities, had the highest goat population. Goat raising is generally associated with Cham communities: some raising goats for local consumption and others for high-quality goat meat restaurants. Some provinces are capable of raising more goats, but lack information and technical support to enable them to realize the full potential of goat raising. Bantheay Meanchey is one of the provinces where the goat population was very low, however after a goat population was introduced by an international NGO (Bosh 2000), farmers realized the benefits of raising goats. In the past four years, this province has markedly increased goat numbers and goat meat restaurants.

There are significant constraints on keeping goats. Farmers did not report sickness in goats, but they did report “skinny goats” and “not enough feed” as major constraints. Poor nutrition and/or parasitic diseases could cause this. Further studies regarding this issue are recommended. The Government is encouraging diversity in agriculture to improve food security and goat populations in Cambodia are steadily increasing. This is the first survey to collect data from all over the country, and should help with this aim.
Acknowledgements
This study would not have been possible without the help of enthusiastic staff from the provincial Animal Health and Production offices, local and international NGOs, and the epidemiology and the parasitology sections of the National Animal Health Production and Investigation Centre (NAHPIC).

The support of Director Kao Phal and Deputy Director Sen Sovann and the University of Tropical Agriculture is appreciated.

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References

Goat production in Lao PDR: potential, limitations and approaches of forage development

P Phengsavanh

Overview
According to the Department of Livestock and Fisheries, in 2005, there were about 170,000 goats in Lao PDR of which most are native animals similar to the “Katjang” goats that are common throughout Southeast Asia. Goats are generally allowed to graze freely all year round in small groups in the forest and fallow cropland. Farmers tend to restrict their herds in order to avoid excessive damage to crops, for which the owner is held responsible (Stür et al., 2002).
In recent years (Phengsavanh 2003a), goat management practices have been changing, and vary from site to site depending mostly on land availability, labour and community regulations. These comprise four systems: i) free-range, ii) semi-rotational grazing, iii) semi free-range system, and iv) permanent grazing and tethering. The main feed resources for all these systems are native grasses, shrubs, legumes and tree leaves that are available in forests, grasslands and fallow land.

Potential for goat development
Lao PDR has a comparative advantage in ruminant production (including goat) within the region, mainly because of the availability of suitable land. Most goats are produced in extensive production systems with low capital and other inputs, particularly in sloping areas that are ideally suited to breeding and supplying weaned goats, which may then be fattened closer to market (Phengsavanh 2003a).
Furthermore, Lao native goats have high reproductive rates and are much cheaper than cattle and buffaloes, which make them very attractive and accessible to poor smallholder farmers.
Market demand for local consumption and export of goat meat is strong, the price per kg of live weight being about US$1.7-2.0: more expensive than cattle and buffalo meat at US$1.3-1.5 per kg (Phengsavanh et al, 2004). This is one reason for the relatively high rate of increase in the goat population (8 percent per annum) over the last 20 years (Stür et al., 2002).

Constraints and limitations
The main constraints to goat production in Lao PDR are diseases such as internal parasitic infestation, especially in kids after weaning, Orf (contagious ecthyma), and significant feed shortage in both dry and
wet seasons. Heavy worm infestations are the main cause of high mortality of kids, which can be up to 50 percent prior to weaning (Phengsavanh et al., 2004). Goats infected with Orf can be treated relatively easily if farmers have taken a little care at the time of an outbreak, but in general goats are severely affected and lose weight. Bloat is another concern and has been a main cause of mortality.

Feed shortages occur in areas of intensive crop production, where grazing land becomes limited. In many cases during the planting season, goats are tethered or confined in small areas where feed is limited, to avoid crop damage. In the dry season, the amount and quality of feed is low; and although goats are allowed to graze freely, they may have to walk long distances in search of feed. All of these problems have a negative impact on growth and productivity of goats (Phengsavanh, 2003a).

**The role of forages in goat production**

The performance of goats is generally far below potential because of limited grazing area, low inputs, as well as low quantity and quality of native forages. Considerable labour inputs for finding feed and herding are also required. The growth rate of goats grazing or browsing on natural feed resources is only about 25-35 gm per day. By using some improved forages such as *Andropogon gayanus* “Gamba” and *Stylosanthes guianensis* (CIAT 184), the growth rate of goats has been improved up to 70 gm per day (Phengsavanh (2003a). Use of *Gliricidia sepium* and *Stylosanthes guianensis* (CIAT184) hay as a supplement resulted in increased growth rates up to 55 and 44 gm per day, respectively (Phimphachanhvongsod 2001, Xaypha 2005).

**Introduction of promising forage varieties**

The most important goal for introducing forages to farmers is to help them identify the “right” varieties for their conditions. There is a need to provide a range of choices for farmers to evaluate, as farmers’ direct involvement in the evaluation is very important for successful adoption of new feed varieties. In Lao PDR, there are about 12 broadly adapted forage varieties, but only 5 of them have been selected by goat farmers as the suitable varieties for their needs, i.e., *Andropogon gayanus* “Gamba”, *Brachiaria* hybrid “Mulato”, *Panicum maximum* “Simuang”, *Stylosanthes guianensis* (CIAT 184) and *Gliricidia sepium*.

**Helping farmers to integrate forage technologies into their farming systems**

The feed technologies that are most promising are varieties of forage grasses and tree legumes. The most important step in working
successfully with farmers to integrate these forages into their farming systems is to find and select an interested group of farmers in the village. This group, with their extension workers, will identify problems and opportunities in their production systems and develop options for overcoming problems. By working with a small focused group of farmers (4-6 people) in the first year, the forage technologies are tested. This requires many follow-up visits by local staff to provide technical knowledge and, in return, to learn from the farmers. At the end of a year, there is a need to meet first with the focused group to share the experiences and exchange knowledge, and then hold a village meeting where experienced farmers will share with other farmers in the vicinity. As a good example of this approach, the Livelihood and Livestock Systems Project (National Agriculture and Forestry Research Institute – NAFRI and International Center for Tropical Agriculture – CIAT) worked with only 12 goat farmers to plan four forage varieties in four villages in Savannakhet province in the first year; the number of farmers increased to more than 60 in the second year.

*Smallholder goat farm, Luang Prabang, Lao PDR*

**Improving goat production systems**

The main aim of improving goat production is to intensify the production systems. The first step is to develop feed resources with
farmers in villages. By having feed resources near the villages, farmers can then provide better housing and animal health management (Phengsavanh et al, 2004). Goat production has a great potential for smallholder farmers as an alternative enterprise and a first step out of poverty. Assisting farmers to identify broadly-adapted forages and integrate those into their production systems helps farmers move into more market-oriented systems. Well-adapted feed varieties are excellent entry points for building trust with farmers and providing early impacts. It is then possible to further work with farmers to solve other livestock management problems that limit productivity. Improving feed resources and adopting some relatively simple and inexpensive improvements in management practices can minimize the occurrence and impacts of livestock diseases, resulting in greater productivity and benefits.

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Genetic improvement of dairy goats in the Democratic People’s Republic of Korea
H -G Wagner

Introduction
The Democratic People’s Republic of Korea (DPRK), as part of the national philosophy of self-reliance or “juche”, and parallel to efforts to improve diets by increasing grain production, has started to introduce small ruminants adapted to mountainous conditions on state and co-operative farms, as well as in rural family units. The focus is on goats, which are highly adaptable and capable of utilizing a wide range of plants, making them easy and cheap to keep. Goats do not compete for grain with humans and are performing an increasingly important role in providing meat and milk and generating income. As a result, while other livestock numbers have not recovered following the recent natural disasters, the goat herd is growing rapidly. The latest national statistics indicate a total goat population of 2.6 million.

To diversify the food production base, expansion of goat raising is given the highest priority in the national strategy to increase food production on hilly and marginal lands. Goats can convert agricultural byproducts not used by humans into food. In summary, the declared objectives of national policy are to: i) increase the capacity and efficiency of food from goat production by technology dissemination, ii) increase the number of goats and milk and meat production on small-family units and co-operative and state farms, and iii) make better and sustainable use of marginal lands in the mountains.

Main constraints to goat production
The major bottlenecks constraining goat production are the genetic quality of the local breeds and a countrywide genetic improvement programme; and the lack of an efficient collection, processing and distribution system to get milk and meat to people in an acceptable and affordable form. An FAO Technical Cooperation Programme (TCP) has addressed the issue of genetic improvement by introducing a genetic improvement programme on two farms together with the establishment of two artificial insemination centers to be able to distribute improved genetics more widely.

Project aims
The TCP aims to:
- Introduce a buck and doe selection programme (nucleus breeding programme) at Pyongryul Goat Breeding Station and Taejam
Cooperative Farm to foster genetic progress and provide high quality bucks and buck semen for use in multiplication farms.

- Introduce a performance-recording scheme and efforts to increase the number of does for selection, and computation of performance data and their analysis using up-to-date genetic evaluation models. The software packages ‘R’ and ‘PEST’ will be introduced for the data analysis and the calculation of Estimated Breeding Values (EBV).
- Establish a model goat semen production unit to produce fresh and deep frozen semen for use in the multiplication scheme.
- Train laboratory personnel in semen handling and processing.
- Develop the logistics and programme for a buck multiplication scheme, using AI and natural mating, to produce sufficient good quality bucks for natural mating in cooperatives, state farms and farmers’ homesteads. Using AI will eliminate one multiplication step, thus accelerating breeding progress.
- Train AI technicians in the multiplication farms/cooperatives and provide semen storage containers and AI equipment.
- Provide trainers’ training in improved management (feeding, reproduction, health and milking) of goats.

Activities
All animals on farms, under performance recording, have been ear-tagged and entered into a data-base. Staff at both farms has been trained in data entry and data maintenance. Forms for performance recording have been developed and translated into Korean language. A performance recording routine has been established comprising: i) monthly milk quantity recording (fat and protein contents), ii) monthly weight recording, and iii) recording of events, i.e., oestrus, mating, births, deaths and other type of exits.

Two staff members have received an intensive 2 months’ training abroad in modern genetic analytical models.

At Pyongryul, a model laboratory has been established and the necessary equipment has been provided to process liquid and deep-frozen semen. The laboratory at Taejam has been equipped to process liquid semen, and at both laboratories, staff have been re-trained in semen processing technology. AI technicians have been provided with equipment and have been re-trained in AI techniques. Reference manuals have been prepared for translation in to Korean. In order to allow early pregnancy diagnosis, an ultrasound scanner has been purchased for the shared use of both farms.
Results
The performance-recording scheme has been successfully established and staff trained to apply modern tools for genetic evaluation.

The total number of animals in August 2005 was 1,364 in Pyongryul and 1,520 in Taejam, respectively. In the mating season of 2004 (August – October), 835 and 1,196 females were mated respectively in Pyongryul and Taejam. Pyongryul registered 697 births (83 percent of mated animals), while in Taejam a total number of 1,227 births were registered: higher than the number of mated animals as additional pregnant animals have been purchased.

In Taejam, out of the total number of 1,227 births only 752 were normal births while 217 births were premature and 258 were abortions. This, together with other mortalities, has resulted in only 400 live offspring. As a similar high abortion rate was noted in 2004, urgent attention has to be given to resolve this problem. In Pyongryul, about 570 live offspring were tagged; 86 percent of the births or 66 percent of the delivered kids, assuming 1.2 kids per birth.

Saanen-crossed kid.

The average daily milk production per goat in 2005 in Pyongryul was 0.77 litre with 4.62 percent fat and 4.08 percent protein. In Taejam, the average was 0.99 litre with 4.00 percent fat and 3.35 percent protein. The difference in milk solids can be explained with the feed base: in Pyongryul corn was given as supplementary feed. The increased volume in Taejam may be attributed to the higher percentage of Saanen genes in the goat population.
Estimated Breeding Values (EBV) for males and females on both farms were run in 2004 and 2005 and allowed the ranking of the animals. Top ranked bucks are now used in AI.

The performance-testing scheme is well established and mastered. More than 15,000 milk records have been analyzed. Animals are weighed regularly and events are recorded. Korean experts are able to run EBVs.

Reasons for serious concern are the very low reproductive rates in Taejam due to high number of abortions and stillbirths or early deaths. To address the issue, Enzyme-Linked ImmunoSorbent Assay (ELISA) kits to check against *Chlamydia* have been provided; other possible causes cannot be ruled out. Reproductive rates in Pyongryul can be improved.

Laboratories have been established in each farm to produce fresh and frozen semen at Pyongryul and fresh semen at Taejam, using modern diluents and newly trained staff.

**Conclusions**

The project has contributed to better understanding and acceptance of genetic improvement as an indispensable tool in increasing the productivity of the national goat herd, while maintaining goat numbers.

It is recommended to increase the population basis for selection and to include the Kubin Cooperative Farm in the performance-recording programme.

Modern genetic evaluation techniques were new for DPRK. Experts and some further scientific support may be required partly through the international consultant geneticists who have assisted in solving problems.

The low reproductive rates are a cause for concern. All efforts will be made to find the causes for these abortions. Both farms will make a further effort to increase the feed base and make additional provision for winter feeding.
Goat production systems and trade in Australia

M Nunn

Industry overview

Goats in Australia include dairy, feral and rangeland and meat breeds. Dairy goat production ranges from small farms of 15–20 does to farms of more than 250 does. Most are near main cities and production is focused on fresh milk, cheese and yoghurt. The common breeds are Saanen, Toggenberg, British Alpine and Anglo-Nubian. Average milk production is between 1 and 3 litres per day over a 300-day lactation. Cashmere goats produce both fibre and meat. About 12 tonnes of high-quality fibre (12–18 micron diameter) are produced per year with a value of AU$90–150 per kg. Mohair is produced from Angora goats and their crosses. Total production is much greater than cashmere: about 220 tonnes of much lower value (about AU$10 per kg), in line with the prices for sheep wool of similar quality. Fine, 23-25 micron, mohair from kids can be worth AU$25 per kg whereas adult fine fibre of >30 micron is worth only AU$5 per kg.

Meat is produced from three production systems based on feral goats (domestic breeds that have escaped and thrive in the wild), rangeland goats that graze extensively, and specialist meat breeds (including Boer, other meat breeds and their crossbreds) that are managed more intensively.

There are about 2.6 million feral goats in Australia, their numbers depending on seasonal availability of feed and water (Figure 1). They originated from European breeds introduced at various times in the 200 years since European contact and settlement. Perceptions of these feral goats are changing. Initially, they were regarded only as an agricultural pest that competed with sheep for grazing, and as an environmental pest that degrades vegetation through browsing. Feral goats are now regarded positively as a commercial resource that can be harvested from the wild and a genetic resource that can be crossed with domestic meat breeds to produce rangeland goats for extensive production.

Rangeland goats have been developed from the capture of selected feral goats. They are hardy and require low maintenance, being able to thrive on low-quality feed and low inputs of health care and management. Rangeland goats are increasingly used for meat production, with selection of males that have the best breeding (meat quality) characteristics and by introducing bucks of improved meat breeds.
The Boer is a specialist meat breed that has a significant impact on the Australian goat meat industry. Developed in South Africa specifically for meat production, the Boer is crossed with other breeds to increase size, carcass weight and yield. It also produces some cashmere fibre. Weaning weights are high and they become sexually active at 3-4 months of age, at live weights of 33 kg (bucks) or 30 kg (does). Fertility is high at an average of 160 percent ranging up to 200 percent. Carcasses are lean from a large frame of live weight 105–125 kg (males) and 90–100 kg (females). Other specialist meat breeds include the Kalahari Red and the Kalahari Black.

**Marketing**

Australia exports live goats mostly by sea and air. Meat can be categorized as either ‘commodity’ or ‘specialty’ with commodity meat sold as a skin-off or skin-on, de-haired, carcass, sometimes butchered to specialty cuts. Specialty meats such as capretto (<5 months old, 6–12 kg milk-fed kids) and chevon (6–15 months old meat goats) are becoming more popular. Approximately 1 million kg of skins, valued at about AU$1.5 million, are exported annually, mainly from Victoria, New South Wales and Queensland in recent years. Skins are exported mainly raw or semi-processed for finishing overseas, and only about AU$300,000 worth of finished goat or kid leather is exported. Australia is the world’s largest exporter of goat meat (Figure 2) but total exports comprise only 0.1 percent of total world production, which indicates the extremely low levels of trade in goats and goat products relative to other livestock commodities. Export volumes are about 19,000 tonnes per year with a value of about AU$70 million. Exports are growing at about 10 percent per year to the US (52 percent of Australian exports), Taiwan, Province of China (32 percent), Caribbean (8 percent), Canada (6 percent), Korea, Rep. of (1 percent) and others (3 percent). Approximately 45,000 live goats, worth about AU$4 million, are exported annually to Malaysia (45 percent of live exports), Singapore (26 percent), Brunei (4 percent) and Indonesia (3 percent). Australia has an excellent national health status (it remains free of major OIE’s listed diseases of ruminants) and this gives Australia a unique competitive advantage in international markets.

**Conclusion**

The goat industry in Australia is small but growing. Growth is built on crossbreeding. In particular, goat meat production is growing, and exports continue to develop, based on meat of all qualities and live animals with the highest possible health status.
Figure 1: Distribution of feral goats in Australia.

Figure: 2 Main goat meat exporters, 2004 (x 1,000 tonnes p.a.).
Goat production in Lao PDR
S Keonouchanh and S Xaypha

Breed and reproductive performance
Goats in Lao PDR are small in size and are used only for meat. At present, there is no dairy milk production in the country. Average adult live weights are in the range of 25-35 kg. Litter size is normally two kids per litter after the first kidding. Lao native goats are morphologically and genetically similar to the north Vietnamese native goats. Their body size is similar to the Southeast Asian dwarf goats ("Kambing-Katjang"-typed goats). Their coat colors are polymorphic with wild-type agouti and black, and their external appearances are Bezoar-type with scimitar-shaped horns, pricked ears and straight-faced profiles. The amount of genetic variability of blood protein has been estimated, reinforcing the conclusion that the Lao native goats can be characterized as the “Kambing-Katjang”-type native goats of the Indo-China peninsula.

The breeding system of indigenous goats is natural mating with very limited human intervention. Inbreeding is usual. Information systems for breed utilization are yet to be developed and there is a need to formulate breeding systems and train staff and farmers in breeding techniques, nutrition and management.

The goat population in the country is relatively small but has increased markedly in recent years (Figure 1).

![Figure 1: Goat population of Lao PDR, 1960 – 2003.](image-url)
**Feeding and management**

All goats graze or browse freely in the dry season and are usually penned at night. Feed shortages occur in the dry season when the amount and quality of the feed declines. Feed shortage is one of the main constraints for goat production in extensive systems in natural grazing land. There is a need to introduce improved forage species that are well adapted to a wide range of local condition, appropriate techniques for processing animal feed, and feeds with high nutritive values, such as cassava hay, cassava root chip and Stylo 184 hay, which can supplement the goats’ diet in both wet and dry seasons.

Other limitations in goat production include diseases, especially parasite infection (Gray 2004) which is high under a free ranging system if large numbers of goats are grazed intensively.

Recently, goat production has become popular among poor smallholders because the animals are highly-productive, less susceptible to diseases than pigs and poultry, and cheaper than cattle and buffaloes. Goats do not need large land areas and they can be used as the first step out of poverty. They are relatively cheap for farmers to buy and they reproduce very quickly. Two or three people can share the cost of one animal. There is high demand for goat meat, especially during religious (Muslim and Hindu) events and holidays (Phimphachanhvongsod, 2001).

*Stall-fed herd.*
Policies, strategies and programmes related to goat genetic resources

Previous government policies related to animal genetic resources were focused on the use of indigenous resources for domestic consumption. With population growth and urbanization, livestock production such as ruminants has been developed to meet the demand for meat, both in rural and urban areas.


In 2003, NAFRI together with FAO/UNDP started to formulate the Agriculture Biodiversity National Programme to be submitted for financial support from different donors and international organizations.

In the past, the country lacked policies and strategies with regard to using and conserving animal genetic resources, such as crossbreeding and import of breeds.

Taking into account production systems, environment, animal genetic resources and national capacities, the first priority for the country is to understand and characterize the existing animal genetic resources by species, and generate reliable information for future long-term sustainable breeding programmes.

Demand for goat meat has increased significantly in the last decade, with a corresponding slow increase in the population of goats. Most of the goats are kept in the upland close to forestry areas. The great challenges are to make goats more environmental-friendly by changing free-range farming systems to rearing technology or stall-feeding systems, and to develop indigenous goat breeding and crossbreeding programmes.

The challenge and cooperation framework

Being the least developed country in the region, goat production and development will offer one of the most promising opportunities for smallholder farmers as well as for foreign investors for commercializing the high value products. Cooperation with other countries and international organizations concerned is absolutely inevitable.

The National Agriculture and Forestry Research Institute (NAFRI), in charge of research activities, has a strong will and need to cooperate with other countries and international organizations in the fields of:
Animal genetic resources — NAFRI has been granted support and collaborated with FAO, ILRI and the Government of Viet Nam.

Animal feed resources — Aus-AID-funded regional forages for smallholder project, executed by the Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO)/and the International Center for Tropical Agriculture (CIAT), commenced in 1995 and was implemented up to 2005. This project was focused on forage development with farmers’ participation in different farming systems, particularly in upland areas.

Livestock and Livelihood Systems Project (LLSP) emphasized increased forage for goat productivity in Luang Prabang and Savanakhet provinces.

Market-oriented production and new technologies for livestock raising are seen as the key for eradication of rural poverty. The livestock sector will continue to be an important food security tool in Lao PDR.

References
Options for genetic improvement of goats by smallholders

C Nimbkar

Introduction
There are only a few examples of genetic improvement programmes (successful or otherwise) of goats belonging to smallholders in low input production systems in developing countries (Kosgey et al., 2006). Yet, genetically-improved, efficient goats are extremely important for these very poor goat keepers. This is because goats fulfill many crucial functions in these households struggling to become economically self-sufficient. Smallholders can achieve some genetic progress in their herds, however small, by simple performance recording and judicious culling. Other agencies, which could include goat keepers’ own associations, will need to be involved to set up nucleus flocks for greater and faster improvement. Genetic improvement programmes will need to be financed at least initially (five to seven years) by governments or national or international funding agencies.

Genetic improvement strategies practised by smallholders
Goat-keeping households regularly take decisions regarding which bucks should be used for breeding or which does should be culled (ISGP, 1993). Sometimes, these decisions may cause deterioration of the genetic potential of their flocks, for example, the opportunity for short-term economic gain may cause faster-growing male kids to be sold for slaughter and their slower-growing herd-mates maintained for breeding. It is, therefore, important to make goat keepers aware of the need and ways to maintain the genetic superiority and thereby sustainability of their flocks.

Smallholders in India have been known to crossbreed their goats or sheep by introducing animals of other indigenous breeds from adjacent states/areas. Two sheep examples from India can be cited where “hair” breeds known for meat production were introduced in to flocks of “woolly” Deccani sheep by rearers: i) introduction of ‘Wijapuri’ or ‘Madgyal’ rams into Deccani flocks in Maharashtra over the last 10-15 years, and ii) introduction of the Nellore breed in to Deccani flocks in Andhra Pradesh (Indo-Swiss Natural Resource Management Programme – ISNRMP, 2005). Because of this initiative of the rearers, concerns have been expressed about the ‘dilution’ or ‘possible extinction’ of the Deccani breed and the need to conserve it. It is a debatable issue whether the rearers with whom a breed is linked inextricably, should or should not have the right to crossbreed their animals if they think it is beneficial.
Publicly financed initiatives by government and non-government organizations

Two successful Indian examples (one with sheep) can be given here:
1. The Indo-Swiss Goat Project in Rajasthan implemented successfully for the first time in India, and perhaps in the developing world, a programme for genetic improvement of Sirohi goats through distribution of improved breeding bucks selected from farmers’ herds based on performance recording (Indo-Swiss Goat Development and Fodder Production Project – ISGP, 1993). About 2,000 goats in 265 flocks spread over 18 villages in two districts were milk-recorded to identify does with high milk production. The recording revealed that the average 180-day lactation yield of Sirohi goats was about 240 kg contrary to earlier reports of less than 100 kg. This project, however, ended prematurely due to apathy of the Rajasthan State Government about its continuance.

2. The open nucleus-breeding programme established and ongoing at an NGO — Nimbkar Agricultural Research Institute in Maharashtra State — to develop a more productive and efficient strain of Deccani sheep using the FecB gene for prolificacy from the Garole breed of West Bengal State. This project is funded by the Australian Centre for International Agricultural Research (ACIAR). Improved rams and ewes have been introduced to local herds and about 25 of these herds are performance-recorded to assess the field impact of improved genetic material (Nimbkar et al., 2006).

Private profit-oriented initiatives
An interesting development in India in recent years has been the setting up of large farms of indigenous goat breeds by private entrepreneurs with either their own or borrowed finance. This has been brought about by the growing demand and prices for goat meat, increasing awareness and concern about conserving indigenous breeds, and that agricultural income (including income from goat rearing enterprises) is not taxed directly. With proper guidance, these farms could turn into nucleus herds (studs) for genetic improvement, bringing profits for the entrepreneurs and improved germplasm for goat keepers. The profit motive should ensure sustainability. However, the prices of improved goats could be very high in such a system, putting them out of the reach of poor goat keepers. Such farms could be prevailed upon to provide at a nominal cost artificial insemination of goats belonging to surrounding farmers, using semen from improved bucks or make bucks available for short-term placement for breeding in villages.
Goat keepers’ own organizations

It would be best if genetic improvement were handled by an organization of goat keepers such as a breeders’ association or a commercially oriented producers’ company. Producers’ companies are being promoted in India as an alternative to cooperatives, which have fallen in to disrepute due to inefficiencies caused largely by political interference and corruption. These problems can be avoided in producers’ companies, as share-holders who cease to keep goats can no longer remain members.

Any nucleus should start with a sample of animals (of a particular breed or type) drawn from as wide an area as possible, helping to ensure that genetically superior animals are included and diversity is conserved, while postponing inbreeding. Breeding animals of proven genetic merit from a nucleus can be promoted by smallholders as follows:

i) households rearing breeding bucks and recovering rearing expenses by way of breeding fees and, ii) through formal or informal networks such as ‘sire exchanges’ or ‘rotations’. Improvement of the genetics and management of smallholders’ animals should be considered as synergistic and complementary rather than alternative options.

Conclusion

On the national level, investments in breeding interventions are considered to be highly profitable. It is, therefore, the responsibility of governments to provide funding and conducive infrastructure to appropriate organizations for genetic improvement of smallholders’ animals. The funding has to be provided for at least the first five to seven years. The ISGP model of field performance recording and selection should be followed with a more comprehensive breeding objective in accordance with goat keepers’ preferences.

References


Goat farming in Malaysia
G Sivasupramaniam

Overview
The majority of ruminant farmers in Malaysia can be classified as traditional or subsistence farmers, using low input methods that are common throughout the region. Seventy-five percent of goat production in the country is from this type of farm, with 20 percent from commercial farms and five percent from goat production that is integrated with tree crops. Current stocks of goats are made up from Katjang (native), Boer, Jamnapari, Anglo Nubian and Feral (Australian) breeds and their crosses.

The current goat population is about 250,000 heads, having risen from 190,000 in 1999 (Figure 1). There are about 120,000 breeding males and females. Per capita consumption of goat meat is low, at 600 gm per annum of which 8 percent is supplied by local production.

![Figure 1: The goat population of Malaysia.](image)

Growth in the goat sector over last five years has been accompanied by an increase in per capita consumption. This demand is increasing faster than supply and, therefore, demand for imported frozen meat and live animals is accelerating. The retail goat meat price is higher (RM25-30 per kg) than for chicken and beef and there is seasonal demand for live animals from the Malay and the Hindu communities for religious and ritual slaughter.

It is clear from these figures that if the national industry is to meet the national demand, there must be a transformation from traditional to more intensive production systems. The national industry needs to be competitive in the face of global competition.
Further challenges come from the need to meet new standards of food safety and quality, and maintaining the Sanitary and Phytosanitary (SPS) status.

Goats are most populous in the states of Kelantan (44,000 heads), Kedah, (35,000), Perak, (31,000), Pahang (23,000) and Johor (22,000).

**Government policy**
The Government aims to encourage the development of commercial and profitable goat farming enterprises. The challenges are considerable and lie in the difficulty of obtaining sufficient numbers of breeding animals of the appropriate breeds, and a lack of staff skilled in training and extension services and in production units. The Government’s target is to increase local supply of goats from 8 percent of the current national consumption to 20 percent by 2010, increasing the local breeder population to over 400,000 heads.

**Mutton industry**
The mutton industry includes sheep and goat meat; both are high-priced products with a large differential between locally produced fresh meat (RM25-30 per kg) and frozen imported meat (RM13-16 per kg).

**Importation of breeder goats and structured breeding**
Between 2006 and 2010, the Government plans to import 5,000 animals per year to improve the supply of breeding animals, while the private sector expects to import 10,000 animals during the same period. A structured breeding programme is proposed: a ‘Three Strata’ system whereby improved genetics flow from government and private nucleus farms through multiplier farms to the commercial sector. Targets for this breeding programme are to: increase the annual kidding rate to 150 percent; for kids born as twins to reach 32 kg live weight at 7 months of age; and for daily growth rates for all kids from kidding to weaning at about 3 months of age to range from 150 to 220 gm.

**Feeding opportunities**
To match the increase in genetic value of the goat sector, there will need to be a corresponding capacity to provide a sufficient quantity of high quality feeds. Four sources of improvement are planned through: i) improved grass fodder crops, ii) the preparation of concentrated feed for goats, iii) the development of silage from palm fronds and other fodders and, iv) other agricultural by-products such as palm kernel cake.
The goat sector in Pakistan
Q Ali

Overview
The population of goats in Pakistan is 62 million heads, increasing at a rate of 4.5 percent per annum. Goats contribute 0.7 million tonnes of meat, 0.6 million tonnes of milk, 40 million skins and 0.07 million tonnes of hair to national livestock production per annum. Most goats are raised on marginal lands and the production is well-suited to landless, marginal and small farmers, providing income and employment to a predominantly poor population. Market demand is constant and therefore goats are a ready supply of cash. Goats are a source of foreign exchange and contribute 2.5 percent of national milk production.

Goat population and production systems
The provinces with the largest goat population are Punjab (37 percent), Sindh (24 percent), Balochistan (23 percent) and the North West Frontier Province (16 percent). Distribution is highly dependent on altitude. The 25 breeds present in the country are a mix of meat (Khaghani, Khurasani and Taddy) and dairy (Dera Di Panah, Beetal and Kamori) breeds. There are four production systems (Table 1).

Table 1: Distribution of goats and description of herd among the major systems of Pakistan.

<table>
<thead>
<tr>
<th>System</th>
<th>Percent</th>
<th>Herd size</th>
<th>Goats : sheep ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nomadic</td>
<td>6</td>
<td>60-300</td>
<td>60 : 40</td>
</tr>
<tr>
<td>Transhumant</td>
<td>32</td>
<td>50-150</td>
<td>40 : 60</td>
</tr>
<tr>
<td>Sedentary</td>
<td>62</td>
<td>15-30</td>
<td>(depends on altitude and customs)</td>
</tr>
<tr>
<td>Household</td>
<td></td>
<td>1-5</td>
<td></td>
</tr>
</tbody>
</table>

Government roles in livestock development
The Federal Government has responsibilities for policy formulation; providing impetus for implementation and provincial coordination; assisting in quality control of veterinary drugs and vaccines; controlling emerging diseases; overseeing research and development in critical
areas; providing animal quarantine facilities; regulating import and export of animals and animal products, and overseeing international coordination and commitments.

Provincial governments are responsible for livestock development, veterinary vaccine production, disease surveillance and reporting, livestock research, livestock production and health education, and milk and meat quality.

District governments are responsible for veterinary health service (preventive and curative), breeding services (artificial insemination), animal slaughtering and livestock markets.

**Constraints on improved production**

There are substantial barriers to the further development of the goat sector in Pakistan. These include the widespread breeding of genetically inferior animals, inadequacy and poor quality of feed and fodder, subsistence production system and small holdings, limited animal health coverage, infectious diseases of economic importance, low investment by the Government, outdated and limited marketing facilities, and inadequate economic incentives to small producers.

**Livestock development policy**

The Government has a vision to “promote livestock to provide safe and quality products at competitive prices, covering entire value chain with focus on market and poverty reduction” — by means of a policy of private sector-led development with the public sector providing an enabling environment.

The development strategy will be led by the private sector and will focus on increased productivity by moving from subsistence to market-oriented commercial farming, covering the whole value chain from production to consumption.

**Livestock initiatives**

The Government has taken some significant initiatives to strengthen the livestock sector. Notably it has:

- allowed duty free import of dairy and livestock machinery/equipment, not manufactured locally;
- customized a “multi-agency approach” for credit access to smallholder;
- established the National Veterinary Laboratory (NVL) in order to meet the EU and WTO’s conditions, to assure quality production and export of livestock and livestock products; and
• implemented a project supporting emergency prevention and control of main trans-boundary animal diseases in Pakistan (e.g. foot and mouth, rinderpest and peste des petits ruminants).

Projects under implementation
1. Strengthening of livestock services project.
2. PM's special initiative on livestock.
3. Construction of animal quarantine facilities.
4. Livestock and dairy development board.
5. Pakistan dairy development company.
7. Milk collection, processing and dairy production and development programme.

Upcoming initiatives for profitable farming
• Improvement of the existing markets with minimum facilities like weighbridges, sheds, water supply, electricity and provision of waste disposal.
• Replacement of stocks in earthquake and drought-hit areas.
• Establishment of model livestock markets and slaughterhouses, especially in goat farming areas, and privatization of public sector slaughterhouses in phased manner.
• Rationalization of municipalities’ taxes on livestock markets and slaughterhouses.
• Establishment of network of cold chain facilities for milk and meat for collection, transportation, processing and storage.
• Establishment of data management system for record-keeping in markets and slaughterhouses for forward and backward tractability.
• Establishment of vertical linkages of small-scale producers with processors and marketers through farmer associations/organizations/exporters.
• Awareness programmes and media campaign (electronic/hard copies) for producers and consumers to improve husbandry practices through better feed, breed and animal health.
• Encouragement of Livestock Development Departments in collecting data on production to improve and regulate marketing channels for live animals and their products.
• Establishment of price structure for producers of animals/goats on the basis of live weight, quality and grading.
• Development of rangeland through community mobilization.
• Enhancement of preventive and curative animal health coverage.
Bangladesh: where goat is a treasure
S Mahmud

Introduction
Goat is probably the earliest domesticated ruminant and it is found across all agro-ecological zones from the arctic to the equator. Long neglected by the policy-makers, the developing world is sensing their increasing importance. Bangladesh is one of the pioneering countries caring for this relatively neglected animal. The Government and the society have changed their outlook towards the 34 million goats in the country and have launched programmes to support goat rearing.

The predominant goat breed of Bangladesh is the Black Bengal breed but others such as Jamna Pari and their crosses and a few Beetals are seen in the country. The goats of Bangladesh are probably descendants of the goats of South China, Hunan and Western Taiwan (Province of China) and may have traversed with nomads or businessmen to this country, crossing the plateau of Tibet.

The advantage of goat keeping
For small farmers and the rural poor, goats represent a small initial investment and a corresponding small risk. They can be conveniently taken care by women and children; and because of their inquisitive feed habit, they can survive under harsh climatic condition. Their high fertility and short generation interval increases their attraction as a source of regular income.

Bangladesh is proud of its Black Bengal goat, which is generally black in colour, small in body size, with adult bucks weighing 25-40 kg and does 20-40 kg. The wither height of adults is 50-60 cm and the body length is 80-90 cm. The ears are small (12-13 cm), pointed, and the horns of the does are narrow, while those of bucks are comparatively wide. Bucks and does are both bearded.

First kidding is observed between 12 and 15 months of age; and in later gestations, double and triplet kidding are common. The average litter size across all gestations is 1.95 ± 0.05. The meat of this breed is tender and delicious with a dressing percentage of 45-47 percent. The goat skin is about 6-7 percent of total weight and size varies from 1.5 to 7.0 square feet. Milk production is 200-300 gm per day and, in some rare cases, milk yield may reach 1-1.5 litres. The lactation period is generally 2-3 months.
Goat production systems

Goats are mainly reared by farmers with small land holdings. About half of the goats in Bangladesh are reared on less than 1.5 acres of land. Farmers with more than 7.5 acres of land keep about 12 percent of goats, with the remainder kept on landholdings of between 1.5 and 7.5 acres.

Goats are kept in open places in day time; and in most cases, they are kept in the same dwelling with their owner at night. A study conducted in mid 1990s has shown that only 15 percent of farmers could afford separate housing for their goats. Providing a separate space in the owner’s own accommodation is a good alternative for better management. The Department of Livestock Services (DLS) promotes such housing system.

Grazing on fallow land, crop field dividers, riverbanks, canals, embankment and roadside, and browsing on bushes, shrubs and short trees provides the main source of feed for goats in Bangladesh. The Government is urging farmers to provide their goats some additional concentrated feeding.

The major diseases of goats are PPR, goat pox, contagious ecthyma, skin diseases, non-specific diarrhea, pneumonia, tetanus and deficiency disorders. PPR was first seen in the country in early 1990s and has caused huge losses to farmers. PPR has been brought under control with the extensive use of locally produced vaccines. Health care is provided mainly by DLS up to sub-district level.

Breeding of goats is dependent on natural service, which is seriously constrained by the declining number of bucks. However, with Government initiatives, the situation is improving.

Initiatives to support goat production

The Government has identified goat rearing as a potential poverty-reduction tool. The Honourable Prime Minister, Begum Khaleda Zia formally inaugurated a National Programme for Poverty Reduction through Goat Rearing on 27th April, 2002.

An action plan was developed for the period of 2002-2007 to facilitate:

1. Development of a goat database
2. Identification of goat production zones
3. Goat production through contract growing farms
4. Establishment of small and intensive farms at sub-district level
5. Supply of inputs
6. Supply of does and bucks
7. Forage and concentrate production
8. Development of technology
9. Training
10. Publications
11. Loan distribution
12. Adaptive research and demonstration
13. Marketing and entrepreneur development
14. Distribution of credit

Credit packages

The distribution of credit initiative: A range of credit packages have been made available to small farmers including: i) small holdings rearing 2-4 goats, ii) farm holdings rearing 2 bucks, iii) small farm holdings rearing 5 goats, iv) small farm holdings rearing 6-9 goats and v) small farm holdings rearing 10 and more than 10 goats. The status of loan distribution across over 440 sub-districts is shown in Table 1.

Table 1: Status of loan distribution for goat packages.

<table>
<thead>
<tr>
<th>Financial year</th>
<th>No. of upazila (sub-districts)</th>
<th>Allocation (in million)</th>
<th>Distribution (in million)</th>
<th>No. of beneficiaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003 - 04</td>
<td>400</td>
<td>150</td>
<td>150</td>
<td>26,400</td>
</tr>
<tr>
<td>2004 - 05</td>
<td>440</td>
<td>75</td>
<td>74.8</td>
<td>12,980</td>
</tr>
<tr>
<td>2005 - 06</td>
<td>440</td>
<td>37.5</td>
<td>37.5</td>
<td>6,620</td>
</tr>
</tbody>
</table>

Goat research

Finally, a goat research division has been established at the Bangladesh Livestock Research Institute. The Government also has a plan to develop a separate research institute. The Bangladesh Agricultural University has an artificial insemination research unit.
Programme

30\textsuperscript{th} APHCA session and APHCA-ILRI regional workshop on goat

(22 - 26 October 2006, Luang Prabang, Lao PDR)

\textbf{Sunday, 22 October 2006}

Arrival of guests

17 00 – 18 00  66\textsuperscript{th} APHCA executive committee meeting (APHCA executive members: India, Indonesia, Myanmar, Pakistan, Sri Lanka and Thailand)

\textbf{Monday, 23 October 2006}

\textbf{Morning}

08 30 – 09 00  Registration

09 00 – 09 30  Opening ceremony (speeches by APHCA chairperson, representatives from FAO and Government of Lao PDR)

09 30 – 10 00  Tea/coffee break

10 00 – 10 15  Election of chairperson and executive members

10 15 – 12 45  30\textsuperscript{th} APHCA session (as per the session agenda)

12 45 – 14 00  Lunch

14 00 – 16 00  30\textsuperscript{th} APHCA session (cont.)

16 30 – 17 00  Move to Grand Luang Prabang Hotel (for 30\textsuperscript{th} APHCA Anniversary function/welcoming dinner)

17 00 – 18 00  Speeches on the occasion of the 30\textsuperscript{th} anniversary of
APHCA (by APHCA chairperson, APHCA secretary) and special presentation on “Outlook on livestock development in year 2030 and beyond” (by H. Steinfeld, AGAL)

18 00 – 20 00 Welcoming dinner (hosted by the Government of Lao PDR)

Tuesday, 24 October 2006

09 00 – 10 30 APHCA-ILRI Regional workshop on goats (chaired by H. Wagner)
   i) General introduction to the workshop;
   ii) Goats as an enterprise option for smallholders in tropical Asia by G.D. Gray, ILRI;
   iii) Role of goats in sustainable livelihood of rural people in Asia by S.K. Singh, ICAR, India

10 30 – 11 00 Tea/coffee break

11 00 – 12 30 Goat development for milk and meat (chaired by S.K. Bandyopadhyay)
   i) Dairy goat industry in Thailand by Suravut Bulakul, Sirichai Dairy Goat Co. Ltd., Thailand;
   ii) Smallholder dual-purpose goat enterprises, milk processing and marketing in Viet Nam by D.V. Binh, NIAH, Viet Nam; and
   iii) Approaches in goat development & marketing in Lao PDR by P. Phengsavanh, CIAT, Lao PDR

12 30 – 14 00 Lunch

14 00 – 17 00 Goat genetic resources and genetic improvement (chaired by G.D. Gray)
   i) Goat genetic resources in Asia by S.K. Singh, ICAR, India;
   ii) Options for goat genetic improvement by smallholders by Chandra Nimbkar, NARI, India; and
   iii) Genetic resources and goat performance improvement initiatives in the Philippines by Edwin Villar, PCARRD, Philippines
Country initiatives:
i) Genetic improvement in DPRK by H.G. Wagner;
ii) Goats in Pakistan - an overview by Q. Ali;
iii) Goat enterprise development in Viet Nam by N.T. Mui; and
iv) Meat goat production in Australia by M. Nunn

19 00 – 21 00 Dinner *(courtesy of ILRI)*

**Wednesday, 25 October 2006**

09 00 – 10 00 Review of day 1 – country priorities for action(s)

10 15 – 12 30 APHCA-OIE Regional workshop on goats *(chaired by C. Leowijuk)*

i) *Brucella melitensis* in goats – diagnosis, vaccination and other trade-related technical protocols by B. Garin-Bastuji, c/o OIE;

ii) Special presentation on “OIE pathway for BSE-free status declaration” by Y. Oketani, OIE-Tokyo Office; and

iii) General discussion on disease issues in goats

12 30 – 13 30 Lunch

13 30 – 17 00 Field trip to goat farm *(courtesy of OIE)*

**Thursday, 26 October 2006**

09 00 – 11 30 Adoption of minutes/session report and closing of the session

11 30 – 12 30 Lunch

Departure of participants and guests
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