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R.M. Acharya
Puneet Kumar

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B.V.Sc. & A.H. (Pb), M.S. (Ohio), Ph.D. (Iowa),
Former Deputy Director General (A.S.), ICAR,
784, Sector – 9, Faridabad, 121 006, Haryana, India.

Puneet Kumar

Ph.D.
Principal Scientist, Animal Physiology
Indian Veterinary Research Institute (IVRI),
Izzatnagar-243 122, Bareilly (UP), India.

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Ph: +91-11-49344934; Fax: +91-11-49344935; Website: www.cbspd.com; www.eduport-global.com;
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Preface

Of the two small ruminant species, goat has been for long probably the least understood, rather the most misunderstood species of livestock in terms of its misconceived role in removal of natural vegetation, and thus, being responsible for desertification. Goat is not a destroyer of vegetation but a creator of vegetation relative to other species of domesticated ruminants, as it consumes mostly the pods of Acacia and other similar trees and leaves of xerophytic trees and shrubs. The seeds in the pods will not germinate because of the hard coat which gets softened through passage in the alimentary tract of goat and further gets pelleted in the faecal matter and wherever such pelleted seeds fall, especially during rains, develop into healthy saplings. Where the goat sits / folds for the night, thousands of seedlings are seen in the morning. If during rainy season, goats are widely browsed or their droppings are widely spread, a large number of trees would arise. The goat is therefore, not a desertifier but a forestation machine.

Goats relative to sheep (i) do not get easily predated while on pasture. It is the last animal to leave the rangeland after all other species of livestock having utilized the vegetation available have left leaving goat as it can utilize the most unusable feed resources especially thorny shrubs and tree leaves which the other species of livestock will despise. Goat gets the blame for the wrongs of other species of ruminants. Thus, goat is not a bane but a boon for natural vegetation.

Goats have large genetic variability as reflected by a number of breeds and strains varying in size, physical conformation, prolificacy and other economic characters related to meat, milk and fibre production. There is a need for better understanding of these genetic resources and how properly they can be conserved and managed so that they can fulfill the current and future demands for meat and other products for human use within the country and for export. India has made a significant contribution towards enriching world's goat germ plasm through export of breeds like Jamunapari for crossing with breeds in other Asian countries for improving goat milk and meat production.

Goat provides the following products and services. Products are (i) meat (raw, cooked, blood and soup), (ii) milk (fresh, sour, yoghurt/ curd, butter, cheese), (iii) skins (clothes, shoe inners and uppers, sacks), (iv) hair (pashmina/cashmere, mohair, coarse hair), (v) horns, (vi) bones, (vii) manure especially for reseeding as goats eat pods of xerophytic trees and the seeds with hard coat do get fully digested and are palleted in goat faecal matter and wherever such palleted seeds are dispersed they lead to seedlings, goat therefore is not a desertifier as often blamed to be but a forest creator through a wide dispersal of pelleted seeds. It provides services (i) as a pack animal in high altitudes, carrying small loads, (ii) the meat can be used for soup and a wide range of products and being lean is preferred in most Asian countries, (iii) the milk having small sized fat

globules makes soft curd which is easily digestible, (iv) the milk can be used by people with lactose intolerance, and (v) is also aphrodisiac, (vi) goat is used for clearance of bush and opening of forest grazing land for other livestock species because of no flocking instinct, (vii) provides cash income through sale of kids for slaughter or for raising them by other people, (viii) provides economic and social security, (ix) can be easily gifted because of higher prolificacy, (x) is used for religious purposes such as offering to Goddess Kali by Hindus and slaughtered on Id as offering to God by Muslims, (xi) Being a playful animal can provide pleasure and (xii) can utilize all the household kitchen waste.

The population of goat has increased from 47.14 m to 124.0 m from 1951 to 2008. During the same period, meat production has increased from 174.4 m kg to 475 m kg relative to an increase from 125 to 239 in case of mutton. The meat production per animal from Indian goats is relatively low (9 kg) per animal because of lower body weight at the time of slaughter and poor dressing percentage. The low return from marketing of goats for meat as live animal/dressed carcasses/edible meat are primarily due to low dressed weight which results from the poor condition of the animal either slaughtered at too early an age or after it has been culled after a number of kiddings. There is a large demand for goat meat within the country and abroad especially in the Gulf countries and South East Asia with large repatriate Indian population.

The contribution of goat to milk production is small (<3% of the milk produced in the country). There has been an increase in goat milk production primarily due to increase in their numbers rather than due to increase in productivity as there has been selection for milk in Indian breeds of goats. The little effort made in the institutional flocks on a few important breeds of goats, though did show genetic improvement but did not lead to distribution of any significant number of breeding bucks to improve farmers goat flocks for milk products. Most of the milk in addition to that suckled by the kids is either consumed by the goat farming family or is used as an adulterant in the cow milk. In spite of tremendous nutritional and health value of goat milk and dairy products arising from it, little attention has been paid in developing, processing of dairy products from goat milk and their marketing. The goat flock size is relatively small and total milk production is not large enough to attract marketing. Goats are essentially static and undergo either no or limited migration, except the flocks which are constituents of sheep flocks.

Goats also produce fine fibre, pashmina, an undercoat of high altitude hill goats, Changthangi and Chegu, found in Leh, Ladakh (Jammu and Kashmir) and in Himachal Pradesh respectively. The pashmina production is low as there has been little attention given for improving the management of these animals and little selection for pashmina production. The quality of pashmina is superior than produced elsewhere having relatively lower average fibre diameter. Pashmina is used for making high quality, extremely warm and light shawls mostly handspun and woven and fetch very high

prices. Exotic breeds of pashmina especially in Tibet and China produce larger quantity of pashmina, though it is relatively coarse. The crossing of low pashmina producing goats with mohair goat Angora leads to increase in production of a slightly coarser fleece but of uniform quality at ¾. The cashgora, fibre produced from Angora crossed with pashmina goats, though coarser than pashmina is still very fine and the production per animal is around 1 kg. It can be used for making fine wool garments and knitwear which have better strength and lustre than pashmina garments but similar warmth and acceptability.

Better understanding through research investigations, both of its biological and economic contribution as a meat animal requires greater and immediate attention. Indian goats, as mentioned earlier, are highly prolific, have better kid survival and growth due to superior mothering ability, and thus, have larger off take, producing more meat per head of the two small ruminant species.

The book also covers the **economic, social and environmental aspects of goat production** and clarifies the issues which repeatedly have been raised with respect to the negative aspects of goats especially as a destroyer of natural vegetation.

International Goat Association (IGA) is promoting the cause of goat internationally and takes up important issues related to goat production, health and products technology in the international conferences held every five years. It has been repeatedly asserting that the misunderstanding of the role of goat towards deforestation should be removed and the important economic livestock species should be given due attention for R&D so that it can play its economic role fully for human welfare. The IGA also brings out a journal which gives the current knowledge about various problems of small ruminants and their solutions. The Indian Society for Sheep and Goat Production and Utilization had organized the 5th International Congress on Goats in India in 1992 and brought out around 5,000 pages of published material on various aspects of goat production, health and processing technologies as pre- and post-conference proceedings which had the contribution of the worlds' best known scientists working on various aspects of goats and were widely circulated and abstracted in major international abstracting journals.

The FAO also brings out a publication on Animal Genetic Resources which *inter alia* contains papers on breeds of goats and the need for their conservation and improvement. The FAO has also brought out publications on goat breeds of a number of countries including India which shows that while there is a large genetic variability among breeds of goats, the fuller appreciation and utilization of this variability is seriously lacking.

The Indian Society for Sheep and Goat Production and Utilization (ISSGPU) is promoting the cause of goat in India through regular annual conferences on thematic issues and is bringing out the proceedings for wider circulation in the world. It also brings out a quarterly journal on Small Ruminant Production.

Considering the economic, social and cultural (religious) importance of goats more as a meat animal and Indian goats having no seasonality of breeding, high prolificacy,

good mothering ability leading to good kid survival and growth should be considered as an important meat animal. R&D efforts should therefore be intensified particularly on meat production in goats both for internal consumption, as there is a large demand because of no religious or sectarian taboo on consumption of goat meat, and there being a large demand for export of goat meat to Gulf and other countries where there is a large ex-patriate Indian population.

The government should reconsider its R&D policies and programmes on goat production and encourage farmers to develop goat for meat production preferably under semi-intensive management system through proper extension and input services, inputs for improvement of goat meat production and organize proper marketing both for internal consumption and export. Goat should no more be ignored in our development planning rather it should be given higher attention as it will help in foreign exchange earnings, improving economic status of small and marginal farmers and landless labourers and other weaker sections of the society and provide a healthier and relatively cheaper meat with no serious additional feed inputs as is required in case of poultry and pigs. It will further provide some milk and skins, and promote the economic well being of a large deprived class of people and the industry based on goat products.

The book attempts to bring the latest knowledge with respect to goat production, health and products technology in India and all other related issues with respect to economics and marketing. It is hoped that book will provide all the knowledge that is required for by students taking undergraduate and post-graduate courses in goat production in Veterinary colleges, as well as, will provide necessary guidance for Research and Development of personnel involved in goat production and trade as well as the goat products' industry.

The book has 19 chapters covering all the aspects of goat production, health, processing technologies, economic, social and environmental aspects and clarifies a large number of issues usually raised against the goat.

Goat is an important livestock species in India both numerically and in economic contribution through food, fibre, skins and manure. India has the largest genetic rather production variants of goats. Efforts have been made in the publication to describe genetic resources and their utilization in different production functions, the prospects and limitations in their improvement on the basis of the existing technologies, future research and development programmes for sustainable use and conservation of genetic resources and their utilization for meeting food, fibre and skin needs and other inputs and services goats provide, their positive and negative effect on ecology and environment and how the goat productivity for meat, milk, fibre and skins can be improved within the limits of inputs and services available and without any negative impact on ecology. The recommendations made will assist in research, education and manpower training, extention and how these can be implemented in a collegial manner involving all government and non-government agencies and goat keepers.

Acknowledgements

The book is dedicated to the Supereme Lord, best known as *OM (AUM)*, the first sound *(nad)* which was heard when the universe was created by HIM. The blessings of Brahma, the creator, maintainer and recreator, to whom all material and non–material elements belong, I bow for the endurance bestowed on me *inter alia* for completion of this book which is based on 40 years of my experience of working on all aspects of goat production and contributed significantly to the goat production science, its application for goat improvement in the world, more particularly in India, as the founder president of the Indian Society of Sheep and Goat Production and Utilization (and now its patron and fellow) and President of International Goat Association, had organized the V International Congress on Goats in New Delhi in 1991. Has also been associated with the FAO Expert Group on Small Ruminant Production and was Chairman of the IDRC Group on Small Ruminant Network for Asia (SRUPNA). Had also prepared FAO technical bulletin on Sheep and Goat Breeds in India. Through these efforts have made some contribution to the promotion of research and development of goats in the world which is included in the publication.

The authors wish to acknowledge the technical support provided by the Central Institute for Research on Goats, its Director and a number of principal and senior scientists who provided their latest publications and the publications brought out by the institute which have formed a basis for this book. The authors themselves have a large research and teaching experience in various aspects of goat production and have published a large number of research papers in national and international journals. It is hoped that the book will serve not only the academic community but also the goat development personnel both in the public and private sector, and entrepreneur involved in goat production.

Contents

Chapter 1
Introduction

1.1 Small ruminants viz. sheep and goat, have a large economic and social importance in India. India has the world's largest and varied (size, production type and level of products) goat population which is growing at a rate faster than any other livestock species inspite more than 60 per cent of it being slaughtered every year. The official figures indicate 45 per cent of the goat population is slaughtered every year, however a large number of animals are slaughtered everyday by the small meat shops to meet the requirement over and above that produced from animals slaughtered in municipal or private authorized abattoirs. Most of the meat produced in private abattoirs is essentially exported. These private companies do have their own systems of raising animals for slaughter or getting them raised under contract by providing assured prices per kg live weight if the animal reaches the stipulated weight as well as provide them with prophylactic health cover. Further a large number of goats and sheep are slaughtered on festive occasions by Muslims such as on Id and by Hindus for offering to Goddess Kali.

1.2 **National Commission on Agriculture** (NCA), appointed by the Government of India in 1970, in its report submitted in 1976 **had recommended that considering the role of goat in removal of natural vegetation and causing desertification, the number should not be allowed to go beyond 40 m.** The goat population currently is 124.0 m. It has grown very fast from 1951 to 2008 (**from 47 m to 124 m, almost 300 percent with an annual increase of 6 per cent**). The population growth has however reduced during the last quinquinnia, this could possibly be due to a large export of live goats or goat meat and slaughter of a large percentage of younger animals, thus, reducing the breedable female population.

1.3 **Goat, because of high reproduction efficiency in terms of larger number of kiddings per unit time and twins and triplets born in each kidding, is growing in population faster than any other species of livestock other than pigs where the off take is even larger than in goats.** However, pig production on commercial line is still small in size. **The kid survival is better because of superior mothering ability of the does. Further, there is a preference for goat meat in the country as it is lean. The goat skins have better economic returns as they are used for shoe inners being very thin and strong. Goat skins are also used as sofa covers and for gloves. Goat manure is a valuable fertilizer and goats are preferred to be folded on harvested cultivated lands** in lieu of stubble grazing and in the form of cash or kind to allow the manuring of land through their urine and droppings. Although the goat milk production

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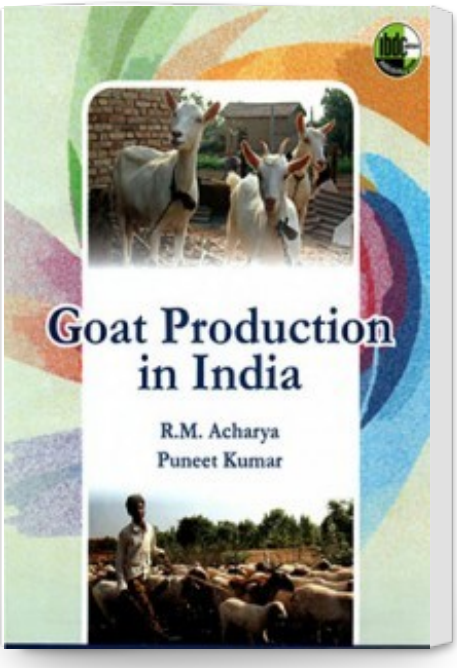

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