

## Sheep Value-Added Products: Enhancing Income and Sustainability in Small Ruminant Farming

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### Introduction

In India, Sheep rearing is one of the livestock farming practiced by humans, play a major role in agricultural systems. Sheep rearing contributes substantially to rural livelihoods by providing food, income, and employment opportunities to small, marginal farmers, landless labourers, and pastoral communities. Sheep are highly adaptable animals in regions with limited agricultural resources and thrive in diverse environmental conditions, including arid, semi-arid, and mountainous regions and ability to efficiently utilize sparse vegetation and marginal grazing lands. According to the 20th Livestock Census of India, the sheep population increased to 74.26 million (2019) from 65.07 million (2012), registering an overall increase of about 14.13%. As per census data, Crossbred sheep population increased significantly which indicted the enhanced breeding policy and productivity, at the same time moderate increase in Indigenous sheep populations indicated the continued importance of native breeds that are well adapted to local climatic conditions and grazing systems. The top five sheep populations (in millions) states are follows: Telangana (~19.1) Andhra Pradesh (~17.6), Karnataka (~11.7), Rajasthan (~10.6), Tamilnadu (~4.5). Sheep, multi-purpose livestock species, provides economic importance of valuable product such as meat, wool, milk, skin, and manure, which can be sold in local and international markets. Value addition of sheep products helps to promotes rural entrepreneurship, increase farmers' income and extending the shelf life of perishable products such as meat and milk.

### Value addition in Meat

Sheep meat is considered an excellent source of high-quality protein, essential amino acids, iron, zinc, phosphorus, and B-complex vitamins that support immune function, blood formation, and overall metabolism. The demand for mutton or lamb consumption i.e. red meats continues and meat-based products such as sausages, nuggets, pickles, dried meat, and ready-to-cook preparations are rising in the domestic markets and many parts of the world. Value addition involves converting raw meat into value added products through grinding, curing, fermentation, drying, smoking, cooking, and freezing. Mutton sausages are prepared by mincing lean mutton with fat, salt, spices, herbs,

and other seasoning ingredients are stuffed into natural or synthetic casings and subjected to further processing such as smoking, cooking, fermentation, or drying depending on the type of sausage being produced. This is consumed as breakfast foods, snacks, or ingredients in various dishes. Mutton pickle is manufactured by cooking small pieces of mutton with a mixture of spices, edible oil, vinegar, and salt. The cooked meat is then stored in oil along with spices, which helps to preserve the product and improve its taste. Mutton nuggets, Cutlets, and Patties are the examples of ready-to-cook products are prepared by mixing minced sheep meat with ingredients such as breadcrumbs, spices, eggs, starch, and binding agents to improve texture and flavor. The prepared mixture is shaped into desired forms, coated with batter or breadcrumbs, and partially cooked before freezing. Customers can manufacture these products by shallow frying, baking, or deep frying within a short time. For dried and smoked mutton preparation purpose fresh meat pieces are salted and dried under controlled environmental conditions or exposed to smoke produced by burning wood or plant materials.

### Value Addition in Sheep Milk

Sheep milk contains significantly higher levels of fat, protein, essential amino acids, B-complex vitamins and minerals rich in calcium, phosphorus, zinc. Sheep milk yields more cheese per unit of milk compared to milk from other livestock species. Several internationally renowned cheeses are traditionally made from sheep milk, including Roquefort (a famous blue cheese from France), Pecorino (a hard Italian cheese widely used in cooking and pasta dishes), Manchego (a well-known Spanish cheese with a firm texture and nutty flavour) and Feta (a soft, brined cheese commonly used in salads and Mediterranean cuisine). Sheep milk yogurt like Flavoured, Fruit, Probiotic and Frozen yoghurt is naturally thicker, creamier, and richer in flavour than conventional yogurt prepared from cow milk. Yoghurt with beneficial probiotic microorganisms' area available in the market that promote gut health in the consumers. Sheep milk contains high fat, protein and other solid content helpful to obtain smooth texture and flavour in different types of ice cream with addition of fruits, nuts, honey and chocolate.

**Value addition in Skin and Wool:** Sheep wool extensively used in the textile industry for manufacturing garments, blankets, yarn, fabric, garments, rugs, floor covering, carpets,

handicrafts and other woollen goods. Sheep wool is environmentally friendly, making it an important in modern textile production. Initially, the wool is cleaned to remove dirt and impurities. Wool yarn serves as the basic raw material for manufacturing numerous textile products, including Sweaters, shawls, blankets, scarves, socks, winter garments are widely used in cold regions. Handmade wool garments and traditional woven textiles are sold in domestic and international markets. Felt is produced by compressing and matting wool fibers together using heat, moisture, and pressure. This process creates a dense and durable material that can be easily molded into various shapes. This is used to manufacture a variety of products, including hats, bags, decorative handicrafts, cushion covers, insulation materials, craft items and souvenirs.

As an alternative of discarding certain parts of the animal as waste, might be converted into lanolin, organic manure, bone meal, cosmetics, fertilizers, handicrafts, and other industrial materials. Sheep skin is a valuable raw material for the leather industry, while sheep manure serves as an excellent organic fertilizer that improves soil fertility and supports sustainable crop production. Vermicompost, organic fertilizer pellets, bio-fertilizers also derived from sheep manure. The products like shoes, sandals, handbags, wallets and belts are prepared from sheep leather. Lanolin is a natural waxy substance obtained from sheep wool during the cleaning or scouring process ingredient widely used in several industries. This is secreted by the sebaceous glands of sheep and coats the wool fibers, providing protection against moisture and environmental conditions. Lanolin has excellent moisturizing, protective, and emollient properties, making it highly valuable in cosmetic and pharmaceutical formulations. The products like bone meal fertilizer, gelatin,

Animal feed supplements are obtained from sheep bones helps to maximize the resource use and reduces environmental waste. Bone meal contains phosphorus and calcium, which are needed for plant growth. Further used in organic farming as a slow-release fertilizer that advances the soil fertility and crop productivity. Gelatin derived is used in food processing, pharmaceuticals, and confectionery industries, while bone-based mineral supplements are sometimes used in livestock feed formulations.

**Conclusion**

Sheep farming plays an important role in processed and high-quality value-added sheep products hold immense potential for rural economic growth. In spite of the wide range of products obtained from sheep, majority of the farmers are selling these products in their unprocessed form, have limited shelf life and fluctuations in market prices which limits the profitability of sheep farming. In many cases, lack of processing facilities, technical knowledge, and marketing infrastructure prevents farmers from realizing the full economic potential of sheep-based products. Rural youth and women self-help groups can play a major role in establishing small-scale enterprises based on sheep products. With proper training, access to technology, branding, and financial support, these groups can successfully engage in processing, packaging, and marketing value-added products helpful for local economic development and entrepreneurship. Government schemes related to livestock development, skill training, rural entrepreneurship, and financial assistance such as credit facilities, subsidies, and market linkages play a crucial role in supporting rural youth and women which can transform sheep farming into a profitable and sustainable enterprises.

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