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REVIEW PAPER

Sheep Rearing Systems and their Productive Performances –A Review

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ABSTRACT

Sheep are raised by small, marginal and landless farmers in India, following different rearing systems. Sheep rearing system still continues in a traditional manner in spite of a number of sheep development activities for poor and landless farmers. The different sheep rearing systems are intensive, semi-intensive and extensive for wool and meat production. Intensive sheep rearing system enhances the productive performance with minimum environmental stress on the animals. The system requires high investment but, the productivity is also high. The semi-intensive system allows the sheep for grazing as well as intensive rearing will result in economic production. In extensive sheep rearing system the animals are allowed to graze in common grazing lands and pastures. The animals are grazed in adverse climatic conditions which will adversely affect the productivity. No supplementary feed is given as well as care of different life stages is not proper. The cost of production is less but the yield is also low as compared to other two systems. The major reasons for low productivity in semi-intensive and extensive rearing system are inadequate grazing resources, diseases causing high mortality, morbidity, exploitation by middle man, low adoption of improved management technologies and improper breeding management. The objective of this paper is to review the scientific evidence related to productive performance of sheep in different rearing systems, which could increase the productivity and profitability of sheep farming.

Key words *Average daily gain (ADG), Dry matter intake (DMI), Economics of rearing system, Migratory system, Productive performance, Rearing systems*

Sheep in India are reared on natural vegetation and common grazing lands. Sheep grows on less input and provides alternate means of income for marginal farmers (Arora *et al*., 2016). The contribution of small ruminants is very valuable in rural areas (Ramesh *et al*., 2012). The major factors responsible for adoption of type of animal production system are climate and geographical conditions, while production cost is the important factor influencing the success of that system (Ocak *et al.,* 2016). In intensive farming the animals are maintained indoor. It involves high labour and cash inputs. Cultivated green fodder and concentrate feed is fed to the animals and it has the advantage of control over the animals. In Semi-intensive farming system the sheep flocks are let loose for a grazing period of 4- 8 hrs and supplement feed and fodder is provided to the animals. Extensive system is carried out in low rainfall areas. The animals are allowed to graze on common lands and no supplement is provided to the animals. There is huge demand for mutton due to globalization and for the fulfillment of the demand; it becomes essential to improve the mutton quality of sheep (Kulkarni *et al.,* 2008). The productivity of Indian sheep is efficient considering the nutrient availability and physical environment of our country. The reasons for low productivity extensive system of rearing are shrinking grazing resources, diseases causing high lamb mortality, morbidity, exploitation by middle man, low adoption of improved management technologies and improper breeding management (Sagar and Biswas 2008); (Porwal *et al*., 2006a).

Migratory system of Sheep rearing

Sheep rearing system still continues in a traditional manner in spite of a number of sheep development activities for poor and landless farmers. Roy and Singh, (2013) reported that about 30 pastoral communities in hilly and arid/semi-arid regions of northern and western parts of India, 20 in temperate hilly regions, depend on grazing-based livestock production. In search of suitable grazing lands, the shepherds keep on migrating their flocks over extensive areas within or even in the neighboring states. Ananda Rao *et al.,* (2013) reported that in North costal region of Andhra Pradesh, the predominant system of sheep production was stationary along with migratory (72.81%), where as 14.47% of sheep farmers followed migratory and 12.70% followed stationary system alone. Farmers usually migrate during dry season due to scarcity of feed and fodder resources in this period and come back after onset of rainy season. Shinde and Singh (1995) reported that in arid and semi-arid regions 86 and 67% of sheep follow migratory sheep rearing system, respectively. Generally there are two types of migratory flocks. Truly nomadic flocks have no fixed centers but following seasonal migratory routes, influenced by the availability of fodder and drinking water resources. In other migratory system, animals graze on the fallow land, but following definite migratory routes to the season pastures and returning to their permanent abodes during other seasons. Dixit *et al.*,

(2005) reported that the Gaddi tribes in Jammu and Kashmir owning Rampur bushair sheep followed migration during summer months. During extreme summer months of the year, the flocks are grazed in the cooler hours of the day; grazing starts in the late hours of the day and the animals are brought to the water points in the afternoon. Ananda Rao et *al.,* (2013) reported that, the average grazing time (h) and grazing distance (km) were 8.48 ± 0.06 and 6.02 ± 0.17 in summer and 6.08 ± 0.05 and 3.78 ± 0.03 in seasons other than summer. The main reasons for low productivity in these systems are poor exploitation of genetic potential of indigenous animals, disease outbreaks, lamb mortality, low adoption of available technology, inadequate resource of feed and fodder, exploitation by middle man and lack of availability of financial support from different agencies.

Dry matter intake in different rearing systems

Sheep can graze closely to the ground; they have the ability to pick up very low level vegetation and grasses that cannot be used by other livestock. They also have the ability to cover long distances in search of forage and water, making them suitable for dry land agriculture. In intensive farming systems higher dry matter intake is due to quantum and quality of feed intake, which results in animal comfort and improves the production performance. In extensive group, the lambs are allowed for grazing on the fields in adverse environmental conditions which might decrease the dry matter intake (Bharambe and Burte 2012). The DMI (g/day /animal), DMI (g/kg/BW), DMI (g/kg 0.75) reported as 944.7 ± 36.6, 36.5 ± 1.22, 83.4 ± 1.22 in intensively management system, where as 743.9 ± 48.65, 32.3 ± 2.17, 70.7 ± 4.50 in semi intensively management system in Avivastra lambs (Shinde *et al.,* 1995). Lower DMI, DCP and TDN intake was found in Malpura weaners lambs but, the growth rate was higher under grazing with supplementation than that in intensive feeding (Karim and Verma 2001).

Average daily gains in different rearing systems

The average daily gain will be higher in intensive rearing system as compared to semi-intensive and extensive raring systems because of supplementation of concentrate feed along with limited hours of grazing which will have a limited stress factors (Sari *et al.,* 2014). ADG of 91.33 g in a growth trial in Nellore weaner lambs were found under intensive system of feeding and management (Prasad *et al.,* 1991). The average daily gain was 35 and 79 g in sole grazing and concentrate supplementation group respectively reported by Chellapandian and Balachandran (2003). Extensive, semi-intensive and intensive system of feeding management recorded an average daily gain of 72.6 ± 5.40, 160.9 ±10.52 and 135.9 ± 7.50 g respectively in Kheri male weaners (Porwal *et al.,* 2006). Yeaman *et al.,* (2013) reported that the, mean ADG was 340 ± 9.2 g for Dorper lambs and 346 ± 8.6 g for Rambouillet lambs in intensive feeding system.

Body weight gains in different rearing systems

Comparatively higher body weight gains in Intensive group followed by semi-intensive and extensive group indicates the advantage of intensive system. Semi-intensive group will achieve higher weight gains when compared to extensive group due to the provision of concentrate feed along with 4 hours of grazing and lesser time exposure to environment stress. Extensive group will achieve comparatively lower weight gains than other rearing systems indicating that extensive farming system has limited feeding resources for sheep flocks. Zervas *et al.,* (1999) and Porwal *et al.,* (2005) also found higher body weight gains for the lambs reared under semi-intensive and intensive system of feeding when compared to extensive system. Carvalho *et al.,* (2007) observed that more quantity of roughage and less concentrate feed in the diets lowers the live weight gain of the lambs. Avivastra weaner lambs had achieved higher finishing weight in intensively (33.5 Kg) fed lambs compared to semi- intensively (27.3 kg) fed lambs (Shinde *et al.,* 1995). Pal *et al.,* (1997) reported that lambs reared under intensive system were superior to semi intensive system with respect to mutton production. During growth studies Meenakshi Sundaram *et al.,* (2002) found that in the lambs of age fifth to twelfth month in intensively reared lambs (slatted and mud floor groups) maintained their superiority in growth rate than those reared under semi intensive system of management. Bharambe and Burte (2012) compared Deccani lambs under grazing, semi stall fed and stall fed systems and found that the body weight, body length, body height, chest girth and total greasy fleece yield was significantly higher ($P< 0.01$) in stall fed system than grazing and semi stall fed systems.

Feed conversion efficiency

The feed conversion efficiency in intensive rearing system will be more as compared to semi-intensive and extensive system of rearing. In intensive system cultivated green fodder will be provided along with concentrate supplementation, so the digestibility will be more and body weight gain will be more. But in case of semi-intensive system of rearing the animal will be allowed for grazing for half a day and little quantity of concentrate feed will be supplemented which will decrease the feed conversion efficiency as compared to intensive system of rearing. In case of extensive system of rearing the animals allowed for grazing on common grazing lands and pasture. The nutritive value of grasses and pasture are low. Sari *et al.,* (2014) reported that, the poor nutritive value of grasses and grazing material decreases the feed conversion efficiency in extensive system. Yeaman *et al.,* (2013) reported that the, feed conversion efficiency was 0.153 ± 0.003 for Dorper lambs and 0.158 ± 0.003 for Rambouillet lambs in intensive feeding system.

Economics of sheep rearing systems

The intensive rearing system requires high investment but, the productivity is also high. The semi-intensive rearing system requires a fairly high investment cost than extensive, though little lower than that of the total intensive rearing system, but the productive performance will be better than extensive rearing system. The cost of production per kg live meat in intensive system will be more as compared to semi-intensive and extensive group. The cost of production one kg of meat was higher because of the cost of feed compared to semi-intensive and extensive. In intensive system the animals are stall fed so, cost of fodder and concentrate feed will increase the production cost. In semi-intensive system, the cost of fodder as well the cost of concentrate was half of the intensive system so the cost of production will be low. In extensive system of rearing the animals are not offered concentrate and green fodder, the animals will be allowed only on grazing system the cost of production will be very low compared to other two systems. But the average body weight gained was significantly lower than intensive and semi-intensive systems. Shinde *et al.,* (1995) found that based on inputs and scale of produce the lambs in the two feeding system provided net return of Rs 124.54 and153.36 with cost benefit ratio of 1.22 and 1.38 respectively in intensive and semi intensive system of management. Karim *et al.,* (2004) reported that under intensive feeding 70 kg complete feed was consumed at a cost of Rs 274/ head, while grazing with supplementation consumed 27 kg concentrate costing Rs 162/ head. Accordingly the cost of feeding/ gain in live weight was Rs 31 in intensive system and Rs 23 in grazing with supplementation. Porwal *et al.,* (2006) reported that disposal of the finisher by slaughter provided 225, 266 and 303 per cent higher income under extensive, semi intensive and intensive than sale of live animals. The cost of expenditure per kg weight was Rs 54.14 and 50.06 for 250 kg supplemented group and 150 supplemented group respectively .The net income obtained was Rs 415.21 and 371.61 respectively for both groups (Karunanithi *et al.,* 2007). Chaturvedi *et al.,* (2010) reported that, the lambs of concentrated supplemented ewes were sold at higher rates (Rs. 1900/lamb) than those of non supplemented ewes (Rs. 1400/lamb). Malisetty (2013) reported extra weight gain in ram lambs supplemented with concentrate was 3.82 kg, with a cost benefit ratio of 1:2.08.

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