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Review On Major Ectoparasites And Their Economic Impact On Farm Animals

*Bijiga Tsafiyo Kuchi and Asmamaw Aki

*Assosa University, college of agriculture & natural resource, Department of animal science
Asossa, Regional Veterinary Diagnostic, monitoring, surveillance and study laboratory, P.O. Box 326, Assosa, Ethiopia; asmamawaki@gmail.com

Abstract: In Ethiopia the livestock population is estimated to be about 60.39 million cattle, 31.30 million sheep, and 32.70 million of goats. In the country skins from small ruminants and hides from large animals are important an important agricultural products contributing for the largest share to export commodities. So, this article is engraved with the objectives to review the status and distribution of Ectoparasites in farm animals and to review the economic impact of Ectoparasites infestations in farm animals in Ethiopia. Even though Ethiopia has very good potential to produce substantial quantities of hide and skins, their quality is very low. In this regard about 35% of sheep and 56% of goat skins were rejected due to Ectoparasites damage and due to this effect about one quarter to one third of all the skins processed at tanneries are unsuitable for export. Trade in hides, skins, leather and leather manufactures have been in a great growth at an average of about 12% over the last 30 years, reaching to around USD 53.8 billion in early 2000. As a result of this, leather has been at the core of Ethiopia's economy since many years. In addition, it has a large contribution to the leather industry in the country. Now a day poor management and low productivity of animals due to parasitic infestation has considerably become the major stumbling block to the potential of livestock industry as well as causes serious economic loss to small holder farmers, the tanning industry and the country as a whole through mortality of animals, decreased production, down grading and rejection of skis and hides. Therefore, it is concluded that impact posed by external parasitic infestation such as (mites, lice, ticks) on farm animals during their life time is more serious and significant. So improved veterinary extension services, strategic and effective parasite control strategies, continuous awareness creation and training on management and husbandry practice are suggested to enhance the quality of skins and hides and to increase livestock product and productivity.
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1. Introduction

Ethiopia has the leading livestock population in Africa and according to CSA (2018), the livestock population of the country is estimated to be 60.39 million cattle, 31.30 million sheep, and 32.74 million goats, 56.53 million poultry, 1.42 million camels, 8.85 million donkeys, 2,01 million horses and 0.46 million mules. Food and Agriculture Organization (1999) estimates a 1.1% growth rate for cattle which is against a backdrop of 2.5% human population growth per annum. In other words, the livestock population growth has been lagging behind the human population growth. The livestock sector represents a significant part of the global economy, particularly in the developing countries. Thus, livestock provide energy, food, raw material, and manure for crops. It is therefore not surprising that the livestock sector has emerged as an important economic source for a vast majority of the rural population and a target for agro business in the dairy, meat and various other products in the processed foods sector (Kabirl *et al.,* 2011).

However, productivity of livestock is very low due to poor management, poor husbandry practice, shortage of feed, poor genetic performance and wide spread occurrence of different livestock diseases in the country which is considered to be major obstacle to the potential of livestock industry (Mokonen *et a*l., 2001). Now days, parasitism represents a major problem to development and utilization of animal resource. In Ethiopia ectoparasites in ruminant causes serious economic loss to small holding farming system, the tanning industry and the country as a whole through mortality of animals, decreased production, performance and down grading quality of hide and skin.

Ectoparasites, such as ticks, mites and lice have veterinary importance which affects economics of cattle production (Regassa, 2011). The exportation of hide and skin is important source income and a good

root of foreign exchange in the country. Yet, as much one quarter to one third of all skin processed at tanneries are unsuitable for export due to various defects. Up to 65% of these defects occur in pre-slaughter stage of production while the animal is still alive. A considerable portion of these pre-slaughter defects are directly related to skin disease caused by parasites and to secondary damage that occur when the animal scratch itself to relive the itching associated with some of these diseases (Kassa, 1998).

Among the ectoparasites infesting cattle, ticks cause very significant and harmful damage because of their blood sucking habits and direct debilitating effect (Taylor, 2007). Although, only relatively few of more than 889 species of tick in the world are important to man and domestic animals, these few species must be controlled if livestock production is to meet World needs for animal protein. Over 79 different species are found in eastern Africa but many of these appear to have little or no economic importance (Cumming, 1999).

In Ethiopia, there are 47 species of ticks that infest livestock and most of them have the potential to cause mechanical damage (tick bite) (Kassa, 2005) and transmit vector borne diseases such as Theileriosis, Anaplasmosis, Babesiosis and Ehrlichiosis (heart water) in domestic animals; moreover, they also cause non-specific symptoms like anemia, dermatosis, toxicities and paralysis (Gebre *et al.*, 2001).

Lice are one of the common external parasites of domestic cattle. The most abundant and clinically important lice are the chewing louse. The chewing lice may cause less individual damage than the various species of sucking lice, it present in larger numbers and so it can cause extreme damage. Poor control may be associated with a failure to detect or identify lice infestation in its initial stages and by the time clinical diagnosis is achieved the entire herd may be infested (Milnes *et al.,* 1999).

Mites are among the important ectoparasites of cattle with great veterinary and medical significance. Infestation by mites may result in severe dermatitis, which is known as mange (Smith, 2009). They are transmitted through contact with affected animals and contaminated materials. Due to their behavior, mites may have direct and indirect effect on their host. These could be a direct harm (blood loss, skin inflammation, purities, etc.) or indirect when they present at high density (cause disturbance and self-wound) (Taylor *et al., 2007*). The economic impact of mange mite's may goes on a marked decrease in weight gain, reduced milk production, hide and skin damage, costs related to prevention and control/eradication program, markedly reduces feed intake, and secondary bacterial infection may further contribute to loss of condition. The damage caused by mites to the skin is usually accompanied by irritation, rubbing and scratching. On a larger scale, mite infections have great impact on local and international trade of animals (Ginn *et al*, 2007).

Generally, ectoparasites cause significant effect on the production, productivity and health of livestock. Various skin diseases which result from tick, lice and mite infestation have been frequently reported in Ethiopia with significant economic impact (Yacob *et al, 2008*). Therefore, having information on an over view of these ectoparasites has a paramount importance to take preventive and control measures against them.

Objectives

- Review the status and distribution of ectoparasites in farm animals.
- Review the economic impact of ectoparasites in farm animals.

2. Literature Review

2.1. Economic Impact of Ticks in Farm Animals

2.1.1. Direct and Indirect Losses in Cattle

Babesiosis, theileriosis and anaplasmosis are the main parasitic diseases transmitted by ticks and that generate important economic losses in cattle production around the world (Demessie and Derso, 2015). Common signs associated with hemoparasitic diseases are: fever, anemia, loss of appetite, reduction in milk yield (Benavides *et al*., 2016), lower weight gain (Polanco *et al.,* 2016), loss of body condition, reproductive effects in males and females, abortions in the last third of gestation (Benavides *et al*., 2016), lower pregnancy and birth rate and death in some animals (Polanco *et al.,* 2016).

Ticks affect 80% of cattle population of the world. Specifically, Rhipicephalus microplus (formerly Boophilus microplus) is the tick that has the greatest economic impact (Benavides *et al,*.2001), due to its wide distribution, vector capacity, blood-sucking habits and the number of cattle that it affects (Dominguez *et al*., 2016). Ticks usually prefer places on the body of animals where the skin is thin and short and have abundant blood supply, such as the inguinal region and external genitals. Ticks grow and develop best in hot and humid climates (Nejash and Tilahun, 2016). Due to its great capacity for adaptation and propagation, ticks of the genus Rhipicephalus have been able to spread in various geographical areas around the world. Approximately 1 billion bovines are in areas at risk of being affected by these parasites (Rodríguez *et al.*, 2011).

The economic impact is strongly linked to the epidemiology of the disease and can be divided in to direct and indirect losses (Benavides *et al*. 2016). It has direct effect on production, results in damage to

the skins by biting, especially in highly infested cattle (Garcia *et al.,* 2010), blood loss associated with high parasitic loads, anemia, severe immunological reactions by the inoculation of toxins (antigens and coagulants in saliva) (Polanco *et al.,* 2016), permanent stress that affects the behavior and welfare of the animal (Garcia *et al.,* 2010), which also leads to depression of the immune function, loss of energy associated with the constant movement that occurs in response to infestation (Polanco *et al.,* 2016).

Indirect losses are related to the effects of hemo parasites and other diseases that they can transmit (Abbas *et al*., 2014). Other indirect losses correspond to the cost of treatment for clinical cases; expenses incurred in the control of ticks; unearned income or inefficiencies in the production system, use of genetically resistant breeds to ticks but less productive, confiscation by acaricide residues in meat or milk; trade restrictions of animals between areas and countries (Benavides *et al*., 2016). The economic losses by ticks include not only the price of animals of high genetic value, but also the impossibility of these animals to contribute to the genetic improvement (productive potential) of an entire herd or even a region (Kariuki, 1991).

Betancourt (2017) mentioned that the losses caused by the infestation with R. microplus, the associated diseases and its control, have been calculated at USD $13.9–18.7 billion per annum worldwide. According to FAO (2004), the average total financial losses (production losses plus control cost) per animal per year are USD $7.3. The effects of ticks on weight gains are quite negative. On average, each engorged female tick is responsible for the loss of 1.37 g of body weight in Bos taurus cattle. It has been observed that animals infested with ticks reduce their feed intake (4.37 kg) compared to animals not exposed to ticks (5.66 kg). These effects cause losses of several billions of Dollars in the global livestock economy (Rodríguez, 2014). The direct effect of ticks on dairy cattle can reduce total milk production by approximately 90 l/lactation/cow. Each fattened female tick can be responsible for up to 8.9 mL of milk reduction (Rodrigues and Leite, 2013). Other estimates indicate that losses in milk production reach 23 % (Regitano and Prayaga, 2011).

2.1.2. Direct and Indirect Losses in Small Ruminants

Small ruminants are an important source of meat and milk in different countries and play a vital role in food security, in addition to the income earned from the sale of skins and wool. However, as with other species, ticks can limit the production systems of small ruminants, causing direct and indirect losses (Habela *et al*., 2003). Although no tick is a specific host for sheep or goats, both hard and soft ticks parasitize these ruminants (Gnad and Mock, 2001).

Some species of ticks cause paralysis while others cause toxicosis. Intensive lameness has been noted in goats, where ticks adhere around the coronary band (Kusiluka and Kambarage, 1996). Ticks cause substantial financial losses in the livestock industry of some countries such as Ethiopia, for the damage to leathers and skins of sheep and goats. Lamb skins are particularly susceptible to damage. Secondary bacterial infection after tick bite increases the severity of the damage (Mohammed and Admasu, 2015). Some infestations by ticks such as Otobius megnini and Ornithodoros coriaceus can generate irritations and injuries at the ear level, which can lead to permanent nerve damage and death from meningitis (Gnad and Mock, 2001).

Ticks generate indirect damage due to their key role in the transmission of a large number of infectious agents (Habela *et al*., 2003). As mentioned by (Bilgic *et al*., 2017), in recent decades, the socioeconomic impact of small ruminants has grown worldwide, and therefore more attention is now being given to the pathogens that affect sheep and goats. As in the case of bovines, the main tick-borne diseases are Babesiosis, anaplasmosis, theileriosis and heart water (Jongejan, 2004). Losses attributed to these diseases include mortality, production losses, diagnostic, veterinary treatment and control costs of ticks (Bilgic *et al*., 2017). As the per capita economic loss of sheep or goats infested by these tick-borne pathogens is at least 2 USD, the total annual loss of small ruminants due to tick-borne diseases is estimated at around 70 million USD (Yin and Luo, 2017).

Ectoparasites significantly affect the quality of hide and skin there by affecting the economy of Ethiopian farmers as well as international market. However, poor management and husbandry practice, wide spread occurrence of livestock diseases, poor genetic performance livestock and other factors result in low productivity which in turn has major stumbling block to the potential of livestock industry (Bekele *et al*., 2011). Now a day parasitism represents a major obstacle to development and utilization of animal resource among ectoparasites that significantly affect the quality of hides and skins (Rony *et al*., 2010).

2.2. Defects Caused by Ectoparasites

Ectoparasites are organisms that live on the surface of animals upon which they depend for food, shelter and other basic needs to survive (Anderson, 2004). It has been observed that ectoparasites do not only have direct effects on their host, but they may also transmit pathogens, there by acting as vectors of diseases (Parola *et al*., 2001). They generally affect the health of animals and the quality of hides and skin. The leather industries have suffered great loses over

the years because of infestation of animal hides and skins (ESGPIP, 2010).

In Ethiopia ectoparasites in ruminant causes serious economic loss to small holder farmers, the tanning industry and the country as a whole through mortality of animals, decreased production, down grading and rejection of skin and hide (Tikit and Addis, 2011). As a result of their activity, ectoparasites may have a variety of direct and indirect effects on their hosts. Ectoparasites commonly ticks, mites and lice affect the host species by the inflammation and the infection they inflict on the skin and by their effect on the physiology of the animals as well as through transmission of different diseases (Bekele *et al*., 2011). Tick and mites also have ability to transmit many infections due to blood sucking habit. However, skin damage is the most important cause of losses in livestock industry (Tadesse *et al*., 2011).

Skin problems caused by lice, mange mites and ticks are among the major defects during the life of animals that reduce skin qualities and results in rejections (Tefera and Abebe, 2007). Up to 65% of the defect that lead to decline of the quality occurs while the animal still alive and a considerable portion of these impacts are directly associated to skin disease initiated by external parasites (Ahmed *et al*., 2016).

2.2.1. **Tick Infestation**

Ticks are blood sucking ectoparasites of mammals and birds. There are two main families of ticks that include the Ixodidae (hard) ticks and Argasidae (soft) ticks which are known to transmit the widest variety of pathogens of any blood sucking arthropods such as bacteria, rickettsiae, protozoa and viruses that favors the emerging of various skin disease (El-Kammah *et al*., 2001). According to Venededoe (2002) about 850 species of ticks have been described worldwide and they cause the greatest economic losses in livestock production. In Ethiopia, tick and tick borne diseases cause considerable losses to the livestock industry, ranking third among the prevalent parasitic diseases, after trypanosomes and end parasitism (Zeleke and Bekele, 2004).

According to Solomon *et al*. (2001) ticks damage hides and skins and interfere with meat and milk production. The most commonly known tick borne diseases are Anaplasmosis, Babesiosis, Theileriosis and Heart water; ticks also cause non-specific symptoms like anemia, dermatitis, toxicosis and paralysis. Tick bites may damage host at the site of attachment causing local injury, which may predispose to secondary bacterial infection. The lesion caused during feeding may predispose to myiasis in addition to reducing the value of hides and skins at slaughter (Taylor *et al*., 2007).

They have many effects which include reduced growth, milk and meat production, damaged hides and skins, transmission of tick-borne diseases of various types and predispose animals to secondary attacks from other parasites such as screwworm flies and infection by pathogens such as Dermatophilus congolensis, the causative agent of streptothricosis (ESGPIP, 2010). Recently, reports from different areas of Ethiopia indicated overall prevalence of ticks infestation to be 16% in sheep and 29.7% in goats from Tigray region (Mulugeta *et al*., 2010) and 57.6% in goats from three agro-ecological zones of southern rangeland of Ethiopia (Asnake *et al*., 2013).

2.2.2. Mange Mites

Mange mites are common parasites in Ethiopia and therefore are reported from many regions and different agro climates. Most mange mites spend their entire lives in intimate contact with the host. High temperature, humidity and sunlight favor mange mite infestations as well as dramatic increases in mite populations, occur more commonly in animals with poor condition and more often seen at the end of winter or in early spring. Based on the reports so far, mange mites are most prevalent in part of Ethiopia (Asnake *et al*., 2013).

There are four main genera of mange mites which infest ruminants: Demodectic mange (follicular mange), Sarcoptic mange (barn itch), Psoroptic mange (body mange, ear mange and the sheep scab) and Choroptic mange (tail mange, leg mange and the scrotal mange). Mange mites are the major causes of skin diseases that affect ruminant production in many areas of Ethiopia. The infestations by these mites are called acariasis and can result in severe dermatitis known as mange (Urquhart *et al*., 2006). In cattle and goat, Demodectic mange causes significant damage to the hide and skin rarely death that may result from secondary bacterial infection (Radostits *et al*., 2007). Mites multiply preferably under the skin and damage the hides and skins (FAO, 2005).

Among ectoparasites, mange mites are most common which parasitize different domestic and wild animals. They spent their lives on the animal body by feeding on blood, lymph, skin debris and inject subcutaneous secretion while puncturing the skin, damaging the skin surface as well as cause tremendous losses of skin through downgrading and rejections (Teshome, 2002). Sarcoptic scabiei var. caprae and Sarcoptic scabiei var. ovis have a wide geographic distribution in many goats and sheep rearing in arid and semi-arid areas of Ethiopia, and it is more commonly seen in goats than sheep. In Ethiopia, they are widely distributed in lowland mainly (Asnake *et al*., 2013), low and midlands (Kumsa *et al*., 2012) as well as central midland part of the country (Yacob *et al*., 2008).

The highest prevalence of sarcoptic mites observed in sheep and goats were 30.32% in Tigray (Kedir, 2000) and 57.6% in Southern Ethiopia (Asnake *et al*., 2013), respectively. While mites of the genus Psoroptes cause psoroptic mange in sheep and goats, its prevalence is found to be higher in sheep than in goats. Recent studies indicate that in Ethiopia, psoroptic mange is most common among small ruminants in lowland areas of north (Kassa, 2006; Mulugeta *et al*., 2010) and south (Dessie *et al*., 2010) as well as central lowland areas (Yacob *et al*., 2008).

Demodectic mange has been reported in sheep (Demodex ovis) and goats (Demodex caprae). While Chorioptic mange mites are common in cattle and the condition is often referred to as leg mange or foot mange because of the distribution of the lesions, which are usually limited to the lower limbs extending up the limbs to affect the scrotum in males or udder in females and characterized by the production of crusts and flaking especially on the backs of the feet. It causes the downgrading of skins to the tanneries (ESGPIP, 2009).

2.3. Control and Prevention

A number of different control methods are available to farmers to prevent and treat ectoparasites. Commonly there are three classes of compounds available for the treatment and prevention of external parasitic infestation: organ phosphorus compounds e.g. diazinon, synthetic pyrethroids e.g. flumethrin and high cis-cypermethrin and macro cyclic lactones e.g. ivermectin and doramectin (Barbara and David, 2003).

Ticks are treated and controlled with acaricide only where ticks are present in large numbers. If tick numbers are not large, do not use acaricide, in this case, it is possible to kill them by hand using a needle or thorn. Shear the animal's hair and then use an insecticide such as Amitraz and solutions can be sprayed on the animal, used as a dip or pour-on. Knapsack spraying is the most practical method if more intensive control measures are needed for a small number of animals. However acaricides are toxic to people as well as animals and care should be taken to prevent any possibility of dip fluid being drunk, or contaminating ground water (Sileshi and Desalegn, 2008).

Where as in case of lice infestation spraying or dipping with acaricide is effective and should always be carried out twice as a treatment and control. The first time to kill the lice currently on the body and the second, 14 days later, to kill lice hatching from eggs present at the first treatment, because there is no insecticides which affect eggs of lice so far (Tekle, 2008). Shearing of the wool in case of sheep keds, spraying or dipping with insecticide after shearing also will destroy flies. In addition, flies can also be controlled by organo phosphorous dips, certain synthetic pyrethroids and other pour-on products (Merck, 2016).

However, the treatment and control of mites are almost similar for all species of mites and in which case infected sheep should be dipped with acaricide and ivermectin injection is also effective. Newly introduced animals are the main sources of infection for a flock. Therefore, these animals must be checked carefully and possibly treated before being introduced into the new flock (Sileshi and Desalegn, 2008). Moreover, majority of ectoparasites infestation can be prevented and controlled through regular cleaning of animal houses, removing grass/plants around the barn, all litter and discarded wool must be collected and burnt or deposited out of animal contact, if external parasites are seen on an animal, it should be treated immediately to prevent transmission to others, all animals introduced to a farm must be treated immediately upon arrival to avoid the spread of new parasites on to the farm, rotate the land where livestock graze and if the above measures are not effective, treating the animals with appropriate pesticide or insecticide is indicated (ESGPIP, 2010).

3. Conclusion And Recommendations

Despite the large livestock population in Ethiopia, their contribution to the country's economy is less than expected mainly due to the presence of many external parasitic infestations, which have great impact on their production and productivity. Skins from small ruminants and hides from large animals are important economic products contributing for the largest share to agricultural export commodities in the country. Conversely, about one quarter to one third of all the skins processed at tanneries is unsuitable for export due to various defects which is attributed to parasitic infestation. Most tanneries state that only 10 to 15% of harvested skins qualify for top grades, with the rest downgraded and rejected mainly due to parasitic infestation. For instance, the estimated economic loss due to drop in quality of sheep and goat skin is around USD 14 million per year. Moreover, during the first growth and transformation plan, Ethiopia has planned to earn about 496.5 million USD from hides and skins sub-sector but the actual earning was radically reduced to 132.86 million USD which is a great loss to the country's economy. Therefore, based on the above conclusion, the following recommendations are forwarded:

- Effective prevention and control measures should be implemented so as to minimize the impact of ectoparasites infestation on farm animals.
- Continuous awareness creation programs should be launched for farmers and livestock keepers to improve management and husbandry practices.

- Veterinary service should be improved and be accessible to the whole areas of the country to prevent skin and hide defects due to external parasitic infestation.

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Corresponding Author:
Dr. Asmamaw Aki
Regional Veterinary Diagnostic, Surveillance, Monitoring and Study Laboratory
Telephone: +251 0902330029
Email: asmamawaki@gmail.com

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