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Economic impacts of infectious diseases of livestock

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India has a huge livestock population of more than 500 million comprising of 199 million cattle, 105 million buffaloes, 140 million goats, 71 million sheep and 11 million pig and ranks first in buffalo while second in cattle and goat population (DAHD 2007). About 24.72% of the agricultural GDP in this country is contributed by livestock sector and contribution of national GDP is about 4.36%. According to National Sample Survey Organization's data, the livestock sector provides employment to 22 million people including 18.5 million workers in dairying and another 3.5 million in poultry and meat industry. The gross value of output from livestock comes to around ₹ 2 40 601 crore (2007–08) which is about 26.9% of the total value of agricultural output (8,94,420 crore) (DAHD 2007–08). Major problem in livestock sector is the livestock diseases which cause huge economic loss resulting due to mortality, less efficient resource use and need of faster stock replacement rates, all of which requiring additional financial as well as personnel resources. Control and treatment of diseases also add to the losses (Mathur and Dubey 1994). India alone losses 4.45 billion US dollars (₹ 20 000 crore) per year due to the uneconomic performance of the animals because of adverse effect of some diseases *(The Cattle Site News Desk).* Perry *et al*. (2001) concluded that in South Asia, the top four diseases of importance to the poor were foot-and-mouth disease, reproductive disorders, *Toxocara vitulorum* and *Brucella abortus*. The report of 1989–96 about the national level disease profile indicates 220, 104, 32 and 8 outbreaks per 1,000 villages in India due to FMD, blue tongue, sheep and goat pox, RP/PPR respectively, while mortality rates are 21, 19, 15 and at 2% for sheep and goat pox, RP/PPR, blue tongue and FMD respectively (Sharma *et al*. 2010). Immediate impacts of a disease outbreak include a reduction in the productive capacity of the animal products industry and a subsequent reduction in the supply of meat products and at the same time, disease outbreaks may reduce the demand for meat and meat products (Pritchett *et al.* 2005). In addition, the disease impacts are generally easy to identify but may be difficult to quantify. In livestock, for example, delays in reproduction result in fewer offspring, which has long term effects not easily measured in the present. Disease outbreaks often have broader, longer-term multiplier effects that extend beyond principle markets. Outbreaks of infectious diseases in a community or a region may result in disruptions of local market as restrictions on animal movement are imposed, as a result of which, the farmers are unable to market livestock and livestock products at optimum time. In addition to this, the restrictions imposed on international trade which further have potential multiplier effects on employment and other stakeholders.

Loss due to FMD: In India, the disease is endemic and occurred throughout the country and more than 5000 outbreaks are reported every year (Sarma 2005, Sharma *et al.* 2005) and cause direct losses to the tune of ₹ 60 million per year (Venkataramanan *et al.* 2005). AICRP FMD project estimated the economic losses of FMD at approximately ₹ 15 000 million/year and ₹ 3 861 million from Maharashtra alone (Mahajan and Rautmare 2005). Ellis and James (1976) estimated ₹ 4 200 million/year loss in India, without estimating losses for small ruminants and pigs. The NDDB in 1975–76 assessed the annual loss due to FMD to be ₹ 500 crore/year. Saxena (1994a and 1994b) worked out that taking into account milk and non milk losses, India losses about ₹ 3 463 crores annually at prices and population for the year 1990. He further estimated loss of 3 508 million kg of milk (approximately 6.5% of total milk output) which was ₹ 12 520 million in terms of lost foreign exchange and about ₹ 16 500 million to ₹ 18 730 million in terms of lost domestic economic surplus according to 1990 milk prices. The losses due to loss of draught power, animal deaths and cost of treatment were estimated to be ₹ 18 130 million per year. On an average, annual losses per head of cattle and buffalo in the country were estimated to be ₹ 125. In yet another study, annual losses due to FMD were calculated to be ₹ 2 421.51 lakh and were calculated on the basis of mortality, morbidity and opportunity cost (Singh and Prasad 2005). As per the estimates of MSSRF the country suffers an annual loss of ₹

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5 000–20 000 crore due to FMD. Mathew and Manon (2008) while taking into consideration milk loss, losses due to abortion and treatment charges calculated a loss of ₹ 313 900 during outbreak in 62 animals, out of which loss in milk production accounted for 80.68%. An average loss of 8 h/day/animal was calculated, vaccination cost of ₹ 5/animal and loss of manpower of 2-h/animals for 5 days towards the nursing of animal and disinfection of shed was calculated. Mahajan and Rautmare (2005) calculated loss of ₹ 472/animal due to losses in milk production, ₹ 320 for treatment and ₹ 895 average loss for working animals and the total expected loss per buffalo due to immediate FMD costs to be ₹ 792. Apart from milk losses, there are some non-milk losses also like sterility or reduction in reproduction performance in female and reduced sex libido in males (Markandeya *et al.* 2005*,* Mohapatra *et al.* 2005*,* Singh *et al.* 2004*,* Venkata Reddy *et al.*1991*,* Murugvel *et al.* 1997*,* Ali *et al.* 1991) abortion (Garg *et al.* 2001), loss of draught power, lack of heat tolerance (Radostits *et al.* 2000) and diabetes mellitus (Bhikane 2003).

Loss due to haemorrhagic septicaemia (HS) : HS is one of the most common bacterial diseases affecting primarily bovines and is an acute septicaemic fatal disease and causes substantial economic losses because of high morbidity and mortality. The mortality rate is 50–100% within 24 h in acute form of this disease. In India, it account for about 58–77% of the aggregate bovine mortality. HS is estimated to be responsible for animal death in India resulting in losses exceeding ₹ 10 million annual, and is endemic in India with most of the states reporting its occurrence. In Asia alone, more than 1 lakh bovines die of the disease. Buffaloes are more susceptible as compared to cattle, sheep and goat for this disease. Hemorrhagic septicemia or pasteurellosis is probably the most serious disease of buffaloes and the death rate in buffaloes is three times than in cattle (Bain *et al.* 1982) and 30 000–50 000 animals die annually in India (Dua 2003). According to Singh and Prasad (2005) Indian losses 204.17 lakh rupees annually due to HS while Singh *et al.* (2008) calculated economic loss of more than ₹ 225 million annually due to this disease.

Losses due to pestes des pestis ruminants (PPR) : PPR, an important disease of sheep and goats, causes huge economic losses in India due to high mortality and morbidity of the affected animals (goats) in the endemic regions and is considered to be one of the main constraints in improving small ruminant productivity (Rajak *et al.* 2005). Several outbreaks of PPR were reported from various states during 1994 (NPRE 1995) and is now enzootic in several states of India. The mortality rate is 60–80% and kids over 4 months and under 1 year of age are at highest risk and cause huge economic loss (Venkataramanan *et al.* 2005) per year to a tune of around 1 800 million Indian Rupees (US$ 39 million) annually (Bandyopadhyay 2002). According to Singh and Prasad (2005) a loss of ₹ 653.20 lakh occurred due to PPR. Thombhare and Sinha (2009) reported that the total loss due to this disease is ₹ 918 in sheep and ₹ 945 in goats on the basis of meat price, weight reduction during the outbreak, number of days of illness, reduction in the market value, reduced price due to abortion and reduction in the quality of wool/hairs for estimating the production losses due to disease.

Losses due to Swine Fever: A research study on the economic losses due to swine fever in organized farm at IVRI, Izatnagar during the period from 1997–2007 revealed a loss of ₹ 123 000 due to mortality, morbidity, treatment cost and replacement cost (Tiwari 2009).

Loss due to bluetongue: BT, an arboviral disease caused by bluetongue virus (BTV) — which naturally infects domestic (sheep, goats, cattle) and wild ruminants, camelids and elephants etc.—, is characterized by the catarrhal stomatitis, rhinitis, enteritis and lameness. Bluetongue is transmitted by several species of culicoides (biting midges). BT is an economically important disease of ruminants for several reasons and is inflicting great economic losses to livestock industry in India and different parts of the world. These losses are attributed primarily to mortality and high morbidity, including abortion, milk, meat and fleece losses in sheep. Worldwide losses due to BTV have been estimated to be US$ 3 billion/year.

Loss due to mastitis: Mastitis is a most economically important management disease of dairy animal causing great economic losses to the nation. Blosser (1979) reviewed the main factors for economic losses due to mastitis are discarded milk, decreased sale value, reduced production, treatment and replacement costs, cost of veterinary services and extra labour involved. The National mastitis council (Costello 2004) estimated that economic loss to the US dairy industry is around $185/cow/year. In India economic losses due to mastitis are estimated at US $ 526 million annually (Varshney and Naresh 2004). Singh and Singh (1992) estimated a loss of ₹ 1 607.20 crores due to bovine mastitis in India. Clinical mastitis in dairy cow for 100 days caused a loss of ₹ 780 (Venkatakrishnan 1997) for the treatment and losses due to reduction in milk yield. However in India, annual economic losses incurred by dairy industry on account of udder infections were estimated to be about ₹ 6 053.21 crore. Out of this, loss of ₹ 4 365.32 crore (70% - 80% loss) was attributed to sub clinical version of udder infections (Dua 2001).

Losses due to brucellosis: Brucellosis infection (placentitis, abortion or still birth in last trimester of pregnancy and orchitis in livestock) has an important economic impact since it causes reproductive and production losses in cattle and small ruminants besides causing a chronic debilitating illness in people in contact with infected animals and consuming infected dairy products (Sharma and Mishra 1987). According to Kollannur *et al.* (2007), an annual loss in India due to this disease is US $58.8 million. Schewabe, a WHO consultant estimated an annual loss in India to be

₹ 240 million in livestock and 120 millions in human beings. In India, brucellosis costs ₹ 350 million in the form of food animals and man days of labour. Moreover, there are losses due to abortion in the affected animal population, loss of progeny as well as reduced milk production. Human brucellosis is causing physical incapacity and loss of 3 million man days of labour annually.

Losses due to tuberculosis: The disease has an adverse effect on health, production and reproduction and is highly contagious in animal and human beings. The morbidity rate is 20–50% but mortality rates are 60–80%. The average incidence of this disease in highly affected organized dairy farm as high as 60% however according to WHO the worldwide prevalence of tuberculosis is 5% and approximately 30% cattle lose their power of production.

Losses due to paratuberculosis (John's disease) : The infection has almost become endemic causing heavy economic losses (Tripathi 2008) due to ill health, poor growth and reduced productivity and working efficiency.

Losses due to Japanese encephalitis (JE): In India, it is a disease of rural areas and people of lower socio-economic group. There is high mortality in piglets with a huge economic impact in swine market. In equines there is 2% morbidity during outbreak and mortality is up to 5%.

Losses due to Swine flu: The first case of H1N1 infection in India was reported on 16 May 2009 when a 23-year-old infected student arrived in Hyderabad from US. The first case of human-to-human transmission of swine flu in India was reported on 8 June 2009 in Hyderabad. The swine flu death toll has reached 1 152 with more than 28 401 cases in India (Wikipedia, Country Statistics as on 22 January 2010).

Losses due to rabies: In case of rabies there is 100% mortality. In India, rabies is estimated to claim about 20 565 human lives (36% of global cases) annually**.** The human and animal rabies causes in the country costs ₹ 300 and ₹ 100 crore, respectively (Garg 2007).

Losses due to sheep/goat pox: Sheep pox remains most important viral disease resulting in heavy economic losses, through causing higher morbidity and mortality in sheep (Mullick 1988, Carn 1993). Garner *et al.* (2000) found an average morbidity of 63.50% and mortality rates of 49.50% in Maharashtra. According to Senthilkumar and Thirunavukkarasu (2010), average annual loss due to sheep pox was ₹ 2 908.17, ₹ 4 662.18 and ₹ 5 599.06 in small, medium and large farms, respectively. Existence of this disease also results in heavy trade restrictions in mutton trading countries and thus loss of revenue (Singh *et al.* 1979, Kitching 1986). Similarly goat pox is also a major threat to goat Industry in India (Nandi and Rao 1997).

Losses due to calf mortality: The problem of neonatal mortality is higher in crossbred animals than in indigenous cattle and results in severe economic losses. High losses of young calves occur due to inadequate management practices leading to diarrhoea (House 1978, WHO, UNICEF Report 1983), pneumonia, dehydration and infection by *E. coli,* rotavirus, *Salmonella* species and *Pasteurella haemolytica* (Razzaque *et al.* 2008). Sharma *et al.* (1984a) reported the serious causes of calf mortality as scour/gastroenteritis (26.43%), milk indigestion (21.83%), pneumonia (13.79%), pneumoenteritis (8.04%) and ascariasis/coccidiosis (6.9%). The report also estimated calf losses due to HS/FMD (4.6%), septicaemia (3.45%), weekness and debility (3.45%), joint/ naval ill (2.30%) and other causes (9.20%). The major factors of neonatal calf losses (Sharma *et al.* 1984b) including prenatal (Sharma *et al.*1984c) and perinatal losses were abortion followed by premature/stillbirths and congenital malformation. Pathak *et al.* (1984) reported the significance of underweight birth of calves in dairy economics.

Unless sincere efforts are made, prevention and control of common diseases like Foot –and– mouth disease, mastitis, haemorrhagic septicaemia, brucellosis, tuberculosis, paratuberculosis, IBR, leptospirosis, anthrax, black quarter, tetanus, rabies, pseudorabies, PPR, swine fever etc. of animals, the country is far away from achieving the optimum targeted production of 160–170 million tones of milk by 2020 *(The Cattle Site News Desk).* Hence, it altogether implies that livestock health management should be the most important focal point for enhancing the livestock productivity leading ultimately into the improved socioeconomic condition of majority of the population of this country.

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