Chapter 1

Introduction
CHAPTER – I
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The dairy sector in the India has shown remarkable development in the past decade and India has now become one of the largest producers of milk and value added milk products in the world.

India has large share of the world’s cattle (15 per cent) and buffalo (53 per cent) populations and most of these are milk cows and buffaloes. Though, India stands first in milk production but it is attributable to larger number of milch animals rather than production per animal. The average milk production by a cow and buffalo is 2.3 and 3.5 kg / day, respectively, which is very low as compared to Western countries. Livestock sector has got high potential to sustain the Indian economy by increasing the production from this sector. The annual rate of growth in milk production is between 5-6 per cent, against the world at 1 per cent. Despite the high growth rate in production, the per capita availability of milk is very low (245 gms per day) than the world average. The main reasons for the low yield are the existence of millions of small scale dairy producers who do not use modern scientific management practices, poor genetic potentials of livestock, insufficient health cover, inadequate availability of fodder in all the season which leads to nutritional deficiencies. All these factors directly or indirectly influenced the productive and reproductive process of the dairy animals. Among these, nutritional deficiency, specially deficiencies of minerals contribute one of the major role in health, production and reproductive potential of dairy animals.

All animal and plant tissues contain minerals or inorganic elements in widely varying amounts and proportions. Basal metabolism, growth, pregnancy, lactation, wool growth, reserve deposition and reproductive cyclicity are important physiological functions in order of priority (NRC, 2001). Based on metabolic function, at least 15 minerals are regarded as essential (Spears, 1999) and required for the normal functioning of essentially all biochemical processes in the body and support adequate growth, reproduction and health of livestock. Thus, status of micro and macro minerals in animal body is the mirror image of the health, growth and
production ability of livestock. Therefore, mineral deficiencies have a marked effect on productivity, particularly reproductive performance and health.

The plants derive their minerals from soil and the animals from the plants/feed they consume. Plant mineral content virtually depends on type of soil, plant species, stage of maturity, pasture management and agro-climatic conditions (Mc Dowell et al., 1993). Low concentration of a particular mineral in soil will lower the mineral content in plant grown on such soil. The availability of mineral in soil depends upon their effective concentration in soil solution (Hockstra, 1973), which is influenced by pH, moisture, organic matter, leaching, erosion, evaporation, salinity/sodicity of soil (Burk, 1978), application of pesticides to soil, fertilizers, manures and sludge, aerial fall out from industry and transportation (Horvath and Reid, 1980). Thus, there is direct interrelationship between soil, plant and animal (Prasad et al., 1999).

Majority of the Indian livestock derive most of their mineral nutrients from the feed/fodder and crop residues available at the farm, there by directly depending on a particular type of soil. Tropical animal husbandry is mostly semi-intensive. In tropical countries animals are fed on crop residues, natural grasses, tree leaves and shrubs, in which mineral is generally low and their availability to the host is not known (Ibrahim et al., 1998). The small holding livestock system is dependant mainly on grazing and crop residues as source of dry matter. Mineral imbalance is quite common in this system and there are evidences of trace mineral deficiency/excess in different regions of the country (Chhabra et al., 1991 and Prasad et al., 1995).

Nutrient composition of feed/fodder and crop residue, especially micronutrients, depends on soil. Thus, mineral deficiencies or imbalances in soil and forages have long been held responsible for low production and reproductive problems among grazing tropical cattle. It is well known that micronutrient deficiency even sub-clinical can have a marked effect on animal performance. Prolonged feeding of diets low in minerals, exhibiting sub-clinical and clinical syndromes like loss of appetite, unthriftyness, rough hair coat, pica, tetany leading to non-infectious abortions, anaemia, bone abnormalities, low fertility and drop in production. The mineral deficiency disorders and decreased productivity of farm animals are found to be mostly area specific and in most cases it differs from one region to another region.
due to different soil composition, intensity of cropping, precipitation pattern and soil erosion pattern etc. The mineral deficiency syndromes in animal can only be corrected by suitable supplementation of specific mineral. Therefore, it is necessary to have detailed survey information on the micro-macro mineral profile of soil, feed and fodder and in animals in different agro-climatic zones. This will enable to identify the extent of deficiency of minerals and practical ways of supplementing them through mineral sources. Most practical and cost effective method of supplementing the deficient minerals through strategic measures using area specific mineral mixture by assessing the mineral status in soil, feeds/fodder and in animals in different agro-climatic zones. Therefore, there is ample scope for utilization of area specific mineral mixture for balancing the deficiency, meant for the exploitation of optimum production potential of farm animals. This approach will improve the reproductive efficiency, good health and ultimately enhance the production, which has a significant bearing on the economy of the farmers.

It is reported that, salinity and sodicity of soil adversely affects the availability of micronutrients to the plants. It is estimated that 3% of the world’s agricultural land is salt affected. In East Asia, however, the proportion is 6% and in south Asia 8% for the arid and semiarid tropics, as a whole 12% of the agricultural land may be affected. About 0.54 million hectares of black soil in Maharashtra are reported to be salt affected.

In Vidarbha region of Maharashtra State, the Purna river valley is the unique tract of vertisols having native salinity/sodicity. It is an east west elongated basin with slight convexity to the south, occupying the part of Amravati, Akola and Buldana districts of Vidarbha and extend from 20° 45' to 21° 15' N latitude and 75° 15' to 77° 45' E longitude with east west length of about 100-150 Km having with about 10 to 60 Km, with an area of about 2.74 lakhs hectar and spread in 547 villages (Fig.1). These soils have appreciable amount of CaCO₃ (Sagare et al., 1991) and precipitation of Ca in the form of CaCO₃ which greatly immobilizes Ca and Mg in these soils and dominance of Na is increased which affects the physical and chemical properties of soil adversely. The ground water which is also alkali in nature makes the situation more problematic (Sagare et al., 2000). It has been reported that the salinity of soil affects the crop yield and interferes the uptake of nutrients to the plants. Intensive research related to soil characteristics and yield of crops and its
management have been already conducted by several workers (Sagare et al., 1991 and Babhulkar, 1999). However, very scanty information is available on the macro-micro mineral profile of soil, fodder/feed in this area. The research on impact of salinity on production performance and health status of animals in this area has not been undertaken so far, however, the occurrence of metabolic and reproductive disorders have been reported in this area.

In view of the fact, the present study was undertaken to estimate the status of micro-macro mineral in dairy cow as influenced by soil-plant relationship in saline affected villages of Akola district and impact of salinity on production performance of animals in this area. The mineral profile of soil, fodder and animal helped to identify the mineral deficiency/excess causes of low productivity of dairy cows. The therapeutic study was carried out in cows by supplementing formulated area specific mineral mixture to optimize the production of dairy cows of saline tract area of Akola district. The study also provided baseline data to promote efficient and profitable livestock production in dairy cow herd. The performance was assessed on the basis of improvement in milk production and serum micro-macro mineral profile of dairy cow herd after supplementing area specific mineral mixture.

Thus, the present study is planned with the following objectives.

1. To study the micro and macro-mineral profile in soil, fodder and serum of dairy cows in some saline affected villages of Akola district.
2. To investigate the micro and macro-mineral deficiency existing in cows maintained in saline tract area.
3. To establish the soil-plant-animal relationship in saline tract area of Akola district.
4. To study the impact of saline tract of Purna river valley on production performance of dairy cows in Akola district.
5. To assess the improvement in production performance of dairy cow herd after strategic supplementation of area specific mineral mixture.