ABSTRACT

Land and water are the two basic natural resources for survival of living systems. These two resources have been interacting with each other in various phases of their respective cycles. The future of the nation depends largely on effective utilization, management and development of these resources in an integrated and comprehensive manner.

Today, Environmental pollution is a major concern all over the world. Especially India is heading towards a freshwater crisis mainly due to improper management of water resources and environmental degradation, which has led to a lack of access to safe water supply to millions of people. This freshwater crisis is already evident in many parts of India, varying in scale and intensity depending mainly on the time of the year. When sources of pollution are enumerated, agriculture is, with increasing frequency, listed as a major contributor. Agricultural activities can contribute to deterioration in soil and water quality through the release of several pollutants such as pesticides, animal manure, fertilizers, sediments (due to Siltation), and other sources of organic and inorganic matter. Soil and water resources are two indispensable components of agriculture. Their conservation and management is fundamental to enhancement of productivity in agriculture.

Depending on the type of nutrient and the existing soil conditions, different kinds of fertilizer inputs are required in order to maintain a given level of soil fertility. Organic fertilizers containing high proportion of water, such as liquid manure or slurry disturb the physical properties of soil. However, in recent years there has been increasing concern about the quantity of mineral fertilizers used in agriculture and its adverse effects on the environment. Attention has been drawn to the fact that when nutrients are applied to crops, all are not taken up immediately and also some farmers apply inappropriate quantity due to lack of awareness.

The nutrients applied may leach over a period of time to the environment and such losses occur due to:

- Runoff as a result of erosion;
- Leaching, beyond the root zone, eventually reaches groundwater;
- Escape to atmosphere as volatile gases
Impacts of agriculture on water quality are diverse. In addition to problems of water logging, desertification, salinisation, erosion, etc., that affect irrigated areas, the problem of downstream degradation of water quality by salts, agrochemicals and toxic leachates is a serious environmental problem. "It is of relatively recent recognition that salinisation of water resources is a major and widespread phenomenon of possibly even greater concern to the sustainability of irrigation than is that of the Salinisation of soils. Indeed, only in the past few years has it become apparent that trace toxic constituents, such as Se, Mo and As in agricultural drainage waters may cause pollution problems that threaten the continuation of irrigation in some projects".

Food production by the agricultural sector is unfortunately associated with nitrogen (N) and phosphate (P) losses to ground water and surface water, sometimes resulting in water quality standards being exceeded. The increased nutrient loads in waters can damage public water supplies, through too high nitrate concentrations, and surface water quality as a result of eutrophication processes. In many countries, there is much concern about the impact of agricultural activities on environmental quality, and therefore responsible politicians and farmers have to develop strategies for the reduction of nutrient losses from agriculture. This is not an easy task because the relation between agricultural activities and environmental losses is rather complex.

The extent of nitrogen and phosphorus losses from agricultural soils depends on factors such as crops grown, amounts of slurry and mineral fertilizers applied, time and technique of application, soil type, hydrological characteristics and weather conditions.

Agricultural pollution is both a direct and indirect cause of human health impacts. The WHO reports that nitrogen levels in groundwater have grown in many parts of the world as a result of "intensification of farming practice" (WHO, 1993). This phenomenon is well known in parts of Europe. Nitrate levels have grown in some countries to the point where more than 10 % of the population is exposed to nitrate levels in drinking water that are above the 10 mg / l guideline. Although WHO finds no significant links between nitrate and nitrite and human cancers, the drinking water guideline is established to prevent methaemoglobinaemia to which infants are particularly susceptible.
In India application of chemical fertilizers and pesticides is still low compared to developed countries, and while eutrophication due to high levels of washed-off nutrients is observed in rural ponds and other stagnant bodies of water receiving agricultural drainage, and excessive pesticide residuals are often reported for vegetables, fodder, milk, etc., monitoring of streams and rivers does not show any significant pollution due to nutrients or pesticides from agricultural diffuse pollution during fair weather months. High nitrate concentrations have been reported in ground water and in many areas, such as Punjab and Haryana, these can often be linked directly to diffuse agricultural sources. The major problem of agricultural diffuse pollution appears to be the heavy silt loads, along with large quantities of dissolved salts, nutrients, inorganics and even heavy metals and bacterial contaminants washed off during floods. The silt tends to clog up the flow channel to further encourage seasonal floodplain agriculture. This result in a vicious circle, which degrades the channel, increases food-damage and is undesirable from ecological and sustainability points of view. High concentrations of salt and nutrients encourage growth of weeds and macrophytes after the floods have passed. The presence of organics, heavy metals and bacterial contamination renders the stream water unfit for in stream use or abstraction.

Therefore, the need of the day is studying of impact of irrigation return flows on such surface soil and water quality to protect our environment from any serious deterioration, to address this problem the only solution is the data establishment. A common observation among water quality professionals is that many water quality problems especially in developing countries produce data that are often quite unreliable. Further the data are not assessed or evaluated and are not sufficiently connected to realistic and meaningful programme, legal/management objectives.

Thus the present research work “Studies on Impact of Modern Agricultural Practices on Soil Environment and Receiving Water Bodies in Haveri District” was carried out to visualise impact of agricultural activities on surface and subsurface water quality and soils down the agricultural lands of the study area. compounding these factors into consideration the objectives of present research work were defined, samples were collected, analysis were carried out to meet the objectives, based on the results of experiments the inferences and conclusions were drawn. For convenience and clarity of presentation the subject matter has been divided into following chapters:
The Chapter I emphasizes the introduction part of research work. It encompasses the scope of research work, the major objectives followed by specific objectives.

In Chapter II an attempt has been made to collect study and collate the research carried out by researchers across the globe, the discussions on issues related to research topic are also incorporated in this chapter. The subject matter covered in this chapter include agricultural pollutants with an in depth emphasis on nitrogen and phosphorus, factors affecting runoff, impact of agricultural practices on surface and subsurface water, impact of landuse on water quality, measures to reduce agricultural runoff, economic implication of modern agricultural practices, etc.

Chapter III discusses various materials and methods used in the research work along with summary of experimental conditions adopted to achieve stated objectives of the study. It includes the description of study area with reference to geographical location, geomorphology, occurrence of ground water, soil types, agricultural practices, seasons considered for study, Identification of sampling stations, collection of samples, and methodology adopted for analyses of samples are also documented in this chapter.

Chapter IV documents the results of experimentations, discussions made and inferences drawn, the highlights of inferences drawn based on analysis of results are summarized as below.
➤ At all the stations considered for all the parameters, accumulative trends of parameters from season to season have been observed.

➤ The higher the concentration of quality parameters during Pre monsoon - 1 and Pre monsoon - 2 was found to be due to lesser quality of water available in lakes compared to the Post monsoon season.

➤ Further higher concentration of quality parameters recorded during Post monsoon season compared to Pre monsoon - 1 is attributed to two factors namely much storm water runoff join these lakes from agricultural fields and dilution due to more quantity of water in lakes.

➤ Variation in water quality parameters in one season at different sampling stations was found to be due to catchment area of these lakes, soil type in catchment area, topography of catchment area, crop pattern and fertilizers usage.

➤ For any lake considered very good correlation between related parameters have been observed which speaks that results of analysis are acceptable.

➤ The water samples were found to be rich with phosphorous compared to potassium. Further it was inferred that these concentrations noticed are inversely proportional to their concentrations in soils. Even though the quantity of potash and phosphorous applied for the crops cultivated in study area (Byadgi taluk) was same the reason for this difference in concentrations was attributed to uptake characteristics of phosphorous and potash by crops. The phosphorous uptake by the crops by principle will be more as it is required for roots development and potassium requirement will be less as it is required for grains development. The superimposition of values of these two parameters present in soil, again confirmed the crops uptake behavior where in soils were found to be rich in potash compared to phosphorous.

➤ The maximum concentration of TDS and total hardness and thereby the EC value was recorded in subsurface source surrounding the lake at Honnatti. The subsurface water quality surrounding Asundi Lake exhibited lower concentration of these parameters. 417 mg / l, 218 mg / l and 645 µs were the TDS, Total hardness and EC concentrations.
corresponding to Asundi and the values corresponding to Honnatti were respectively 761 mg / l, 400 mg / l and 1172 µs.

During Post monsoon season highest 29 mg/l and lowest of 11 mg / l nitrogen contents in water of Asundi and Kudhirihal lakes were observed. These Soils also recorded concentrations of Phosphorous, sodium, potassium and chlorides having the trend same as that of nitrogen. The maximum concentration of 14.26 mg / l, 23.57 mg / l, 48 mg / l and 211 mg/l of P, Na, K, and CL were recorded. Accordingly lower concentrations respectively were 11 mg / l, 0.65 mg / l, 0.60 mg / l, 19 mg / l and 83 mg/l. The lake waters during Pre monsoon - 2 seasons exhibited the following sequence with respect to chlorides concentration.SR1 > SR2 > SR7 > SR4 > SR9 > SR8 > SR3 > SR5 > SR6.

Chapter V lists major conclusions drawn based on the experimental studies, results obtained and analysis of the same. It also includes limitations and recommendations for further research work.

The list of references includes relevant and latest research papers, articles and technical reports collected, collated, discussed and referred to in text of this thesis.