GENERAL CONSIDERATION

Biological diversity means the "diversity of life" itself (Wilson,1992). Biodiversity participates in renewal process and ecosystem services which are largely biological; therefore their persistence depends upon maintenance of biological diversity (Altrieri, 1984). There is great concern over the rapid depletion of word' s biological resources and the implications of this loss for the global biosphere. Like, many of the ecosystems are loosing their biodiversity as a result of large scale intervention made by human being (Rudd, 1984). This loss and modification of ecosystems and habitats are also occurring at an alarming rate, which are more difficult to quantify or estimate on a global scale. A major danger is that the continuing loss of our biological wealth will leave us not only with a smaller but also a much less "varied" stock of biological resources.

In Agricultural ecosystem, biodiversity is affected perhaps by having more human activity and have caused an adverse impact on population dynamics of several organisms. The wide spread introduction of high yielding cultivars and adoption of monocropping tends to reduce the overall health of the ecosystem and also leads to increased incidence of pest that feeds on grains or fruits and make all agriculture suffer from pest attack. To combat this pest problem, with the rise of modern agricultural science, chemical pesticides were developed to get crop free from pest

Earlier chemical pesticides developed were of broad spectrum, affecting a wide range of organisms It was certainly effective in controlling the pest, but in addition, it affected the beneficial organisms as well, and thus was not much used. The development of organic pesticides began with the end of World War II. When, DDT and other chlorinated hydrocarbons, including endrin and dieldrien were discovered. The discovery of DDT brought

revolution in chemical pesticides. At first DDT was thought to be long sought magic-bullet and appeared to have no short time effect on people inhaling (workers) and seemed to kill only insects. Thus DDT was used widely at large scale, until the toxicity of DDT to animals was known and its accumulation in their tissues. The intake of DDT and its metabolites affected the reproduction success in the birds of higher trophic level such as Bald Eagle, Osprey and Pelican. As a result of these problems, DDT was banned in most developed countries in 1971. Since then there has been recovery in the population of affected birds like brown Pelican of the California coast, which had become rare, showed dramatic recovery in the population.

DDT is still being produced for use in developing and less developed nation, because it is cheap and effective. These pesticides specifically are produced to control agricultural pest and thus enters in the environment Also, the indiscriminate use of pesticides led to disturbance in natural balance of ecosystem, there by increasing the risk of toxic hazards. Thus the regulation of pesticides dose not focus solely on assessing the toxicity but also managing the risk controlling the exposure of non-target organisms, which needs to develop awareness among the user group. Lack of support from the local community may indicate failure to comply with pesticide regulations. However, no policy can replace a good grower-education system in promoting sound environmental protection.

To initiate with the present scenario of pesticide use, a process documentation research was designed to know the impact of agricultural and trade policy and the individual farmer' s background (i.e. economic status, scientific orientation and knowledge, socio-economic status, attitude towards the adoption of IPM) on magnitude of pesticides used by them for pest control. The study reveals that the policy for agriculture and trade had an immense influence on the utilization of the pesticides. The

constant encouragement for maximizing the use of agricultural input have shown 32 times rise in the pesticide use in the country than it was in its introduction phase. Also, the crops to be exported the maximum consumption was 45 % total pesticide used in the country (Singhal *et al.*, 1999). This indicates that to reduce the pesticide use in agricultural crops there must be cordial and favorable agricultural and trade policy. When checked about the impact of individual farmer' s background and the use of pesticide for pest control indicated that the farmers comparative less educated, economically sound, but having low scientific knowledge and orientation about the pest control, uses more pesticides per hectare. So, it requires making our farmers more knowledgeable about pest control and aware of adverse impact of the pesticides. In a case study on awareness about IPM program for farmers of Kheda district have shown that 61.67 % paddy grower have low level of awareness about IPM program and from the study carried out it is clear that maximum input of chemical is by the certain group of the farmers which should be given the training of IPM Simultaneously the study also required to find out which groups of the farmers are more adoptive and will be implementing well the IPM program Thus it is suggested that to save wildlife dwelling in the agricultural landscape, the first step is to reduce pesticide load in the environment by implementing intensive IPM program through training to the farmers.

Birds are important and visible part of our environment. Traditionally they have been used as sentinels of general environmental quality (Diamond and Fillon, 1987) and a large body of literature exists on avian toxicology. However, given their mobility, it is difficult to protect or exclude them from areas that are being treated with pesticides. These birds are particularly sensitive to some of the more toxic classes of pesticides (Walker, 1983) and their reproduction has been found to be affected by organochlorine pesticides (Burgal_Sacaze *et al.*, 1990).

Agricultural landscape of our country provides habitat for a wide array of bird species. Thus it is not possible to assess the pesticide residues in all the birds' species existing in the area of investigation. Hence the proper selection of key species for assessing pesticides residues in the environment and its impact on the biota become all the more important. As these species selected are most sensitive to chemical contamination and ecologically more susceptible to such exposure. Thus, generic birds should be considered for an initial assessment and for refined assessment, indicative key species that represent those which are most at risk with respect to the selected area under study. Again the avian species that are dependent either directly or indirectly on agricultural area for food (seeds and insects) are treated with pesticides. Keeping this fact in mind, to study the effect of organochlorine pesticides on avian community, it was necessary to recognize the few key specie to fulfill the objectives.

An agricultural field provides feeding ground to many of the birds' species, where the frequency and the way of utilization of agricultural area by birds vary from species to species and as a result the exposure to pesticides also varies with the species. It was necessary to identify the key species for assessing the risk of pesticide. Most studies of birds preying on insect pest in India do not clearly indicate their role in agricultural pest control or the accumulation of chemical in their body due to adaptation to such habitats. To ensure our findings the food and foraging ecology of the selected key species were carried out, which indicate that they are most vulnerable to pesticide risk. The Cattle Egret is mostly associated in all the agricultural operations. Also, the Cattle Egrets breed and feed in the agricultural area and are also the opportunistic feeder, found largely feeding on the insects (preferably target pest) which is well represented in the data (food analysis) having highest relative index of importance compared to other taxa in the diet. The species exhibits all the criteria

recommended by EPA for selecting the key specie. Looking to this fact Cattle Egret was considered as one of the major key species to identify agricultural chemical risk. And also can be used as an agent for natural suppression of pest population as a part of IPM.

The Black-throated Weaver Bird is another predominant species in the study area and is closely associated with the agricultural field basically for foraging, breeding and roosting. They frequently occupy the cropped area for different activities. Present study indicates that the adult Black-throated Weaver Bird' s diet mainly depends on availability of various food grains. Till today there is no report of these birds being resistant to the pesticides, so they are at the risk and this high toxicity of pesticides might perish these birds in future and affect the agricultural ecosystem and their food web. Also, the species has exhibited all required criteria proposed by EPA to select the key species for pesticide hazard assessment.

To strengthen our hypothesis or to establish a perfect link between the food and its contamination with pesticides, the residue analysis of the organochlorine pesticide concentration in the body tissues of key bird species was performed. Results reveal that current level of the organochlorine pesticide residues in body tissue was below the critical level of contaminant, which could cause adverse effect to the individual or population. However, it is alarming to conservationist that current level residues found in indicator species may reach to lethal in future if, preventive measures are not taken immediately. So, it is required to monitor these contaminants in indicator species and simultaneously efforts should be taken to reduce the contaminant level in the environment.

To assess whether these pesticide residues have any adverse effect on reproductive success of the birds, the organochlorine pesticide residue analysis and morphometric study was carried out in the first laid eggs of Cattle Egrets from monitored nests. In the present study, the residue level

was lower in all the eggs than the critical level of each contaminant. The shell index was negatively correlated with DDT and its other metabolites, HCH and linden. The organochlorine contaminant has definitely altered the eggshell index, but not so significant. Also, the impact of organochlorine pesticides contaminants suggested that the current level of residue do not cause any adverse effect on the reproductive success.

Residues of organochlorine compounds (like DDT, DDD, DDE, HCH and Linden) are believed to be additive in assessing the degree of danger in interpreting concentration in the brain with regards to the lethality. The existing use of DDT in this region is evident from the study. So it is suggested that to reduce further load of organochlorine on environment, the illegal use of DDT in the area should be stopped.

It is well established that compared to terrestrial birds, the wetland dependent birds show more tendency of pesticide biomagnification in their body tissue. To accomplish with this fact the fish eating birds are at the higher risk, to the exposure of the pesticide through contaminated water and food, which gets polluted through pesticide drift from the agricultural area. Therefore a case study on Little Cormorant was done which suggested that food item, body tissue and the eggs were contaminated with organochlorine pesticides and the amounts of residue detected in body tissue was higher than the level in the food, which showed the bioaccumulation of pesticides from the food base. Most of the residues in the egg were higher than in the body tissues and the level showed negative correlation with eggshell thinning. The results obtained were not significant due to small number of sample studied. The large number of samples would definitely give conclusive results. The wildlife protection act (1972) prevented in taking more samples, which are needed to find out the reasons for population decline, which is evident from percentage

difference in number of heronries occupied by little cormorant in year 1999 and 2000.

Looking on to the above facts of pesticides use and its impact on environment, it can be suggested that further detail investigation on same line is required from different part of the country to have the conclusive effect of the organochlorine pesticides on avian community and its habitat. At the same time, to minimize the damage to wildlife and its habitat one requires to use eco-friendly pesticide. For that approach one should follow the recommendation given by Mineau and Keith, 1993.

Future prospects

The current study has indicated that selected pesticide compounds have little adverse impact on the avian community. However, in this study very few compounds were considered from the long list of pesticides registered for pest control in our country. Other compounds requires evaluation for their effect on non-target organism in addition to their action on target organisms keeping following points in mind.

1 Continuous monitoring of the hazard caused by pesticides to the non-target organisms is required in one or more way as suggested below:

- Recording the events of wildlife mortality due to pesticides.
- Monitoring of the pesticide residues at tissue level in the selected key species.
- Monitoring the population fluctuation of selected key species in relation to pesticide residues at tissue level or its enzyme inhibitory effect.
- Monitoring of the pesticide utilization pattern and its trend

- The compound specific enquiry for potentiality to damage the ecosystem should be made before the introduction of new pesticides.

2. Promotion of IPM strategy for combating with current pest problem
3 Special agricultural policy should be formed to favor the *in situ* conservation of biodiversity.
4 Pesticide act should be enforced strictly to check the entry of new hazardous pesticides in the agricultural ecosystem.
5 The pesticide trade should be regulated through separate trade policy.
6. Field studies on pesticide efficacy testing should also evaluate the impact of the pesticides on non-target organisms.