PREFACE
Man has been dependent on forests right from precivilisation days. Forests have provided man with his basic needs of food, shelter and water. Forests are known to prevent soil erosion, wind erosion, conserve and recycle water, maintain carbon dioxide balance and also serve as the storehouse for genetic diversity. The forest based industries such as paper and pulp, veneer and plywood, lumber and timber and the industries engaged in distillation of wood to derive many chemicals used as raw materials, in various other industries form the backbone of modern economic development to millions of people all over the world. Forests are not only important for their economic utility but also influence the psychae and social life of mankind.

Man started exploiting forests for economic development at an early stage in human history. As agriculture expanded, forests were considered as rivals for the space needed for crops and flocks and were cleared for agricultural pursuits. So much so the overexploitation of forests are said to have resulted in the extinction of many well-developed and flourishing ancient civilizations. The rolling seas of sands, resulted from soil erosion and aridity owing to extensive deforestation were predicted to have engulfed the colonies of great Indus valley civilisation at Harappa and Mohanjo-Daro. In Greece, Anatolia, Spain and Iraq, the destruction of forest is known to have interfered with their climate and with the moisture content of soil on which, in the ultimate end every nation depends (Singh, 1987). Deforestation has been credited with being one of the principal causes of doom of Roman civilization and prosperous nations associated with it. It may not amount to exaggeration if deforestation is said to have done more damage than any war, destroying great historical empires.

The causes of deforestation are clearance of forests for farming, firewood, industrial and commercial purposes, mining operations and development projects like construction of townships, roads, railway routes, power plants, etc. Deforestation lead to reduction in green cover that used carbon dioxide for photosynthesis. On the other hand release of huge amount of carbon dioxide in atmosphere by human activities resulted in,
greenhouse effect/ global warming, melting of ice caps ultimately causing soil erosion, floods, draughts, and destruction of biodiversity. Naturally if man has to escape from this impending environmental crisis then the solution lies in intensive afforestation/plantation programmes.

For a satisfactory ecological balance it is estimated that about 33% of the land need be under the green cover of the forests. Though plantation practices were introduced in pre-independent India, the practice got a boost with the initiation of five-year plans. However as late as 1990 only 21% of the total geographical area of our country was covered by forest (Ray & Mandal, 1990)

Therefore, it is obvious that the large scale growth/ expansion of agroforestry plantations are critically important if not indispensable for meeting the national needs of timber and non-timber forest products, conservation of biodiversity and achieving the national goal of 33% forest cover.

Monoculture plantations are uniform agrosystems that substitute natural ecosystems and their biodiversity, either in degraded zones of natural forest or in grasslands. When natural ecosystems are substituted by large-scale tree plantations, it is believed that they usually result in negative environmental impacts: decrease in water production, modifications in the structure and composition of soils, alteration in the abundance and richness of flora and fauna (Shiva, 1993). Pramod et. al. (1997) based on their studies on Western Ghats concluded that the transformation of forest/grasslands into monoculture plantations lead to most serious loss of biodiversity.

However some studies in the past (Gray, 1974) have suggested that monoculture stands can support better stand for avifauna. Thus extensive controversies surround the monoculture plantations. At the same time conditions vary with geoclimatic zones, thus, making it difficult to arrive at a conclusion as to the efficacy of the various systems on comparative basis. Some of the studies have recommended improvement strategies to ameliorate the negative consequences, in the form of interplanting of few indigenous species to improve the biodiversity in plantations (Gandhi, 1986).
Cruz (1988) opined that understorey shrubs, vines and the upperstorey of few native trees retained enhanced avian use of monoculture stands.

In Goa plantation operation commenced in 1963, by clear felling the suitable areas. Initially teak, eucalyptus and rubber trees were chosen for the and later acacia, cashew and bamboo were also included in monoculture practices. Cashew, teak and acacia are the three important plant species, extensively used for plantation purpose in the state. Cashew, *Anacardium occidentale* alone covers 11,196 ha area, largest among plantations in Goa. It is one of the important fruit-yielding trees earning a large amount of foreign exchange to the state. Teak, *Tectona grandis* covers 9507 ha, second largest area among plantations. Australian acacia, *Acacia auriculiformis* is mostly used to bring about green cover in barren and degraded areas.

Despite arguments and counter arguments regarding monoculture plantation, we cannot give up this practice, because of its need to fulfil the requirement of forest based products and to maintain ecological balance. Therefore, it is necessary that we develop complete information on the comparative effectiveness of various monoculture systems with definite criteria and indicator parameters such that we can choose suitable type of systems when we are compelled to adopt one. The study may help us modify the chosen system appropriately to overcome the problems associated with these plantation practices.

Birds are good indicators of ecological disturbances. The quality of an environment can be measured by its birdlife, and ecological planning as well as impact assessment can be developed through ornithological studies (Ripley, 1978; Parasharya, et. al., 1995). Most of the available work on the ecology of birds in plantations is from tropical Africa, central/south America and temperate Australia or Sweden (Bell, 1979; Carlson, 1986; Cruz, 1988; Hansson, 2000; Fisher, 2001 and Reversat, 2001). To best of my knowledge, reports on this aspect from our country are in single digits (Gray, 1974; Khan, 1978 and Gandhi, 1986). Khan (1978) worked on teak, eucalyptus and acacia plantations in high altitude montane tracks surrounding sholas of Nilgiri Hills and the study was limited to habitat utility by birds without any detailed studies on associated ecological perspectives.
Gandhi (1986) studied birds in cashew, eucalyptus and casuarina plantations in Tamil Nadu. In view of the taller canopies provided by the plantations chosen for study, comparison made by the author with scrub jungles doesn't seem to have provided good controls. Most of the other studies from India on plantations are forestry based, centered around litter–soil nutrient cycles, often on eucalyptus plantations besides others (Pande and Sharma, 1993; Mohsin et. al. 1996; Misra and Nisanka, 1997; Singh et. al. 1993 & 2001; Joshi et. al. 1999; Jha et. al., 2000; Aweto, 2001). These studies are mostly from Uttar Pradesh and North-East falling in subtropical belts of our country. Very often these studies have not maintained appropriate control systems for comparison.

In this background, the present work was designed to study the ecology of birds in three monoculture plantations, teak, acacia & cashew in the tropical precincts of Western Ghats. Primary natural forest was chosen as a control system for comparison. The study was aimed to compare the plantations through a wholistic ecological angle encompassing plant phenology, undergrowth, litterfall, litter decomposition, litter nutrients, soil nutrients, insect population and avifauna and its habitat utilization. The study was expected to throw light on the efficacy and relative merits of different monoculture systems with bird life at the center stage. It was also desired to fill the lacunae in the information on birds of forest in general and monoculture plantations in particular within the state.