PROBLEMS - RECOMMENDATIONS FOR MANAGEMENT OF LAND RESOURCES TO ENSURE SUSTAINABLE GROWTH AND DEVELOPMENT OF THE STUDY AREA INTO A BIO-ECOLOGICAL REGION

In the entire stretch of the alluvial landform in the study area numerous tanks of all size and shapes are found. There are about 140 tanks in the study area out of which about 86 occur in the Pondicherry region. In olden days these tanks played a vital role in the day to day life of the rural people and was an important source of irrigation and livelihood. Further the tanks provided an unique ecosystem which was rich by itself comprising of plants, water, land and animals each contributing to the ecological chain and contributing to the villagers' requirement.

However, with the passage of time and development of groundwater source the storage tanks have been completely neglected and the entire system has given way to borewell irrigation culture using huge electric power. The tanks have been encroached, not desilted and also the other infrastructures have not been maintained for years resulting in total neglect and are losing their economic utility.

The tank ecosystem is very important for the sustainable growth of villages and its people. Therefore its conservation and development should be given highest priority. The resource inventory of this tank should be updated and necessary conservatory and time bound developmental work should be initiated without any further delay. The conjunctive use of the tank water and ground water for irrigation purpose which was the major contributory factor for the success of agriculture in the study area should be restored. Also, other components like development of suitable social forestry, pisiculture and other
allied activities should be restored and developed for the sustainable growth of the region. The tank system provides water, biodiversity, food, employment and aesthetic beauty to the villages and restoration of this multi beneficial ecosystem will go a long way in the development of the region.

Fortunately, no major expensive factors like land reclamation of new land, changing the characteristics and properties of land or resettlement are required in the study area to develop it. The development of the already existing land uses by making minor changes in the land utilization types and some modifications in land management within the existing land utilization types are the important measures necessary for ensuring proper management and sustainable growth in the study area.

The proposed changes in the land utilization types and management techniques are briefed below.

a) Reducing the cultivation of water intensive crops like paddy, sugarcane and including pulses or green manure crop in the existing paddy based cropping system.

b) Cultivation of crops based on the land suitability, e.g. growing paddy on sandy coastal plain and flood plain should be avoided.

c) Cultivation of crops at appropriate season closely adhering to the climate pattern and to make use of the rainfall.

d) Cultivation of appropriate varieties ensuring that the seed materials are disease free, and certified by the Department of Agriculture.

e) Ensuring proper scientific methods in preparation of land and cultivation practices.

f) Application of nutrients both in the form of organic and inorganic fertilizers. The quantity of inorganic fertilizer should be need based.

g) Alkali and other problem soils should be suitably treated with soil ameliorative measures.
h) Ensuring integrated pest management.

i) Ensuring time bound harvest without wastage of produce and providing good post harvest storage facilities.

j) Ensure profitable marketing of the produce.

The major portion of the study area is fit for cultivation and especially the alluvial landform is highly suitable for agriculture. With all factors favourable to agricultural land use the immediate necessary step to be implemented is the management of land resource. Management of natural resource is essential not only to improve the productivity / living conditions of the local people on a sustainable basis but also to conserve the land resources for the future.

The main objectives of land resource management are to improve utilization of the rainfall by conserving most of it in the soil profile, drain excess water and to store this water for using during non monsoon periods, prevent soil erosion especially the fertile top soil, reducing the siltation of tanks, channels, canals thereby increasing the storage capacity of the natural reservoirs.

However it may not be possible to achieve these objective on an individual basis. The management strategy should be to approach on an integrated holistic approach to develop and conserve the production inputs viz. soil and water. The lands should be used and developed scientifically by initiating treatments based on the condition of the land units, land capability and land suitability classification.

To implement this integrated approach for managing the land resources, the study area should be considered as a single unit for management and its management should be based on the newly developed watershed approach. The individual holding of the farmers should be managed by adopting optimal cropping scheme. Thus the objective of the watershed development approach can be summarized as follows:
a) To effectively conserve soil and rain water and harvest the surplus by suitable water harvesting techniques to enhance/recharge of the ground water resources.

b) To increase and stabilize the crop yields by adopting optimal crop and cropping system and management practices.

c) To enhance the income of individuals by adoption of alternative enterprises.

d) To effectively cover lands not very suitable for cultivation through horticulture, afforestation and pasture land development.

e) To develop and restore ecological balance.

The study area is a part of a vast stretch of land with basin topography with elevation on the periphery and two rivers draining the area, offers an excellent scope for management and development of the area on a watershed approach.

The management of the land resource should be formulated based on the logical framework of the natural physiographic unit. The management techniques and land use to be advocated should be very site specific and has to be decided based on the local condition specifically with reference to the land users.

In the Pondicherry region a major portion of the lands are under alluvial landform, followed by the elevated lands on the northern eastern, northern and north western side and the coastal landform bordering the sea. The alluvial soils are generally used for growing water based crops such as paddy and sugarcane with groundwater irrigation. This sort of monoculture with the soil always under wet condition has resulted in the soil becoming alkaline and less productive. The heavy drawal of ground water especially in the coastal tracts has resulted not only in depletion of water resource but also intrusion of sea water into the groundwater aquifer.
Further in Pondicherry region the majority of the farmers are either small or marginal farmers. The small-scale farm households who have to make their subsistence on food supply for their family are rarely interested in new innovations in cultivation and are rarely willing to take part in any new changes contemplated. The present cropping pattern has been influenced by the soil and water, food crops for self consumption, profitability of crops, availability of loans, inputs and the prevailing government policy.

Since the last decade the agricultural growth in the Pondicherry region has been showing a decline in spite of the huge investments during the preceding five years plan to develop the infrastructure for development of agriculture. Large tracts of good agricultural lands are being converted for non agricultural purposes, the yields of crop seems to have reached a saturation point, agricultural labourers are becoming scarce the profitability of agriculture is becoming a question, increase cost of inputs, declining trend of groundwater potential and total vanishing of surface irrigation system, competition with other enterprises, lack of enthusiasm among farmers. These problems are slowly eclipsing the agricultural development and its status in the region. The recent spurt in industrial and urbanization are the main reasons for the gradual downfall of agriculture.

The problem in agriculture are thus multi faceted and needs a holistic approach to manage them. The water shed management concept will be ideal; the individual landforms should be managed and utilized separately and integrated with the sole objective of conserving soil and water and to derive the maximum benefit on a sustainable basis.

The elevated landforms in the north and north eastern part of Pondicherry region are prone to severe erosion and the lands are dissected with ravines and gullies. Provision of soil conservation measure, contour bending the landscape and growing trees will help to check the soil erosion. The land cover can be strengthened with either locally available grasses or introduced grasses and legumes like kikuju (Pennisetum clandestinum), Stylosanthes hamata and
Stylosanthes scabra. The lands may be generally planted with suitable fruit species like mango, sapota, jack etc. In places where adequate ground water is available cultivation of horticultural crops especially flowering plants can be taken up. The few patches of degraded lands may be developed with silvi-horti-pasture. The existing gullies and ravines may be planted with suitable vegetation to control soil loss and further development of gullies.

The alluvial landform with the storage tanks provides a natural landscape for intensive cultivation of crops. However as mentioned earlier the surface irrigation system comprising of tanks, canals and channels are at present defunct and the entire irrigation requirement is met from the groundwater resource leading to fast depletion of the aquifers. There is an urgent need for restoration of the tanks and canals by desilting them. The very recent flood plains may be thickly planted with economical trees not only to provide income but also to control erosion. The recent flood plain and old alluvial plain may be cultivated intensively based on land suitability for different crops. The paddy based cultivation should be split into one or two paddy followed by green manure or pulse crop. Other commercial crops like cotton and sugarcane should also be cultivated to enhance the revenue from Agricultural resource. Groundnut and tapioca should be cultivated on light to medium textured soils. Land evaluation studies have proved the profitability of groundnut and therefore the crop should be cultivated extensively.

Paddy is an intensive water consuming crop and about 40% of the water is used for growing paddy. The average yield of paddy is far below its potential. Therefore it is time now to change the crop/cropping pattern to save water. The paddy areas can be minimized and especially on water stress tracts the paddy lands may be used for growing fruits and vegetables. However the proposed decrease in paddy lands needs proper assessment of grain requirements etc. Paddy cultivation along the coastal tracts and sandy soils should be totally stopped and converted with fruit/vegetables growing or other economic trees. The present land resource position warrants a need to introduce and diversify the crop and cropping pattern in Pondicherry.
The increase in demand of water for agriculture, industry and urban/rural communities are further accelerated by increase in population, contaminations of both surface and ground water and degradation of the environment. Therefore it is necessary to reclaim/recycle the used water and use it for irrigation instead of wasting the water or polluting the adjacent lands.

The soil problems should be identified, understood and mapped through intensive soil survey and the problem soils should be reclaimed. The fertility study has revealed the low status of nitrogen in the soil. Therefore it is necessary to apply suitable quantity of nitrogenous fertilizer and also ensure proper utilizations of the nutrient by the plants. The established and efficient technologies of Integrated pest management and Integrated nutrient management should be popularized among the farming community and should be practiced uniformly by all the farmers.

In view of the limitation of land resource the possibility of bringing more area under cultivation is absolutely impossible and the only way is to increase the per hectare yield of crops. Production can be increased only by increasing productivity. The farmers should be encouraged with more facilities and no steps should be spared to assure profitability and sustainability in agriculture. The reduction in the availability of Agricultural labourers can be partially managed by introducing more mechanizations in the farming system. The rural youth can be encouraged to procure implements and hire it to farmers which will not only greatly help small farmers in taking to mechanised operation but will also provide employment to rural educated youth to take up small agro-business.

Overall, the most important need is to protect the natural land resource from further degradation and depletion. The farmers should be given adequate incentives and encouragement in the farming business, food for all, employment to youth. Conversion of good agricultural land should be stopped or even banned and only degraded or lands with less agricultural value should be allotted for industrial and other purposes and development of water intensive
industries should be stopped. Diversification in the form of diversified cropping pattern, animal husbandry, pisiculture and other allied agro-business should be encouraged in rural area to avoid total dependance on agriculture. The whole programme should be productive, balanced to assure sustainable and holistic development without affecting the socio-economic life of the rural people who are so important to the development of the region.