SUMMARY AND CONCLUSIONS

The objective of the study is to conduct a holistic study of the land resources and utilization in Pondicherry and its environs. This was studied integrating all the parameters that contribute to land utilization.

The physical parameters studied were landform, soil, water and climate. Also other factors such as dynamics of land use over the years, population, agriculture, irrigation and other associated factors were studied.

As a first step, the landform was studied. The portion of the study area south of river Gingee is a flat alluvial plain with two major rivers flowing across; throughout the alluvial plain about 140 tanks were found, out of which 86 occur in the Pondicherry region. There are two elevated highlands of about 30-40 metres above mean sea level in the northern and north eastern portion of the study area. The elevated lands occur in the form of red broken mound with gently to very gently sloping lands. Gullies and ravines are common in this land form. Adjacent to the mound on the north western side, small charnockitic hillocks occur with gently sloping lands.

In between the two elevated mounds the uplands plain with very gently sloping land with flat low ayacut cultivated land occur.

To the south of the river Gingee occurs the alluvial plain which is the major landform in the study area. The marine/coastal land extends as a narrow stretch bordering the Bay of Bengal on the eastern side.

In the study area about five major landforms and 16 subunits (physiographic units) were identified. The alluvial land form occupies about 60% of the total extent followed by the elevated uplands (23%), upland plains (9%), marine landform (2%) and water bodies and settlements occupy (6%). Out of the various landforms the alluvial plains are extensively cultivated.
The soil of the study area exhibited a lot of variations and were found typical to the landform where they occurred. About twenty two soil units/series were identified totally. In the alluvial plain nine types of soils were identified; out of which five soils (OP1, OP2, OP3, OP4 and OP5) occurred in the old plain and two in the recent flood plain and very recent flood plain respectively. The soils in the old plain were medium to heavy textured and were intensively cultivated with paddy and sugarcane. The soils in the recent flood plain and very recent flood plain were light to medium textured and were cultivated with paddy, sugarcane, cotton, groundnut, tapioca and millets.

The soils of the coastal plain (MN1) was mainly of sandy texture and only a few crops like casuarina, groundnut were cultivated. The beach soil MN3 were found unsuitable for agriculture. The soils in the coastal creek(MN2) were of medium texture and fit for only paddy cultivation.

The red soils in the elevated landforms (SS1, SS2 and SS3) are light textured and are suitable for horticulture crops and Agri-horti-silvi-pastoral cultivation.

About four soils were identified in the upland plain (LL1, LL2, LL3 and LL4). The LL1 and LL4 occur in low lying ayacut lands are heavy textured and are fit for paddy and sugarcane cultivation. The LL1 & LL4 soils in the slightly undulating lands are light to medium textured and have moderate potentiality for cultivation of crops.

The soils (CK1, CK2 & CK3) in the north western portion with hillocks and undulating landforms have poor to moderate potential for agriculture.

The soils composition were found to establish a strong relationship with the physiographic units. The landform and soil resources were mapped and studied by adopting the procedure outlined by Seghal et al.(1987) and the method was found to be ideal and suitable for the study area.

Fertility status of the study area was also studied. Soil samples from 721 sample points were analysed and it was observed that the soils were
generally low status for available nitrogen, high status of phosphorous and medium status of potash. The soils were mildly to moderately alkaline in general and sometimes strongly alkaline in localized patches.

The climate resource comprising of the main parameters viz., rainfall and temperature were analysed for their variability and fluctuations. The north east and south west monsoon operating from October to December and June to September respectively were mainly responsible for bringing rainfall to the study area. Both the monsoons were found to be variable and differed only in the intensity of rainfall, though the north east monsoon brought 62% of the rainfall the difference in the number of rainy days between the two monsoons was very meagre. Frequency classes and monthwise frequency classes for a period of 80 years (1911-1990) were analysed and presented. The period October to December were the months of maximum rainfall. The temperature also revealed variations in the mean maximum and mean minimum temperature. However the variations were not very abrupt to make significant climatic changes. The water balance study revealed the growing period as ranging from 150-210 days. The months July to December were the periods of recharge & surplus, January & February were utilization period and from March upto July it was deficit period. Overall, the temperature and rainfall was favourable for the cultivation of crops.

The water resource study revealed the potential of surface and sub surface water for irrigation and other purposes. The surface water resource comprises of river Gingee and river Ponnaiyar which feed the numerous storage tanks through a net work of canals and channels. The tanks and rivers also get water flow from the adjoining lands. The rivers are seasonal and are dependant upon the monsoon for their flow. The surface resource was having a command area of 6700 ha in Pondicherry region only but by 1986 the area got reduced to nil. The reason was due to the bad maintainance of the tanks and canals resulting in siltation and reduction in storage capacity. At present the entire load of water supply for irrigation and other purpose is met by only the ground water resource. The ground water supply for the region is mainly from three aquifers.
namely, Alluvium, Cuddalore Sandstone and Vanur-Ramanathapuram formation. Initially only the Alluvial aquifer was tapped but due to over exploitation this aquifer has depleted and from the middle of seventies the Cuddalore Sandstone aquifer was tapped, and in the early eighties the Vanur-Ramanathapuram aquifer was tapped. However over the years due to over exploitation, all the aquifers have started declining indicating the depletion of groundwater resources.

At present there is no scope for further development of tube wells and it is now only a question of monitoring and enhancing the recharge of the aquifer. With the intrusion of sea water at several places the situation is alarming and there is an urgent need to conserve and improve the resource.

Therefore it is necessary to desilt and reinstate or even increase the capacity of the storage tanks and canals so as to not only increase the storage capacity but also to enhance the recharge of the ground aquifer. The simple regression analysis showing the relationship between rainfall received and water depth showed that the depth of water level did not increase with increased quantum of rainfall. This may be due to the heavy drawal from the surrounding places of the observation tube wells.

The analysis and dynamics of general land use over the past revealed that the barren and uncultivated land has declined due to land reclamation. The area under non agricultural use has increased mainly due to conversion of good agricultural lands. Net area sown has been gradually declining over the years. The cultivable waste land area has increased and the net cropped area has also gradually declined. Above all the agricultural lands are converted for non agricultural purposes which is due to the rapid urbanization and the spurt in industrialization witnessed in the Pondicherry region since the last decade. This trend in land use change is not in the right direction because the decrease in area under age old agriculture will affect the region in many ways.

The agricultural and cropping pattern showed the diversity of crops, dominance of food crops, increase of area under paddy which is the principal
Sugarcane ranks first among commercial crops followed by groundnut as an oil seed crop. The area under pulse has been fluctuating over the years and in the last few years the area under pulse has increased significantly. Overall the area under different crops and cropping pattern did not show any pattern or trend the whole scenario was hapazard with dominance in paddy and sugarcane cultivation.

The land evaluation were conducted by adopting the Land Capability Classification Riquier model, F.A.O. model and land evaluation by predicting optimal crop using statistical model. The Land Capability classification revealed that about 57% of the land were under Class II, 25% under Class III and 0.1% under Class IV, other lands unfit for agriculture. According to Riquier parametric method 6 soils were under the class ‘Good’, 11 were average and 4 were poor. The land suitability classification for various crops revealed that more than 55% of the land were highly suitable for paddy and sugarcane cultivation, 23% for millets, 23% for groundnut, 40% for vegetable and 37% for flower cultivation besides the other lands which were moderately suitable, marginally suitable, currently not suitable and permanently suitable.

The prediction of optimal crop profitability based on soil properties and yield brought two distinct informations, sugarcane was the most profitable crop occupying about 74% of the sampling point. Also, increase in prices of inputs with various levels did not alter the status of sugarcane excepting when the proposed water levy was considered.

However when the income of crop was considered on monthly basis, groundnut occupied the major place. It continued to remain on top even when prices were hiked including water levy thereby demonstrating its profitability under all circumstances and also showing less consumption of inputs like water, power and labour.

The optimal crops prediction gives an overview of the most profitable crops to be grown so as to plan the suggested land use or cropping pattern to augment the revenue from the agricultural sector.
From the land evaluation for predicting optimal crop using statistical model and the decision maker approach model for precasting the profitability of crop due to increase in prices of inputs; the following was observed:

1) Sugarcane was the most profitable crop when the profit/income was considered for a single crop.

2) Groundnut was the most profitable crop when income/profit was considered on a monthly basis and it continued to be high compared to other crops even when all the input prices were increased.

CONCLUSION

In spite of the fact that all resources shows a supportive tendency to agriculture, yet of late agriculture is declining in the Pondicherry region. Based on the study and the discussion with the farmers and extension staff the reason are detailed in the concluding part.

The overall picture obtained from this study reveals that despite the fact of indiscriminate and over exploitation of land and water resources for various competing developmental activities, the position today is not as bad as it ought to have been and it is still conducive for practising sustainable agriculture. Climatological factors like rainfall and temperature have not undergone alarming changes during this outgoing century excepting for the spasmodically occurring aberrant weather elements causing crop damage.

The inherent buffer action on the soil properties has not manifested any significant decline in the soil fertility status for supporting agricultural productivity under the conditions of high cropping intensity and judicious fertility management. Dearth of technology and lack of financial resources seldom acted as inhibiting factors in stepping up crop production. There is a well built and sound infra-structural support available for marketing, processing and transport of agricultural produce. Nevertheless, there exist some hidden
factors which are responsible for the continuing trend of diversion of good agricultural lands for non-agricultural purposes. No effort can be spared to bring out them for focusing the priority attention of planners and policy makers.

Unlike industries, the pricing mechanism is not within the reasonable access of the producer of agricultural produce. Government machinery plays the primary role in making a compromise between the producer and consumer by fixing minimum support prices. These support prices fixed at the All India level taking into consideration the production cost in major command irrigation areas in respect of staple food crops like paddy and that of rainfed areas in respect of oil seeds and millets are not universally applicable and remunerative for the same produced in Pondicherry under lift irrigation system at exhorbitant cost. Regulation of trade elements here under the purview of statutory provisions goes a long way to help the farmers in deriving competitive prices in the open market. Tie up arrangements made with the sugar mills make sure not only the availability of institutional credit but also the State advised price for sugarcane. Even though the productivity per unit area and the income generation there from are rather high in the case of perishable horticultural crops, lack of adequate marketing infra-structure coupled with unstable price pattern is mainly deterrent to area expansion under these rightly fitting less water budget crops.

Unlike the industries, the increase in agricultural returns is not directly proportionate to the increments made in terms of inputs and technology application sequel to the operation of the economic law of diminishing returns. Any enterprising producer will, therefore, attempt to optimise his resource application only to the reasonable extent of deriving high efficiency production against low cost.

By and large, availability of labour for agriculture, at reasonable wage rates is affected by the socio-economic factors prevailing in rural areas. Improvement in rural literacy standard made the younger generation labour force prefer non-agricultural work despite under employment and comparatively low wage rate. Unlike the seasonal engagement for agricultural
operations, the round the year employment available in the industries and supporting services is another point of attraction for the labour force towards this organised sector with social securities under labour laws. As a result, though engaged seasonally, the burden of high wage rates has become indispensible to the farmer.

Unlike elsewhere in the country the reason for the spurt in population in Pondicherry is also due to the uncontrolled immigration due to various plus factors like low rates of taxes, well developed education system, transport and communication, residential and civil amenities and banking infra-structure in addition to better law and order situation and industry friendly government policies. Consequently, the pressure on natural resources has been mounting at an alarming rate calling for prudent management, lest irreparable damage by undue exploitation is done.

Progressive trends of disposing of good agricultural land needs an indepth study and critical analysis. The question as to whether agriculture is a loss making profession has no positive answer. Undoubtedly, crop production is not merely a means of living as it was in the yester decades. There can be two opinions that under normal circumstances agriculture is also a reasonably paying profession barring the operation of risk factors which are not uncommon even in the cases of many lucrative businesses. Despite this fact, offer of unprecedentedly premium prices by the elite group of entrepreneurs for their money laundering ventures trap the innocent farmers in many cases. Government’s apathy in controlling the mushrooming growth of real estate businesses as one of the main causes for the decadence cannot be totally ruled out.

Certain business minded elite farmers are tempted to dispose of their lands and reinvest the proceeds on regular income yielding urban properties and bank deposits while some others are acquiring two fold replacement landed properties elsewhere outside Pondicherry. Evidently, our political masters having vested interest is the root cause of his growing menace.
Mismanagement of water resources by not letting out water for irrigation from the major lakes and closing the eyes on the willful encroachments into the storage structures triggers indignant responses on the part of farmers. It may, therefore be clear that there is no valid reason for the apparently steep decline in ground water resources which is really attributable to indiscriminately maintained water balance.

Lack of policy integration is a major draw back with the Government machinery in accelerating all round growth in all sectors without being detrimental to each other. To cite an incident, the Government of Pondicherry have since announced its industrial policy regardless of its implications and interactions that would have a direct bearing on agriculture. The ill conceived notion seeded in the minds of policy makers that industrial growth alone can accomplish remarkable increase in G.D.P., smacks elitist bias.

The aspersion made in some quarters contending that agriculture is losing its significance has no relevance for the reason that the theory of greater comparative costs can not be held universally applicable to this study area in isolation. Any reasonable minded person will appreciate the fact that industries cannot flourish in the study area at the cost of agriculture for indefinite length of time without the co-existence of the latter. As it is a well known fact, water is a critical input for industries too. Even though cultivation of crops requires enormous quantity of water, by virtue of its application spread over a large surface area, percolation and ground water recharge in the inbuilt mechanism of water recycling enables to strike a natural balance between demand and supply. The picture is totally different in industries.

As against the large quantities of ground water mined by the industries, practically there is no output of water available for recharge excepting the unwanted effluent that invariably helps for nothing but to spoil the land and water resources. If this situation is allowed to continue any longer, the danger of ground water acquifer going dry even to support the survival of industries is not too far.
What is, therefore, imperative is an ideal blend of agriculture and industries which can be achieved only by an appropriate policy integration. Time has come now to encourage only environment friendly industries. A suitable cut off point should be arrived at between these two core sector activities by demarcating the areas and quantifying the resource allocation.

To be more specific, cultivation of field crops like paddy, sugarcane, cotton, millets, groundnut and horticultural crops can be cultivated favourably based on the land/soil suitability classification. There need not be any hesitation to allocate the other land not very suitable for crop cultivation with regulated water mining for non-agricultural activities including industries consuming less water and discharging minimum effluents. Among these, priority should be given to agro based industries for mutual self help.

In a nut shell, there is no sound and valid reason to push back agriculture without giving the due importance it actually deserves, of course, with suitable provision for diversification and also without letting down the importance for industries by suitable policy integration to accomplish resource buoyancy and growth with social justice.