Land and Water Resources Development

The planning and development of water resources depends mainly on proper understanding and assessment of existing physical, agro-climatic and socio-economic conditions of the basin. An integrated approach is necessary among earth scientists, climatologists, agronomists and engineers for proper utilization of land and water resources. The development of land and water resources in the Pandameru and Tadakaleru basin has been proposed, basing on studies from land capability, surface and sub-surface water resources, magnitude of elements of water balance, irrigation facilities, present land use and cropping pattern. The studies of the land capability of the basin reveal that there are six major classes of land. The class-I land consists of alluvial plains. They are located in patches along major Pandameru and Tadakaleru rivers. The slope is very gentle. It is less than 2°. The soil fertility is very good. The ground water resources are excellent. The erosion susceptibility is very low. The present land use is
cultivated land wet and dry conditions. The crops cultivated are paddy, groundnut, sunflower, mulberry and vegetables. The production of crop is high. The two crops could be cultivated under well irrigation. The crop, which requires more amounts of water resources, could be cultivated. Paddy requires about 100 cm to 120 cm of water. Vegetables require about 80 cm to 110 cm of water. The soils require enrichment of organic matter in the form of mulching process. Land leveling and land grading could be carried out.

The class-II land consists of canal (Tungabhadra High Level Canal) irrigated land. The slope is less than 3º. The soil fertility is good. On either side of canal, there are black soils and they are suitable for cultivation of cotton, lemon and sweet orange. The ground water potential is very good. The erosion susceptibility is low. The present land use is cultivated land under wet and dry conditions. The crops cultivated are paddy, groundnut, sugarcane, vegetables, citrus and sweet orange. The two crops could be cultivated under kharif and rabi seasons. The land requires mulching process and the land development activities, that could be taken up are land leveling and land grading.
The class-III land consists of colluvial plains formed on the deposition of small streams and the valley plains. They are located in the southern and central parts of the basin. The slope is gentle. The soil fertility is moderate. The ground water potential is very fair. The erosion susceptibility is very low. The present land use is cultivated land under dry and wet conditions. The crops cultivated are paddy, groundnut, mulberry, mango and dry food crops. The main sources of irrigation are well and tank. The land development activities required are land mulching, land leveling and land grading.

The class-IV land consists of pediplain. The slope varies from 50° to 100°. The soil fertility is poor. The ground water potential is poor. The erosion susceptibility is high. The present land use is cultivated land under dry conditions and barren lands. The crops cultivated are groundnut and dry food crops. The land development activities that could be taken up are land leveling; land bunding, land grading, land mulching and construction of stone fill dams and rock fill dams.

The class-V land consists of slope regions of the hilly terrain with 10° to 20° slopes. These are located in western, southern, northeastern and eastern parts of the basin. The land development
activity that could be taken up are land leveling, land grading, terrace bunding and construction of rock fill dams and check dams for conservation of soil resources. The slope zones could be used for cultivation of groundnut, sunflower and dry food crops. The pastures can be raised on the slope zones. Fruit crops like custard apple, jack, guava; pineapple and pomegranate could be brought up on the slope zones by adopting soil conservation measures.

The class-VI land consists of hilly terrain with more than 20° slope. The soil fertility is poor. It is a runoff zone. The erosion susceptibility is very high. The present land use is forest with scrubs and degraded forest. The land development activity that could be taken up are terrace bunding, graded bunding and afforestation. The forest products like tamarind, eucalyptus, custard apple and teak plantation could be brought up. Due to degradation of forest resources, much of the soils have been eroded by acceleration erosion like dissection, gulling, sheet wash and sheet flow. In order to minimize soil erosion contour grading, contour bunding, graded bunding and narrow base terraces could be constructed. Forests could be raised.

The plain regions could be used for cultivation of fruits and vegetables, cereals and legumes. Crop rotation is recommended to
restore soil resources. Land with slope more than 20° is not recommended for crop cultivation. The organic matter in the soils has to be enriched by crop mulching for higher yields. Continuous cropping with some inorganic fertilizers like nitrates, potassium and phosphate affect the soil physical properties of soils, which result into severe depletion of nutrients. Organic matter helps in suffering soils against inconsiderable effects and ensures more balanced nutrients supply. The soil organic matter can be restored and maintained by crop rotation, crop residue mulching, addition of farm manuring and green manuring, natural and planted fallows, minimum tillage, cropping and balanced nutrient application in the form of organic, inorganic, bio-fertilizers and chemical fertilizers.

Based on study of magnitudes of water balance, it has been found that the basin receives an average rainfall of about 536.855 mm. The average annual potential evapotranspiration is 1644.14 mm. The average annual actual evapotranspiration is 845.71 mm. The total annual water deficit in the basin is 888.57 mm. There is no water surplus in the basin. The annual moisture adequacy is 62%. The annual Aridity Index is 38%. Climatologically the basin falls in dry sub humid type of climate. The water availability days show that the number of days in humid and wet periods vary from
0 to 182 days. The southern, eastern and southeastern parts of the basin experiences high water deficit. The northern part of the basin possesses 154 days of humid and wet periods. There is no dry period in this part of the basin. The crop cultivation is highly favorable from June to February months. In the central part of the basin, the crop cultivation is favorable from July to January months. In western part of the basin, the crop cultivation is favorable from July to December months. The moderately dry period prevails for six months in southern part of the basin. It is found in March, April, May, June July and August months. In the central part of the basin, the moderately dry period is five months. It is found in February, March, April, May and June months. The dry period is varies from 61 to 90 days. In the northern part of the basin, the dry period is 61 days. It is in the months of May and June months. In the central and southeastern parts of the basin, dry period is 89 days. It is in three months in May, June and July. The water balance studies reveal that the total surface water resources of the basin are about 1102461 m³. Out of these 10% is stored in ponds, lakes, tanks and reservoirs. 9.33% is recharged to the ground water, 20% is lost in the form of surface runoff and 59.67% is lost in the form of evaporation and evapotranspiration. The major sources of irrigation in the basin are well in southern, western and central parts of the basin. The Tungabadra High Level
Canal (TBHLC) is located in northern and northeastern parts of the basin. There is a lift irrigation scheme also present in eastern parts (Pulivendula Canal). The average annual recharge of 57.62 mm. The water resources in the basin have to be carefully utilized by adopting water conservation measures. Modern irrigation methods like sprinkler, drip and trickle are suggested. Though the cost of implementation of sprinkler, drip and trickle irrigation methods are expensive, a few Nationalized and Land Development banks may come forward and finance the farmers for adaptation of new micro-irrigation schemes. The Government of Andhra Pradesh is giving 50% subsidiary on the sprinkler, drip and trickle irrigation. One village in each mandal may be adopted for successful implementation of modern irrigation methods and monitor the changes in land use, cropping pattern, crop yield and crop production. Pilot projects implemented in Kuppam mandal are highly successful and increased the crop yield and production. The Government of Andhra Pradesh has also introduced the new scheme for bring out the waste land to cultivated land programme in the name of Comprehensive Land Development Programme (CLDP). The monsoon water has to be carefully stored in various tanks present in the basin. The tanks have to be regularly degraded (desilted) under various programmes implemented by the Government of Andhra Pradesh. A few more tanks could be
constructed to increase the storage of surface water resources and to enable to enhance the seepage and recharge of water to the subsurface layers to maintain the optimum ground water levels. The Government of Andhra Pradesh has successfully implement the Water, Land and Tree Act (WALTA) for maintaining the geo-ecological balances and save the soil fertility.

In order to increase the yield and production of various crops cultivated in the basin, modern agricultural techniques like adoption of high yielding varieties of different crops, application of required quantities of organic, inorganic and bio-fertilizers and use of required pesticides to prevent from various pest attacks have to be propagated. It has been found that the majority of total land holdings fall under the category of less than 5 hectares. The majority of farmers are illiterates and do not have knowledge of modern developments in agriculture and irrigation sectors. The farmers do not have the knowledge of credit facilities available for short term and long term from Nationalized and Land Development Banks. Therefore, adult education about use of high yielding varieties of crops, optimum utilization of fertilizers, pesticides, and bio-fertilizers, banking facilities, optimum utilization of land and water resources, adoption of micro-watershed management programmes have to be intensively propagated through Village
Secretaries, Agricultural Field Assistants and Agricultural Officers. It has been found that the majority of farmers still adapt old system of plugging using bullocks. This is obvious due to majority of farmers possess land holdings less than 5 hectares of land. Farmers can adapt to co-operative systems and purchase power tillers, tractors and sugarcane crushers for better plugging land and crushing of sugarcane.

The waste lands of the basin could be used for plantation of fuel wood, pulp wood, manure leaf, leaf oil, fodder, carving, timber, tamarind, jack, eucalyptus, casuarinas, sababul, custard apples, teak woods and pomegranates. The above said trees could be brought under social forestry scheme along roadside, field-bunds, cultivable wastelands, tank bunds and stream courses. Lastly awareness programmes about use and mis-use of land and water resources, forests, advantages of social forestry, adoption of modern agricultural and irrigation technology, infrastructure facilities available for improvement of yield and production of various food crops, non-food crops, oil seeds, fruits and vegetables, agricultural crops and floricultural crops may be propagated through Doordarshan, All India Radio and by screening documentary films in the villages. The farmers should be educated through these programmes and use the land and water resources
for a sustainable land use development in Pandameru and Tadakaleru river basin. The watershed development programmes at micro unit of 500 hectares of land could be adopted for optimum utilization of land and water resources and overall increase in the yield of crops and agricultural production in Pandameru and Tadakaleru river basin.