CONCLUSION

In the preceding chapters an attempt has been made to explain some basic geomorphological problems of the Lower Chambal Valley. The main findings of the present study may be summed up as follows:-

The Lower Chambal Valley is a part of the stable Indian table land. In fact, it has been affected by the epeirogenic and cymatogenic forces rather than the orogenic movements.

As the region is a part of a very old landmass, its geomorphic history is not very well connected. There are gaps and long stretches of periods for which it is difficult to account authoritatively.

It is interesting to note that the Lower Chambal Valley is bounded on the north and north western sides by the orogenic belts of the Himalayas and Aravallis respectively. So, despite the fact that it is a part of stable landmass it is not untouched by the fringe effects of the orogenic movements. It seems probable that in the Himalayan orogeny this region acted as a foreland. In turn it has been uplifted, tilted and hence the present meso (erosion surfaces and escarpments) and micro (ravines) landforms are directly related to the intermittent upheaval of the Himalayas. Evidences further prove that the Peninsular India is still pushing towards the north under the influence of the Himalayan orogeny.
Though the geomorphic and structural evidences of the Lower Chambal Valley support the above view, yet more intensive research work along the entire margin of the Deccan table land - east to west - remains to be completed before we could reach any conclusion.

Due to epeirogenic movements the fluvial cycle of the Valley has been interrupted, so the region has become very complicated for the interpretation of geomorphic history. Therefore, morphometric techniques have also been applied and aerial photographic maps have been studied to obtain preliminary results. But the results of all these techniques have been rechecked by the actual field study. Thus field investigations have become imperative for this geomorphic study.

This landmass should have become a peniplained surface, but due to epeirogenic forces at present we find remnants of three erosion surfaces (Pre-Cretaceous, Mid Miocene and Pliostocene). The last cycle has been initiated in the recent period. In the Pleistocene period the Chambal and its tributaries were rejuvenated and the present cycle is advancing towards maturity. It seems, that the ravine formation is the outcome of this recent rejuvenation of rivers. The present landforms, may therefore, be placed in the cycle of erosion somewhere in the late youth to early maturity.

Since the region is in early mature stage, one can very well observe the impact of structure in its broadest
sense on the present relief and drainage. This impact is being displayed in the region and it will become more prominent in future when the region will attain full maturity. Most of the streams are guided by the structural pattern of the Gwalior and Vindhyan formations. The existing drainage pattern (dendritic, trellis, centripetal, radical, and sub-parallel) is an evidence of the structural control on the development of the relief and drainage. While observing this adjustment, it may be concluded that W.M. Davis' idea of structure, process and stage is clearly applicable in the Lower Chambal Valley.

The analysis shows that the landforms have essentially been carved out by the fluvial processes. The history of the Chambal goes back to the Mesozoic period when the river developed as a consequent stream along the major tributaries over the Deccan trap surface and later become superimposed on the Vindhyan's near the triple scarps.

Generally, geomorphologists consider only the river terraces, incised meanders, rapids and gorges and not ravines and gullies as results of rejuvenation. But under the present geographical conditions found in the Valley, it seems that ravines are one of the features developing due to rejuvenation and not exclusively due to defective landuse and cyclic changes of climate. Thinking in terms of cycle of erosion ravines may be taken as a feature of early maturity. The study reveals that the first stage for the ravine is of course entrenching the
master stream itself. Therefore, due to entrenching of the stream the banks are cut and dissected in the form of ravines instead of well defined river terraces. To confirm the above theory of ravine genesis, intensive study all along the periphery of the Ganga plain must be carried out.

The study of physiography of the Lower Chambal Valley has provided a rational basis for the human use of land as a resource. The use of land resources in the widest possible sense is influenced by geomorphic character of terrain, pedological characteristics and hydrological condition. Since the agriculture is the main activity of the inhabitants of the Lower Chambal Valley, it is bound to be influenced by geomorphic and hydrologic characteristics. In other words the agricultural resources - their quality (soil) and quantity (land) - are directly related to the nature of landforms.

The physiographic study is significant in agricultural development in two ways; first, in the regional evaluation of the agricultural resources and second, in pin pointing the problems of agriculture. For rational planning of land resources the information about the landforms is essential. For example, for the planning of ravines, quantitative data about various types of ravines (G 1, G 2, and G 3) is needed. No plans can be made unless one understands the processes of ravine evolution, causes of ravine formation and rate of encroachment. Only because of this reason all the aspects of ravines have been
extensively studied in this thesis.

The geomorphic knowledge about superimposed rivers and incised channels also go a long way in locating suitable sites for the dams and the canals. Such information gives a helping hand to the river valley development projects. It is due to superimposed nature of the river Chambal that four dams in its course have been constructed and canals have been dug out. However, geomorphic study is a pre-requisite for the resource planning of the river Valleys.

The over all study of morpho-agricultural features make it evident that the Valley is agriculturally an advanced region in Rajasthan. The level topography, heavy clay to clayey loam soils and adequate water supply have made the Harawati plain a developed agricultural region in the Valley itself. In the Valley it is this area where relief and soil are favourable for cultivation and which has been greatly benefitted by a net work of canals. This region really holds out vast possibilities for increasing crop production through intensive methods of cultivation. Looking at the rate of agricultural development during the last decade, it may be forcasted, that in the near future this region will definitely become a granary of Rajasthan and one of the leading agro-industrial region of India.

Unfortunately, some parts of the Lower Chambal Valley suffer from physical problems. Most acute of these is the problem of ravine and gully erosion. Some of the problems are directly attributed to the physical conditions of
terrain, hydrography and soil; all of which conspire to snatch away at least nearly 30% of its total area which is not under cultivation. Dissected and undulating hilly topography, thin layer of soil and meagre water supply render the north western hilly and upland section one of the poorest part of the Valley, except where irrigation has been developed from tanks and wells. This is also true of the ravine infested part which is a problem area for agriculture. This region is full of deep cut alluvial gorges, bare surface and wasteland. Here the area for cultivation is very limited.

SUGGESTIONS

A detailed study of physiography and agricultural resources of the problem areas and their existing landuse, direct us to give the following suggestions for agricultural development.

The Harawati plain which is a prosperous agricultural region of the Valley has immense possibilities for future development. In this part eroded areas may be put under cultivation by soil conservation techniques. The problem of water logging and its related problems may be over come by the following measures:-

1. Suitable sites along the irrigation channels should
be chosen for draining the excessive water from the fields. This water may be utilized in the fields of water scarcity.

2 After draining out the water from the fields, following steps should be taken to correct the acidity of the soil and increase its fertility:

(i) Mixing lime in the soil,

(ii) Cultivation of grasses to add nitrogen and organic matter or humus for about 3 years,

(iii) Rearing the cattle on these grasses lands.

3 On these reclaimed fields those crops should be grown which can withstand a longer period of these conditions. Paddy and sugarcane cultivation belts should be developed. Cultivation of Jowar, gram and wheat must be restricted in the reclaimed water logged areas.

The hilly and the plateau sections are not fit for cultivation, hence forest belts should be developed. But such species of trees should be introduced which may thrive under these physical conditions. This type of specialization would serve two purposes: firstly in this area forest based industries may be developed and secondly it will give commensurate return within shortest possible span of time.

As the ravine erosion poses a serious problem in agricultural and irrigation planning of the valley, this may be tackled by the following measures:

1 It is a pre-requisite for the ravine land to carry out
a physical survey at the village level. In such survey emphasis must be given to the classification of ravine lands, collection of soil samples and hydrological information.

2 Besides, data on the socio-economic status of the villagers should be collected in order to trace out their indifferent attitude towards the adoption of soil conservation methods.

3 On the basis of these informations allotment of ravine lands should be made on priority basis. For different classes of ravine following uses may be suggested:

(i) Permanent vegetation should be drown on the marginal lands of ravines according to the hydrological condition.

(ii) Peripheral bundhs all along the periphery of ravines should be constructed for checking the further extension of ravines. For the safe disposal of water from the agricultural land suitable structure must be provided.

(iii) Ravines up to 3 metres depth can be reclaimed for the agricultural purposes with the mechanical method with minimum of investment. On these reclaimed lands green manuring should be done for about 3-5 years for restoring soil fertility and improving hydrological condition. After doing so on these areas such crops as gram and ground nut should be grown which have greater soil binding capacity.

(iv) Provision for assured irrigation facilities and government subsidy to farmers to level these lands will also go a long way in solving the problem of ravine lands.
Besides, social impetus to farmers must be given.

(v) Deep ravines of more than 3-4 metres may be reclaimed for housing purposes only around Kota where the cost of land is increasing fast due to industrialization.

(vi) Deep ravines of more than 10 metres depth and degraded ravines where 'kanker' layer has been exposed should be strictly put under forests. In these areas plantation of bamboo and juliflora species should be grown. These species will not only protect the land from further erosion but also give economic returns within a shortest possible period. But proper care must be taken that these plantations may not encourage decoit activity in these areas.