SUMMARY AND CONCLUSION

Situation. Geology & Drainage

Moradabad district lies in the North-western Uttar Pradesh and forms a part of the Ganga Plain, which is composed of alluvium overlain, in places, by the aeolian deposits. The Ganga river flows along its western border, but the Ramganga river forms the main line of its drainage. Both these rivers flow in wide belts, changing their courses from time to time and thus affecting the lot of villages, therein. In addition, numerous tributaries of these rivers drain the district, yet in parts such as the Udla and Panmar tract the drainage needs improvement.

Topography and Soils

The topography is varied to a degree and many micro-physiographic tracts can be identified. But, the rocks, relief, aspect and slopes do not present any great problem for land utilization in this area. In its transported soils the easily tillable loams predominate, though the lighter soils are quite extensive. The surface soils are generally fertile but shallow so that a deep ploughing results in the turning up of an infertile layer of the subsoil which requires a longer period of rest or much fertilization to be fit for cultivation.

Climate

The district enjoys a subtropical continental climate of the general monsoon type. Temperature is suitable for
cultivation throughout the year. But, rainfall is very much concentrated in the months of July to September. It averages about 39 inches per annum, varying from more than 40 inches in the north-east to less than 34 inches in the western parts. But, it fluctuates much from year to year and may be early or late or heavy or low for the cultivation of crops. Hence, safeguards against its failure or excess are essential. Drought is much dreaded in most parts of the district, while in the khadars, bhurlands and the Udla and Fanmar tracts a succession of wet years results in much harm. Frequent floods in the streams also do a good deal of damage in the khadars.

Irrigation

The streams, ponds and the subsoil water resources offer great possibilities of irrigation water supply. The extension of tube-well irrigation in most of the central uplands and that of the canal irrigation in their north-eastern section has made cultivation quite stable in a large part of the district and with a greater amount of water supply even the lighter soils are producing well.

The People and their Industries

The district is densely populated; the gross density according to the 1951 census is 717 persons per square mile. But, the population is increasing at a rapid rate of about 13% in 10 years. Nearly 67% people depend on agriculture for their means of livelihood. In addition, a large number of livestock
also depend upon the crop land. Population is on the whole progressive and the middle aged persons constitute 52% of it. The number of households is growing also because there is a tendency among the young couples to have a separate kitchen. This too is increasing the housing requirements.

The district has a predominantly rural landscape. The bulk of its population lives in small villages. There are only four towns with a population of 15,000 or above. Even most of the non-agricultural occupations of the people are associated with the industries dependent upon the agricultural produce so that arable land sustains them also though indirectly.

Means of Communication

Recently roads and railways have been extended in the district, but yet the south-western parts and the Thakurdwara tahsil are insufficiently served by them.

Main Types of Land Use

The district has been occupied by sedentary farmers for thousands of years and it shows a continuous settlement and cultivation, interrupted only by occasional small patches of wasteland. The arable amounts to about 85% of the total area. Forests and grasslands are absent. Groves and orchards have only local significance near the settlements. The growing pressure of population has also led to some extension of cultivation into the wastelands recently. Simultaneously, the land agriculturally unproductive has also increased owing to the extension of buildings, roads, railways, etc.
The subsistence farmers form an overwhelming majority of the population. The land holdings are extremely small and scattered. Since these peasants have few resources of investment on their land, the application of scientific developments, fertilizers, manures, etc., is very little practised. All these factors are responsible for keeping the land resource underdeveloped and the agriculture in a state of backwardness. The government has taken certain steps to improve the agrarian structure; zamindaris have been abolished and land turned to the tillers. A scheme of the consolidation of holdings is also being carried out in the area.

Crop patterns

The cultivators are quite industrious in general. They have developed various cropping practices to suit their conditions while the cultural developments, in the recent years, are facilitating them to improve upon the same. Thus, owing to the progress of the means of transport and communication, the need for local self-sufficiency in matters of foodstuffs and other agricultural products is no longer felt to the same degree as in the former days, yet, the emphasis remains on the production of foodgrains and feedstuffs. This is due to the subsistence level of agriculture. Climate and soils are suitable for the cultivation of wheat in the rabi and millets in the kharif. Rice holds a secondary position and is grown mostly in the wetter north-east. The only significant cash crop is sugarcane, which
also provides a high calorie foodstuff. It has become more popular since the establishment of sugar mills. The town demand for fresh fruit and green vegetables, low cost of transport and the speed, avoiding wastage due to packing and transit, favour the cultivation of fruit, vegetables, etc., near the larger towns, while their demand for milk and milk products promotes a zone of dairy products and forage crops around them.

During the course of time, some farming types have developed in various parts of the district in response to the varied physical and cultural conditions. But, about all of them belong to the major category of 'Arable Farming', most of which is 'mixed farming'. The influences of various factors responsible for the development of farming types in different tracts are also exhibited in the crop associations found in these tracts. Thus, we get a basis for dividing the district into crop regions, which are ten in number.

Changes in the Crop Pattern

In the course of time, again, various changes have taken place in the crop pattern. In response to the large increase in population and livestock numbers, there has been a natural and substantial increase in the area under foodgrains, pulses, feed crops and market garden produce, particularly potatoes. But, there has been a large rate of increase in the area under sugarcane, the higher demand for which is due not only to the increase in the local population, but also to the
sugar mills which manufacture sugar for sale far and wide. The
extension of the means of communication and transport has
facilitated the export of sugar in its various forms, while
the physical conditions are suitable for the cultivation of
sugarcane here.

On the other hand, the area under fibre crops, parti-
cularly cotton and that under small oilseeds has decreased much
owing to the successful competition from cheaper cotton and
oilseeds from Panjab. Partly it also seems to be due to few
bad seasons in this area and partly to the comparative advan-
age found in the cultivation of sugarcane and wheat, here,
while cotton and oilseeds were available easily from Panjab
and elsewhere after the construction of railways. Groundnut,
however, found its way into the district quite recently and
has established as the most important and progressive oilseed.
Its popularity is due to its suitability for the dry, sandy soils
of the bhurlands where it is mixed cropped along with millets,
pulses and feed crops during the kharif harvest. Opium and
indigo, which were grown on a small scale, formerly, have dis-
appeared, simultaneously.

But the smallness of land holdings of the majority of
farmers, too much dependence by the rural people on foodgrains
and the growing pressure of population requiring a larger pro-
duction of the same seem to be the main hurdles hindering a
greater change in the crop map.
Ponds are utilized for raising singhara. Fishing is carried on in various jhils and streams. In addition, on their margins some strips may be reclaimed for rice and other crops. But, in places, the ponds have been wholly or partially drained out for cultivation, e.g., at Hauz Badesra.

Very little wasteland remains in most parts of the district and that too in tiny patches serving various purposes such as threshing grounds, meeting places, weekly markets, grounds for the livestock to roam about, etc. In the inferior parts such as the khadars, bhurlands, adhek tracts and the upland of Thakurdwara, where substantial wastes have existed until recently, their reclamation has been most evident, since the Grow More Food Scheme was launched and refugees from West Pakistan were rehabilitated. In a few khadar situations, however, the increase in wasteland is due to the sweep of the floods which have deposited sand where crops were raised, formerly.

Carrying Capacity of Land

The per acre yields are very low in this area. The average per acre yield of foodgrains varies from 179.0 kg. to 445.3 kg. The poor yields are due in part to indifferent physical conditions and in part to the backwardness of agriculture. The higher yields are found in areas having irrigational facilities, protecting against dryness of the seasons, extension of the means of communication and transport and urban influence.
both of which are indicative of better cultural impact. Thus, while the Katehr Bilari shows 1.73 P.P.U., the Ganga khadar shows only 0.90 P.P.U. and the Thakurdwara upland shows only 0.70 P.P.U. The carrying capacity of the foodgrain land averages only 0.80 person per acre for the district as a whole, varying from 1.48 persons per acre in Katehr Bilari to 0.6 person per acre in Thakurdwara upland.

The average per head food intake in the district is 2400 calories per day or 876,000 calories per annum. The S.N.U. for production is, however, about 1,000,000 calories, which is the produce of 1.1 acres of the average foodgrain land in the district. But, to have this much foodgrain land there must be 1.50 acres of the gross area.

**Composition of Daily Food Intake and its Influence on the carrying capacity of Land**

Of the average daily food intake 74% energy is provided by the foodgrains in the district as a whole. This ratio varies from 61.7% in the Ucla and Panmar tract, where jaggery plays a very prominent part in the diet and provides about 25% of the energy, to 80.7% in the Thakurdwara upland. Wheat constitutes the chief foodgrain everywhere, nowhere amounting to less than 50% of the total calorific intake excepting in the Ucla and Panmar tract. Rice provides less than 12% of the energy, while other foodgrains such as maize, bajra, jowar etc., supply about 6% of that.
Meat, fish, fruit and vegetables have very little place in the diet of the people. The proteins are derived from the pulses which provide about 6% of the total energy. Milk and whey account for 3%, ghee and vegetable oil for 6%, jaggery and sugar for 9.6% of the same. Evidently, the diet is unbalanced and the people are suffering from malnutrition.

Owing to the lesser actual intake of food as compared to the proper nutrition standards and to the less food intake in the form of foodgrains, however, the carrying capacity of foodgrain land is slightly higher than that stated above. In the areas where a larger ratio of the gross area is put under crops and a larger proportion of the cropped land is devoted to foodgrains, the carrying capacity of the land also becomes higher as is the case with the Udla and Panmar tract.

**Foodgrain Deficiency**

However, most of the district seems to be deficient in respect of foodgrains. Only two areas, i.e., the Udla and Panmar tract and Thakurdwara uplands have a foodgrain surplus. But, they owe this surplus to the very high percentage of their total cropped area being devoted to the foodgrains and having a larger per capita crop land. In the case of the Udla and Panmar tract it is also partly due to the lesser local intake of foodgrains. The lot of the Ganga khadar tract is the worst since, even with 32.6% of its total cropped area under foodgrains, it runs in a deficit of 53%. This owes to the very low
yields and a considerable part of the land remaining untilled owing to annual floods.

Non-food Requirements

Since there is little scope for non-agricultural incomes agrarian community must satisfy all its needs from the land resource. The list of non food requirements includes numerous items such as housing, clothes, fuel, light, medicine, education, marriage, death, etc. It also must include manures, irrigation, livestock, etc., so essential for the production of food itself. Taken together, these needs require much more land for their satisfaction than does food. The ratio ranges from 6:5 in the Ganga khadar to 3:1 in suburban Moradabad. With the spread of cultural amenities the rural communities are getting zealous for such needs so that with increased standard of living the carrying capacity of land diminishes if it is not accompanied by a corresponding increase in the output of land as well as other sources of income.

Uneconomic Land Holdings

A comparative study of the land required for the satisfaction of family needs and present land holding shows that an overwhelming majority of holdings are uneconomic. The size of the economic holding varies considerably in different tracts depending on such factors as the size of family, non-food requirements, composition and amount of daily food intake, availability of non-arable sources of food and feed, nature of
work, non-agricultural sources of income, etc. The average percentage difference between the actual average agricultural holding and the size of the economic holding in the district amounts to -82.8, with a minimum of -56.4% in Thakurwara upland where the present holdings are comparatively larger than elsewhere.

Poverty of the rural people is quite evident under such circumstances. They are living under debt. The indebtedness, however, seems to be directly related to the non-agricultural sources of income. Hence, it varies from Rs.1.50 per head in suburban Moradabad, where the per head non-agricultural income amounts to Rs.102/- per annum, to Rs.280/- per head in Thakurwara upland where the non-agricultural income is only Rs.3.50 per head per annum. Usually the indebtedness arises out of the expenditure on non-food needs but, sometimes, people have to borrow even for their food, though temporarily. Hence the poverty of foodgrain farming is so very clear.

Where people grow cash crops such as sugarcane, vegetables, potatoes, etc., or where they rear livestock for sale as a part-time occupation, there also their economic condition is better. We have, therefore, to be cautious in relying too much on the calculations of the carrying capacity of land on the basis of foodgrain yields only. This is particularly necessary while dealing with the suburban and sugar mill areas where the foodgrains find a much lesser importance than the cash crops.
Settlements, roads, etc., cover only 3.6% area of the district. This area has shown an increase in the recent years, amounting to 15% over the average of 1931-36 and is likely to increase more in future, since on the one hand there are very few large towns and good roads in the district, on the other hand the growing population and cultural amenities are tending to enhance urbanisation, housing standards, road development, etc.

So far there is only one medium sized town for every 600 square miles of the area. Most settlements have been compact and nucleated and their sites reflect various physical controls such as the availability of water supply and sufficient firm ground. But, in the politically disturbed medieval period the defensibility of the site also appears to have determined some of the settlement sites and their lay-outs. Since peace has prevailed in the country people have begun to spread over wider spaces. Now they care more for open space and light than for mere security. Hence, we find many open bungalow type residences on the outskirts of the towns. The land demands of industry, educational institutions, play grounds, parks, recreation, governmental establishments, etc., have also greatly enhanced. Hence unless an over-all land use planning is envisaged, these items may severely encroach upon the arable land particularly on the first class land close to the settlements.
Land is not only required for the living people but also for the dead and this is quite an important item here since the population of the district has a substantial Muslim element which needs wide graveyards for the dead. The Christians too require cemeteries.

The construction of roads and railways has, moreover, entailed the creation of wide belts of wasteland on the sides. This is more true in the case of the latter, since the railway department has cared little to utilize these wastes properly.

Problems of Land use

The topography, soils, and temperature are favourable for cultivation throughout the year. But, the fertility of the soils has been exploited for thousands of years and without necessary replenishment so that now they require much curing and manuring. The cultivable soils are thin in most cases and deep ploughing must be accompanied by a heavy manuring. Heavy manuring and irrigation together with anti-erosion measures can save them from further losses. In places, they are also affected by water-logging and re-infection. But, it is not within the means of the individual peasants to manage the soils properly.

The variability of rainfall and its vagaries through the months and days, when water is so much needed for the sowing operations or for the growing crops, present the greatest of the physical problems in the area. The extension of irrigational facilities has tended to lessen the severity of evils of drought.
But all parts of the district have not yet received this benefit and within the tubewell or canal irrigated areas, too, all fields are not equally benefitted by it. The craving of the people for irrigation water has increased recently owing to their having come to know that it can help to improve their economic lot by protecting their cultivation and rendering it an all year round occupation. Hence, the problem has become greater than before when the crop cultivation was adjusted to the condition of the non-availability of irrigation water. As yet, only 20% of the area is irrigated on the whole and much of the rest needs irrigational facilities for the development of its cultivation properly.

On the other hand, in the depressed tracts heavy showers and a succession of wet years cause much damage. Such areas face the problem of defective drainage and this is particularly true about the Udla and Panmar tracts. The frequent floods occurring when there are heavy downpours either locally or in the catchment areas of the streams, also do a lot of damage to kharif crops and property in the khadars and other depressed areas.

The indiscriminate construction and working of tubewells in areas like the Udla and Panmar tracts also seem to have been harmful by spreading additional water on lands which suffer from the evil effects of a wet cycle.

In fact, what is needed for irrigation is an independent means of water supply within the control of the farmers;
the larger land owners having tube-wells, while the smaller ones having persian wheels. The working of state tube wells is not always economical. These wells cannot assure water supply at proper time to all the area within their commands. A slight defect in the machinery may also upset the whole programme of irrigation. The high costs of tube-well irrigation discourage its use. So many peasants have, more recently, constructed persian wheels in the tube-well commended areas. A shallow and slow watering by them is sufficient to grow a good crop in normal years.

Canal irrigation has only a limited scope for various reasons, e.g., the undulating topography of most parts of the district, highly variable volume of water in the streams and the high level of the bangar areas requiring arrangement for water lifting.

Heavy pressure of population and livestock on land is another major problem. Land holdings are small and scattered. About 35% of them are just up to 1 acre each and 21% more of 1-3 acres each. These holdings have acted as a deterrent to capital improvement and have enforced a uniform system of subsistence agriculture. Their consolidation can bring scattered pieces closer together but cannot increase their size, rather it results in a slight loss since some land is sliced for providing certain new requirements not available in the villages so far. The growing burden of taxes also bears down more on the smaller peasants so that their poverty increases.
The level of technology is too low and the method of tillage is age-old. The struggle of life is tough. The poor peasants feeling helpless against it have become superstitious and fatalist in their outlook upon life. But, those who can work for their uplift are quite dogmatic in their approach. They try very little to understand the local problems and the felt needs of the peasants. Milleniums of despotic rule and centuries of landlordism have made the rural masses suspicious about the governmental professions so that it needs a persistent effort to gain their confidence in matters like land use planning.

The net result of the various adverse factors working here is that agriculture is quite inefficient. The total rural population amounts to 660 persons per square mile but, the average carrying capacity of the foodgrain land is only 563 per square mile. In other words about 116 persons produce food for only 100 persons and it is so when meat and milk play very little part in the diet of the people. If we compare with the conditions in the United Kingdom, Netherlands, Japan, etc., the area appears to be extremely backward and under-developed.

But, evidence of potential yields is available from crop cutting experiments, crop competitions and agricultural research work on State Farms. It shows that the possibilities of increasing the crop yields are considerable. The soils need water, manures, better seeds, better implements, suitable crop combination and crop rotations, etc.
Planning of land use must secure the best possible use of the land resources and avoid their misuse. It must provide for the satisfaction of the basic needs of work, food, clothing, housing, roads, recreation and other needs. Much of the land should serve more than one use while all land should be so used as to satisfy the multiple needs of the community as a whole, though personal initiative need be respected. All planning must start from the study of existing problems and the felt needs of the people and, to be effective in the democratic set up and socio-economic conditions available in this area, the land use planning must be carried out at various levels, from family up to the national level.

Most of the land use planning in this densely populated rural area must be concerned with the agricultural land use. Much of the arable land can be upgraded by scientific methods, use of manures and fertilizers, improvement of drainage, provision of irrigation facilities, etc. Cultivation has already extended to the maximum limits so that the agricultural planning should be centred about the increasing of the per acre yields progressively. Foodgrain farming cannot meet the growing needs of the growing population. Changing diet habits can create a change in the demands on agricultural production. The provision of a proper standard of nutrition would require more emphasis on such foodstuffs as vegetables, fruits, dairy produce, poultry, etc., which would, therefore, need a larger acreage under them than at present, while the area under foodgrains might decrease.
Planning at the family level should aim at making each farm family a self-sufficient unit by providing it an economic land holding and an independent means of irrigation. About 8 acres of average land, a Persian wheel, essential agricultural implements, a pair of healthy bullocks and a breeding cattle must be the minimum that each farm family should possess. It would be better if cooperative village farming is developed by pooling together all resources and rationalizing agriculture. But, as a preliminary step the uneconomic farm units must be amalgamated. It would be the duty of the micro-regional or block planning authority to survey and determine the best use capabilities of each piece of land and to suggest its proper utilization to the farmers, who, as a rule, should follow these suggestions. Micro-regional research and planning should be coordinated at the district, macro-regional, state and national levels, where the wider influences of land utilization have to be determined and planning schemes re-shaped accordingly in the interests of the higher organs of the community. The district is not an independent unit; it forms a part of the national organism. Hence, local planning has to be guided by the national interests and to be supported by national resources. All types of surveys pertaining to soils, topography, hydrographical conditions, land use, crop suitability, crop yields, carrying capacity of land, potentialities of land, etc., are necessary. The provision of the research and planning authorities at the micro-regional level would provide the necessary central guidance, vigilence and control over the activities of the ill-equipped farmers.
The wastelands in the khadars, bhurlands and the wastebelts running along the railways and roads should be planted with fruit and other trees and seeded with grass. As regards land under water, fish-culture and the extension of the cultivation of water chestnut and other water loving plants can make it productive economically. But waterside spots can also be converted into picnic resorts, sporting places and the like. Most of the new land for housing as well as industry must come from the existing arable land and grove land around the growing towns and villages. As far as possible, the wastelands around the settlements should, however, be used as parking places, playgrounds and sites for public buildings.

The future pattern of settlement should take the shape of numerous small towns or rural centres instead of large sized towns like Moradabad. There are many large villages, which can be developed into small townships with narrow belts of market gardens around them. This type of settlement would increase the area of intensive cultivation and specialities may develop in different localities.

**Conclusion**

Land may be compared to a canvas over which the patterns of human settlement, agriculture, etc., are drawn by the long brushes of history. These patterns are in a constant state of evolution under the influence of various factors, physical and cultural. By utilizing healthy trends desirable improvements can be introduced into the present conditions. But, land must not be
allowed to suffer in the hands of resourceless farmers.

In the preceding pages, the writer has made every effort within his means as a non-official research worker to present essential facts about the patterns of land utilization in the district of Moradabad and their objective interpretation. There is a good deal of diversity of physical and cultural setting in various parts of the district and as a result of these micro-regional differences of environment we find considerable diversities in the details of land use, of output from land and of the standard of living of the people. However, the most glaring facts that emerge from this study are the very high percentage of tilled land, the excessive pressure of population and livestock on the land and the extremely low per acre yields, indicative of the great under development of the land resources, in this area. The line of progress is evidently a progressive increase in the output comparable with that of the most intensively cultivated parts of the world. The great necessity is that the people should be more familiar with the soil management, development of crops, vagaries of nature, etc. A balanced mixed farming, a scientific combination and rotation of crops and relatively larger land holdings or cooperative farms equipped with improved agricultural implements and a reasonable degree of mechanization seem to offer the solution of the agricultural backwardness of the area. But, to put agricultural industry on a scientific basis detailed surveys of the local conditions, both physical and cultural, are most essential.