CHAPTER VII
CONCLUSION

The productivity of a soil largely depends on its inherent characteristics and other factors such as terrain aspects, climate, inputs used and other management practices. Suitable physical, chemical and biological condition of soils are also important for vigorous growth of plants. Other factors which play a great role in crop production are air, water, temperature regime, healthy seeds free from insects, pests and diseases. The plant growth can be retarded severely if any of these ingredients is absent in right proportion at right time.

The characteristics of the land/soil and its capability for agricultural production may vary in innumerable ways. There is no standard method for classification or categorisation of lands/soils. There are different types of lands used by different kinds of people in many different ways. So the problems of understanding and classifying lands are varied and complicated. Here classification of agricultural lands is of utmost importance. There are varieties of approaches of classifying lands. It must be noted that in any approach, observable or recordable features should be taken into consideration. However, any standard method may not be suitable for all the purposes, so modification should be made as and where necessary to suit individual requirements. Classification of lands having high and moderate relief is rather easier than
plain lands, because groups or classes in the plains require intensive scrutiny for micro-level studies. The characteristics of soil (both physical and chemical), profile characteristics, soil texture, soil reaction, micro relief, slope, climate, drainage and erosion aspect will certainly be of great help to determine the productivity of land/soil. Soil is considered as a valuable natural resource and its best use in terms of its nutrient status can be well established by the application of the methods and techniques used in the present work.

To assess the soil productivity of Mayurakshi-Bakreswar interfluve on the basis of inherent qualities will give an indication to the potentiality of this part of Birbhum for its future land use planning purposes. The physical and chemical aspects of land/soil that have been taken into consideration are soil texture, soil moisture, organic matter content, total nitrogen, available phosphorus, available potassium, soil reaction, profile character, micro-relief, slope, drainage and erosion.

G. Azzis principle of land classification on the basis of chemical status (potential fertility) gives a definite clue for evaluation of land in terms of its inherent quality (Chapter-VI). But he has not given due consideration to the physical aspects of land/soil which have great influence on crop production.
To assess the combined interaction of physico-chemical factors for assessing land into different grades, R.E. Storie’s method has been applied to in the present study (Chapter-VIII). But his method has some drawbacks. For, if any one of the factors has the low value, the result will be low, neglecting, the higher value of others. So a modified method has been suggested here to present a more accurate expression of land type.

Before approaching modified method all physico-chemical properties of soil and other physical attributes of land influencing have production have been taken into consideration. A high positive correlation between these factors and paddy production both individually and collectively are obtained, suggesting that physico-chemical factors have strong influences on land/soil in crop production.

A series of maps have been produced in the study area, to show the spatial distribution of different nutritive elements (Map Nos. 18-21). The observed frequency distribution and scatter diagram correlating production with each of the individual nutritive elements are also shown in the maps.

On the basis of Azzi’s, Storie’s and Modified Indices No., different land classification maps are drawn (Map Nos. 28-25) which indicate the boundaries of the different categories of lands.
according to their inherent qualities. In case of Azzi, the map gives three land types whose boundaries are delineated on the basis of chemical status only but in case of Storie as well as modified methods both the maps show four land types whose boundaries are delineated on the basis of physico-chemical quartam.

Increasing human population always increases the pressure on the land. So best lands should be utilized for raising as many crops as possible. This involves certain factors for consideration, firstly, the maintenance of soil fertility and the yield and secondly, the supply of irrigation water in times of need. If the land is used continuously without addition of fertilizers, the land must be impoverished, the result of which will be reflected on the rapid fall of yields.

One of the main works of the farmers is to produce more crops. The farmer, therefore, must carry out a plan with the object of improving and maintaining the fertility status of the lands on which he depends for his out turn. Organic matter is most important to maintain soil fertility.

Under the humid tropical climatic condition, there is a continual washing out of the plant nutrient, specially nitrogen, calcium and potassium in the study area. To this must be added the unavoidable removal of plant nutrients in harvested crops.
Such losses can be kept low but cannot be altogether avoided, by restoring to the soil as many plant residues in the form of organic manure as possible. Organic manuring can act as a steady supplies of nitrogen, phosphorus pentoxide, potassium and calcium oxide. Hence lands rich in humus do not need any artificial fertilizer. N.R. Dhar (1972) by experiments has shown that straw plus basic slag when ploughed, can supply available nitrogen, phosphorus pentoxide, potassium oxide and trace elements as almost as readily as composts.

On account of the farmers stringent pecuniary condition, they often find it difficult to procure artificial fertilizers for use in their farms. So application of farmyard manure or compost, animal excreta may be recomended for the maintenance of fertility of soil in the region. It may be noted that the western part of the study area is deficient in N.P.K. due to high gradient of terrain. These areas need good management practices for profitable agriculture.

In coarse textured soils of the western part of the area, the infiltration is more as compared to the light textured soils of the east. So it has been found that the sandy areas almost remain low in fertility. Sheet, rills and gullies ruin an appreciable part of the agricultural land. Deforestation is one of the main causes of keeping the lands fallow. Intense rain cause much more
erosion during monsoon period. In coarse textured soils rain water passes through porous and rapidly. This aspect of wide range erosion should not be ignored.

Morphologically the falling upland, the undulating plain cannot provide irrigation facilities so easily. In the western upland area subsoil watertable is very low. This is definitely a handicap in the use of subsoil water for agricultural development.

Uncertainty of monsoon rainfall, drought and erosion are the important natural hazards responsible for wide fluctuation and uncertainty in the production of agricultural crops in the area.

The average income of most of the people of the study area is very low so it is beyond farmer's financial capability to improve the condition of land, by the use of inputs, like better seed, manure or irrigation water even when the facilities are offered by the government agencies.

In the eastern part of the study area, diversification in the production of the crops has been increased by the canals under Mor Project. But owing to undulating nature of the terrain in the west, canal irrigation is difficult. Owing to scarcity of water, it is very difficult to raise more than one crop in the west.
High temperature and high moisture regime in the study area helping rapid mineralization and enhancing microbiological activity and thereby organic matter, nitrogen and other nutrients are reduced. The combined effect of these lead to the low fertility status of the soil.

The capillary action, weathering and leaching processes with alternate wet and dry condition and fluctuations of water table induce laterite crust formation and thereby large tracts remain barren and unproductive. Some of these tracts at present are cultivated with great difficulty.

In the study area, 'Aman' is the main crop. Owing to insufficient and erratic distribution of rainfall, supply or irrigation water is absolutely necessary, as Aman crop depends solely upon water for its existence from seedlings to maturity.

The traditional methods of cultivation and primitive implements are still used in the area, which causes poor agricultural productivity. The high yielding varieties of seeds and chemical fertilizers have hardly been used in the area. The production of crop may be increased by applying improved agricultural implements. Now a days, some provisions (by the Government) have been made to distribute improved agricultural implements like paddy - weiders, wheat - hoes, seed driller, etc., at a subsidy of 50 percent. But as the cultivators are very poor, the programme has not become widely popular. The repairing of the
implements also poses a great problem to the farmers as they could hardly arrange for the spare parts.

In order to have higher yield by improving the conditions of land and soil, the following effective measures are suggested.

1. Scope for the better utilisation of water through river lifts, canals, shallow, deep tubewells and tanks, by the farmers is to be provided.

2. Farmyard manure, compost along with an appropriate dose of N.P.K. fertilizer must be used to increase the organic matter, nitrogen, phosphorus and potassium level in the soil.

3. Leguminous crops, such as, clover, gram, vetches, soyabean, etc., should be cultivated. These plants can take nitrogen directly from the air because these plants contain within their root nodules nitrogen fixing bacteria, the "Rhizobium". When the whole crop is ploughed, the soil nitrogen supply is enriched to the extent of the entire amount of nitrogen fixed by the plants.

4. Green manuring as a practice is of great help in meeting the organic matter and nitrogen requirement of crops in the study area.

Cultivation of Dhaincha (Sesbania) in the low lands where there is adequate water before rainy season and their mixing in the
soil through ploughing during preparation of land for paddy cultivation is helpful for enriching the soil with organic matter as well as nitrogen.

(5) To improve the water holding capacity as well as cation exchange capacity of the soil the application bulky organic manure and green manure should be practised.

(6) Countour bunding is one of the methods to control erosion in the western part of the area. Ploughing should be done along the contours of the field. This method provides sufficient resistance to the flow of rain water. Such bunds are helpful in the low rainfall areas for water conservation and also checks the velocity of runoff. On the other hand it reduces soil loss by water erosion. The contour tillage, develops ridges and between the two ridges water is stored in the soil and this reduces surface runoff and bringing distribution of rainfall moisture. Countour farming has also other advantages. It saves power, time and wearing of machinery. But on the steeper-slopy land surfaces, this method of cultivation may not be effective because the subsoil is highly impermeable. Terracing may be effective on this type of field.

(7) Field terrace is a channel with a ridge. In slopy land area, it is suitable for cultivation. By modern field terrace construction slope is regulated whose surface runoff can be
collected. In the west of the area, terracing can be used by less expensive measures. In this area intensive terracing method is required for production of soil and water conservation.

(8) The gullied fields must be handled with care. In the rainy season, the volume of runof runoff is too great. Vegetation is needed in gully control.

(9) Irrigation water is not sufficient in the area but the removal of excess water through drainage, during rainy season, should be stored by dam construction and reservoirs. The misuse of water leads to the problem of water logging which renders the agricultural lands unproductive. The surface flowing water needs to be tapped in tank or artificial reservoirs. Sufficient water is also available from ground water resources. The rainwater percolates deep into the porous strata of the earth surface. The ground water can be reached by digging or drilling shallow or deep wells. The Geological Survey of India, the Central Ground Water Board and other agencies are organising the ground water reserves. Thus the area will be brought under the plough and the productivity will also be increased.

(10) An extensive afforestation work along the canal banks and other eroded undulating tracts are to be taken on top priority basis. This will not only check soil erosion but also control air
pollution by absorbing $\text{CO}_2$ from the atmosphere. It also induces rainfall.

(11) Suitable crop rotation may be recommended to the farmers for maintaining soil fertility/productivity. It has been observed that crop rotation varies with the land, cropping system and economic conditions. Considering all these aspects it is suggested that paddy in the rainy season and robi crop such as pulses, barley, potatoes, wheat, rye, oats, grams, etc., in dry period may be cultivated in rotation. Field experiments in U.S.A. and England have brought some benefits of good rotations. In a country like India such benefits may be extended. Crop rotation not only reduces the losses of soil but it maintains and increases the yield and also helps control weeds, insects and plant diseases. Organic matter and nitrogen status in soil also are maintained by crop rotation.

(12) Adequate facilities are to be arranged for distribution of agricultural loans with low interest to the farmers for purchasing high yielding varieties of seeds, fertilizers, pesticides and other agricultural equipments.

(13) The slow moving bullock carts and unmetalled roads are also creating hindrances to the villagers for quick transport of materials.

As such efficient transport system, metalled roads and extensive co-operative marketing facilities for transaction of agricul-
tural products are immediately needed in the area.

(14) Public opinion should be mobilized to emphasize on the use of inexpensive compost manure from all waste products like human, animal and agriculture. This is essential because of the long-term beneficial effect of these on soil fertility/productivity.

(15) To increase agricultural production audio-visual units for spread of education to the illiterate farmers at block level, to throw light on the knowledge of cropping pattern, management practices and latest agricultural techniques are to be arranged.

(16) Majority of the landowners are Muslims. As per Muslim law, property is divided equally among sons and daughters. This along with the Hindu inheritance laws caused further fragmentation of holdings. The average size of individual holdings in the area is 20' x 15'. This is a great handicap for introducing better scientific method of farming. So amalgamation of the holdings by means of co-operative farming by legislation is recommended. The birth rate also is to be drastically reduced by adopting family planning programmes which may ultimately check fragmentation of land holdings.
The above suggestion will not only improve land/soil but also help achieve productivity at an optimum level. An assessment has been made to indicate the soil fertility/productivity and classification of land based on physico-chemical properties of soil and terrain aspects influencing crop production in the area. This type of study is helpful both to researchers and planners for further agricultural planning. Administrators and scholars who, by no means, can alienate themselves from the wheel of development in a developing country will surely be benefitted by the present study. So the present treaties may be considered as a positive attempt to improve the economic conditions of the people living in the area.