CHAPTER VIII

SUMMARY AND CONCLUSIONS
A research project with an emphasis on increasing the production efficiencies of land plants for self-reliant food production, was initiated in this Department in 1967, under the International Biological Programme (IBP). The experiments undertaken till today, and the results obtained, have given a strong evidence that forage production, if linked-up with the technique of Green Crop Fractionation (GCF), would increase the efficiency of agricultural land utilization. In the present investigation, attempts have been made to: (a) find ways for increasing fodder productivity; (b) look into the method of silage making for preservation of forage nutrients, and (c) to exploit DPJ, a by-product of GCF, for useful purpose. The studies have been undertaken by integrating different fields of plant sciences i.e. agronomy, plant physiology, soil science and agricultural technology.

The agronomic practices adopted were as recommended for the region and plants. For the measurement of yields of green fodder, dry matter and crude protein in general, and that of extractable protein in particular, methods of Byers and Sturrock (1965) were followed. The yields of crude protein (CP) are calculated by determining nitrogen (N) content. Most agriculturists and agricultural chemists determine the protein content in leaf by multiplying its
total N by a factor, usually 6.25. This is based on the assumption that all purified proteins contain 16% N. This so called "crude protein content" is very crude, as a part of nitrogen in plants is in the form of non-protein nitrogen (Byers, 1983). While dealing with raw material containing little protein, this makes little differences, however, with protein concentrates an error could arise. Pirie (1955), therefore, argued that a factor of 6.0 is probably more correct for plant materials and the protein concentrates made from them. Taking this in mind, crude protein (CP) is expressed as N x 6.25, as is done in conventional agricultural studies; while extractable protein as TCA-precipitable N x 6.0 (Byers and Sturrock, 1965).

In agriculture, fertilizer is one of the factors, which govern dry matter and protein productivity of forages. To determine the effect of fertilizer N on fodder potential of maize and Sorghum, the crops were cultivated in the University Botanical Garden. Application of fertilizer N resulted in relatively succulent plants with lower % dry matter (DM) and higher N content in the leaf. In general, application of P, with N, gave variable results, while the effects of K were obscure. The fertilizer N significantly increased dry matter and protein productivity; due to the application of 150 kg N/ha, 7-8 fold increase in the yield
of DM was noticed with maize, while the increase was 5-6 fold in Sorghum. As with DM, the yields of CP increased significantly with the application of fertilizer. High rates of dry matter and protein accumulation in maize and Sorghum were offset by low extractability of protein N, and hence poor extractable protein yields.

Fertilizers, apart from increasing yield of the crop to which it is applied, leaves residue in soil, which naturally affects the performance of successive crop. Such an effect is known as residual fertilizer effect. Groundnut, a popular oil-yielding crop of this region, showed very little residual effect of maize fertilization. The residues of fertilizer applied to Sorghum, showed significant improvement in morphological characters and yield attributes of sunflower. Soil analysis, indicated that the crop species, which is cultivated and fertilized, also plays an important role in this contest.

In Marathwada region, lucerne - a fodder with relatively high nutritional quality - thrives well. The advantages in growing lucerne crop include its wide range of adaptation, perennial habit, ability to fix nitrogen and to become ready for frequent harvesting (Joshi, 1981). In this region the sowing of lucerne is usually done by broadcasting method. A field trial was undertaken to
compare this indigenous method of sowing with other methods. The results suggested that broadcasting method is good, fully adapted and less labour intensive method of seed sowing, though sowing in rows also yielded similarly.

Agricultural research in the developing tropics has been conditioned by the cropping systems of more developed countries and rather cursory attention has been paid to indigenous cropping systems. For example, most agricultural research is directed towards increasing production under sole cropping (a predominantly temperate system); instead of asking how to increase production under mixed cropping, which is the dominant system of tropical subsistence farmers (Baker, 1978). Agronomic investigations, undertaken till 1980 in this Department, were also restricted to sole cropping systems. Field trials with mixed or intercropping, initiated in 1980 (Kasture and Mungikar, 1981), gave encouraging results with increased fodder productivity. During the present investigation 5 separate field trials were undertaken to study the benefits of intercropping. All intercropping systems gave yield advantages. Lucerne - hybrid Napier intercropping system resulted in significantly higher total productivity.

The pressed forage, left after the extraction of LP, can provide adequate maintenance diet for ruminants. Such
pressed crop residues make better silage, due to the mechanical treatments received during fractionation. The experiment with maize and Sorghum, undertaken to study effects of N fertilizer and the mechanical treatments such as chopping, pulping and pressing gave informative data. Fertilizer application showed very little effect on quality of the silage, however, mechanical treatments offered before ensiling, resulted in better quality of silage, because of better distribution of plant nutrients and enzymes while pulping, and removal of moisture and soluble buffers while pressing.

Forage production programme, if linked-up with GCF, provides pressed crop for ruminants and LPC for mono-gastrics. The process leaves behind deproteinized juice (DPJ) as a by-product, which must be used or properly disposed to avoid pollution. Two separate experiments were carried out with DPJ of lucerne to exploit it as either silage additives, or a nutrient source as fertilizer. DPJ was better as silage additive but being a high moisture product, failed to produce good quality of silage. The by-product supported the growth of Sorghum plants with a significant manurial effect, though at some places it was shown to be toxic.
The results obtained suggest that forage production should be undertaken with recommended agronomic practices, so as to get adequate nutritional fodder round the year. The integration of fodder production with GCF is one of the possible ways by which mankind can be sufficiently fed by recovering nutrients from the ecosystem.

REFERENCES


