8. FUTUROLOGY

An introspection of this study of soil-plant relationships in respect of K and sugarcane reveals the following important research gaps. This may be taken up in future investigations.

1) The understanding of diffusive flux of K from soil to plant roots is still in its infancy and particularly so in respect of ratoon cane where the root system is very much restricted.

2) Kinetics of release of non-exchangeable form of K, though difficult deserve to be investigated in different soil types.

3) The values of $\Delta G_{\text{optimum}}$ and $\Delta G_{\text{response}}$ for ratoon cane need to be obtained.

4) Successive extractions in boiling nitric acid to obtain non-exchangeable but plant available fraction i.e. 'step K' cannot be adopted as a routine soil test method in view of its inconsistency of values, lack of reproducibility, absence of analytical ease and likely hazards. A simple device of the type shown in Fig. 8.1 deserves to be tested and exploited on a large scale in several soil test laboratories and in sugar factories. A brief description of the apparatus for continuous extractions with boiling nitric acid (Fig. 8.1) is as follows.
FIG. 8.1. APPARATUS FOR SUCCESSIVE EXTRACTIONS IN BOILING N HNO₃
The round bottom flask with three openings of standard joints is used for successive extractions in boiling N HNO₃. The openings are marked Sl. No. 1 to 3.

Sl. No. 1 serves as an inlet for soil and acid. 4 g soil is poured in, followed by 40 ml N HNO₃. Boiled for 5 min. ± 20 sec. and then cooled. The solution is pumped out by the rubber bulb provided. Alternatively, this can also be done through a regulated pressure not exceeding 0.5 kg/cm² by using a compressor. Sl. No. 2. This is fitted with a water condenser to check gaseous losses of HNO₃. Sl. No. 3. Through this opening a capillary tube fitted with a sintered glass and almost touching the bottom of the flask is fitted. The fine grained sintered tubing helps to separate the soil from solution and the quantitative removal of the latter is effected.

Once again the acid is poured through inlet No. 1, boiled for 5 min. ± 20 sec., cooled and pumped out from Sl. No. 3. Such five successive extractions in boiling N HNO₃ are made to finally compute 'step K' and CRK. It is expected that this small apparatus will help in quick and safe soil extractions in acid and can possibly be used in routine soil testing for K.

5) The utility of H⁺ resin as a routine soil K extractant to obtain 'step K' values with sugarcane as test crop and the economic evaluation of resins under Indian conditions is an important line of future investigation.
6) The rationale of K fertilization based on the chemical potential of soil i.e. $G_k$ and $G_{optimum}$ for sugar-cane is worthy of future exploration with a view to reduce K fixation in soil and luxury consumption by crops.