cording to a prescribed "preferred" standard, reduces the need for frequent regeneration of accessions. Capital and operating costs of stores at sub-zero temperature, thought to be not excessive, need to be quantified and further refined.

The International Board for Plant Genetic Resources (IBPGR) was established in 1974. Its basic objective is to promote an international network of genetic resources activities. Free exchange of material and information related to it, the deposition of duplicate collections in their country of origin, and the duplication of "base" collections are three basic principles that the Board has adopted.

IBPGR has established two dimensions of crops and regions as a matrix for its priorities. Cassava, potato, sweet potato, and yam are among the tropical root and tuber crops to which priorities have been assigned in 10 of the 14 designated regions. The IBPGR is promoting germ plasm collections of tuber and root crops, grain legumes, millet, and rice in West Africa; cereals in North Africa, India, and Pakistan; rice in Southeast Asia; and potato, tropical forage legumes and grasses, maize, and groundnuts in Latin America.

Summary of Discussions

Basic Productivity

Rapporteur: James Cock

Discussion Leaders: James Cock, Brown Enyi, and Bede Okigbo

The similarity between tropical and temperate root crops is tremendous, and much of the sophisticated work done in temperate regions can form a base for tropical root crop investigation. The root crops, unlike the cereals and many other crops that have their sexual organs as the usable parts, produce the source and fill their sink at the same time. This means that there is always a balance between production of source and filling of the sink, and any increase in source size will be made at the expense of the sink.

This situation means that optimum leaf area indices for root and tuber crop yields may not be very high (i.e. 3–4) and hence leaf angle and canopy structure may not be important. Work on cassava and sweet potato support this hypothesis but in *Tania* higher yields are related to greater leaf area durations. The primary productivity of the crop may not be as important as the partitioning in tropical root and tubers crops; this agrees with Dr Loomis' thinking in the case of sugar beet. In the root crops, very high plant populations tend to increase primary productivity but decrease partitioning to the roots and decrease yield.

The ideal would seem to be a crop that has a very rapid leaf area index build up and once this is formed it should be maintained by a long leaf life with nearly all new production of dry matter being used in the production of roots and tubers. This may be very difficult as types in which leaf growth is dominant at the early growth stages maintain this dominance throughout the whole cycle.

Various attempts to correlate yield with net assimilations rate and photosynthesis are dangerous and often invalid. A plant that has medium LAI will have a higher yield, due to better dry matter distribution, than a very high LAI crop in many cases. The medium LAI crop will also have a higher net assimilation rate and hence a spurious correlation between yield and net assimilation rate. Similarly, trying to relate yield to photosynthetic rate of sink limited crops, as has been tried in corn and soya, is obviously futile.

Frequently, workers are exhorted to produce high protein root and tuber crops, but there is found to be negative effect on yield due to the extra energy needed to produce protein when compared with starch. When starch is stored, it should be

stored in such a manner that its maintenance respiration is low. The whole relationship between photosynthesis and respiration needs further study.

The use of models to describe plant growth has certain limitations due to the difficulties of describing canopy structure in complex branching crops. Nevertheless, a model is a useful tool for defining plant types and assessing the physiological effects of diseases and pests on the plant. In cotton, the yield losses due to insect attack have been assessed very accurately by model.

Translocation has been cited as limiting yield, but there is little evidence for this in the root crops. In sugar beet, no substrate build up effect on photosynthesis could be induced.

The effects of photoperiod need more study, especially the way in which they change partitioning.

It is a tragedy that there are not more breeder physiologists, and in general in the tropical regions there are few crop physiologists. Physiology teaching stops at the level of one plant and makes little effort to describe the situation in a plant community.