

the basic food of most of the world's population but which are sometimes low in natural protein.

Isotopes as tracers

Photosynthesis, an important aspect of agriculture, is unquestionably the most crucial process in sustaining life on earth. While nuclear processes are a most important source of energy for the future, it is photosynthesis, the conversion of the light energy of the sun into chemical energy, which has sustained man and upon which he remains dependent for food, fiber, and also much of his fuel.

The use of radioisotopes has enabled plant scientists to make good progress in unraveling the photosynthetic process. Significant new discoveries are being made each year which ultimately will lead to an understanding of the process and possibly to the design of an effective synthetic light-energy conversion process. Such recent discoveries as the existence of a second major photosynthetic carbon fixation pathway in tropical and other grasses can be attributed to the use of the radioisotope carbon-14. This kind of basic information may eventually be utilized by the more practical scientist in such tasks as genetic engineering of new crop plants in developing high-yield varieties closely adapted to particular growth conditions.

The use of isotopes as tracers has become singularly important in agricultural research in the study of plant metabolism and plant physiology as well as photosynthesis. The use of fertilizer nutrients tagged with isotopes has been refined in the past 30 years of application to a point where the scientist can determine the availability of elements in soils, the best methods and timing of fertilizer applications, the residual value of fertilizers, and also the interaction between different fertilizer nutrients.

For example, a program carried out in several Latin American countries on maize fertilization showed that plowing down the fertilizers in some locations resulted in reduced uptake of the nitrogen in the fertilizer but that side-dressing generally resulted in an increase in uptake of nitrogen, especially when the fertilizer was applied a few weeks before tasseling.

Fertilizers labeled with radioactive isotopes are prepared by the Tennessee Valley Authority at Muscle Shoals, Ala., for licensed researchers. The user pays for the material and the shipping but is not charged for