GM crops are not the only solution

The concern expressed by Padmanaban[1] is an overstated sentiment of a scientist. His views regarding the industrial and green revolutions are one-sided. He has forgotten the negative impacts of these revolutions, two of them being the accumulation of large amounts of toxic chemicals in the environment and the erosion of native varieties from our farmlands. In the American scenario, these destructive effects have already been reported in the much acclaimed book by Rachel Carson, *Silent Spring*. Unfortunately, it seems that none of our scientists has read this book and hence, could not foresee the impending natural calamity in the Indian scenario.

Even though the green revolution in India enabled an increase in productivity, it also caused environmental havoc. By the time (50 years) our scientists understood this, the damage had reached its zenith. Then, Western scientists started a new technology – biotechnology – saying that it was the answer to all the threats faced by humans. When the Western scientists say something, our scientists just follow them. They do not know the science to solve these problems indigenously. All the technical papers in biotechnology or genetic engineering cite references from the West; I fear we do not have a cited protocol that could be called Indian.

The practice of genetic engineering has advantages and drawbacks. As pointed out by Padmanaban[1], problems associated with this technology such as in the use of antibiotic selection markers have been solved over years of research. Here lies the concern for the general public. Ten years ago, they were assured by the scientist that there was no harm; now the same scientist says that the problem has been solved. This anomaly is the curse of science. The same is the case with GM technology. Until and unless long-term impact assessment studies have been done, scientific discoveries should not be made available to the public. It has been observed that in issues of public and political interest, scientists always resort to emotional blackmailing to get their hypotheses accepted. This is not the spirit of science.

The adverse remark by Padmanaban[1] against the stand taken by the minister from Kerala is unethical and unwarranted. The choice for or against GM crops is the discretion of a state. Of course, the ideology of politicians can change with circumstances. But the views of the majority of our scientists also seem to change in accordance with the views of the ruling political party. Most of them seem to have forgotten the basics of scientific methodology.

None of our scientists is promoting native varieties of plants that have certain qualities claimed by the GM plants. For example, the Wayanad region in Kerala boasts of rice varieties having high nutritional value. Here, there is no meaning in cultivating a GM crop like Golden rice. We need to identify and try to solve the specific problems affecting a particular region.

The green revolution has resulted in many wild crop relatives becoming extinct. Everyone cites the example of China being ahead of us in the area of GM crops. But it is also a fact that China has not released hundreds of crops which it has developed through intense research. The Chinese are more cautious than us. If a situation arises wherein most of the crops in the world are GM and wild species are difficult to find, then the country that has large reserves of its germplasm will be in the lead. With judicious research, India can be a prominent player in food-grains management for the future.

1. Padmanaban, G., *Curr. Sci.*, 2011, **100**, 157–158.

BIJU DHARMAPALAN

Department of Plant Biotechnology,
Mar Athanasios College for Advanced Studies,
Tiruvalla 689 101, India
e-mail: biju_dharmapalan@yahoo.co.uk

Guidelines for success of well site selection

Groundwater is a natural replenishable resource. It is an important source for various purposes, including drinking, irrigation and industrial, due to insufficient surface water supply and frequent failure of monsoon. Identification of groundwater zones depends upon many factors such as distribution of rainfall, run-off, grain size of soil, topographic features, type of landform, drainage conditions, lithological characteristics, land-use practices, depth to groundwater level and environmental constraints, which are not uniform in any area. Therefore, the following guidelines are essential and can be applied locally or regionally for success of well site selection.

(i) Low-lying areas favour more than the slope area and high-land areas to sink wells, as the groundwater flows in the direction of descending slope.

(ii) Vegetation flourishes where the groundwater is available at shallow depths. Thus, the occurrence of thick vegetation indicates large groundwater storage at shallow depth. However, the presence of vegetation like desert plants indicates the scarcity of groundwater at shallow depths, as they absorb water from the sub-surface and store it in their thick fleshy leaves and stems.

(iii) Areas comprising thick soil or alluvium cover and weathered, fractured, jointed, and faulted rocks indicate good storage of groundwater, as these support infiltration of groundwater recharge. However, fine-grained soils like clay cannot support infiltration of groundwater. Moreover, they cannot transmit water from one place to another and have saline groundwater due to stagnation. Coarse-grained soils transmit water and hence the water is potable. Bald rocky areas lack such favourable conditions as they do not permit infiltration of water. Thus, these rocks indicate paucity of groundwater.

(iv) Surface water bodies like tanks, ponds, lakes, streams, reservoirs and rivers serve as sources of recharge to the nearby areas. Thus, if we sink wells in and around the areas of surface water bodies, the wells can yield sufficient water.

(v) The study of existing wells in the vicinity of the proposed well sites with respect to soil cover, rock types (hard rock or soft rock) and their structural conditions (fractures, joints, faults, etc.) depth to water table and well yield is essential to have a clear picture of the hydrogeological conditions of an area.

(vi) Scanning of sub-surface hydrogeological conditions like depth of soil zone, weathered zone, fractured/jointed zone and unfractured zone from the ground surface is essential. From these surveys, it is possible to assess the depth of saturated zone and water quality (saline or non-saline). Such surveys should be conducted in summer to know the real depth of the saturated zone. This zone is generally deep in summer and shallow in the other seasons. If we conduct the surveys in seasons other than in summer, there could be decline or dry-up of water conditions in summer, as the shallow depth of saturated zone observed from the remaining seasons can decline.

(vii) If two wells are situated close to each other in a more or less plain land, the supply of water can be greatly affected due to well-interference, when both the wells are pumped simultaneously, especially in summer. This is because, the water in a shallow well can get depleted or dried-up rapidly than the water in a deep well. Thus, it is important to maintain a distance of 150–300 m in alluvial areas and 75–150 m in rocky areas between two wells.

(viii) The water level in any area can decline or dry-up in summer due to lack of infiltrating recharge. But, the depletion of water level can be rapid in the uplands than in low-lying areas of the same place due to heavy pumping of wells in the low-lying lands, which sometimes lead to drying of wells, irrespective of the distance of wells between them. These conditions can reach alarming levels, where the apartments are more due to over-exploitation.

(ix) For large scale of well-sinking programme, integration of satellite data with hydrogeological data, can help in making rapid survey of an area.

N. SUBBA RAO

Department of Geology,
Andhra University,
Visakhapatnam 530 003, India
e-mail: srnandipati@gmail.com

ICAR: time for introspection

The Indian Council of Agricultural Research (ICAR) was established with the mandate of teaching, research and extension in the farm sector through agricultural universities and national institutes catering to the need of training young students and scholars in the country[1]. It is time for introspection regarding functioning of ICAR.

For the last two decades, teaching posts are either lying vacant or there is no increase in the number of such posts. ICAR is not questioning how the universities are running several undergraduate and postgraduate courses with only 2–3 teachers. Students, after obtaining a master's degree, enter into diverse fields such as banking or railways, or appear in IAS/IFS exams. Some universities have parameters such as NET/GATE, a Ph D degree, publishing record and research experience for selection. In others, no such criteria is followed.

Frequent transfers of talented people to work on a different crop and interdisciplinary transfers on executive grounds, of incompetent and disinterested personnel, from research to extension or teaching to research or vice-versa are common. This overlooks the fact that they are selected for their ability to work in well-defined fields. Another major cause of decline in research and teaching is reservation. Relaxation in marks and seats compromises the quality and quantity of the output.

Agriculture curriculum has no separate course for fungi, bacteria or viruses in graduate programmes; but there is a separate course on nematodes. ICAR is running research projects without any time-frame. Some projects have been running for more than three decades without any breakthrough research being reported. A reassessment of all the projects should be done by a review committee comprising specific subject/crop experts. The ICAR grant is customarily not received in time and the university disburses salaries out of the research grant. This delay in receiving grants affects timely field operations, procurement of seeds, fertilizers, pesticides and sowing.

Research posts in time-bound coordinated projects are also lying vacant. Normally, in a coordinated project set-up (of any crop) four kinds of scientists are required, viz. a breeder, an agronomist, a pathologist and an entomologist. But in most of the projects, posts are lying vacant. There is loss of season, loss on data of trials which are to be conducted under specific conditions (rainfall, temperature and duration being season-specific) and at a specific location. At times breeders make pathological observations and often entomologists record pathological data. In many universities and national centres, equipments are purchased when the organization does not even have the space to install them. Thus they remain unused after demonstration.

Some unethical practices are not uncommon in farm research, such as sowing on a large area and filing yield data for a lesser area (to demonstrate higher yield), roguing of diseased plants to show disease-free field and variety, and taking rainfed trail of crops and irrigating the field in the name of life-saving irrigation.

ICAR had initiated Krishi Vigyan Kendra (KVK) in each district to learn about technologies through 'on-farm demonstrations', for giving training to farmers, especially women workers, and regular advise by organizing Kisan Melas. Except in a few centres, posts are lying vacant or there are only 2–3 staff. Good infrastructure, farmers' dormitory, guesthouse and land are available, but