

catalysis for development

It has often been said that the most effective form of help is self-help.

But a country which is poor in resources for the initial phases of a major project may never be able to get that project off the ground — however necessary it may be.

The IAEA, as executing agency for some UN Development Programme Special Fund projects, can play a valuable catalytic rôle.

This was the reasoning which lay behind a decision announced in June 1968. In a press release issued at that time the IAEA said that "the use of atomic energy to increase agricultural production is to be intensified in India. The IAEA is to undertake, on behalf of the UN Development Programme, a five-year project costing more than \$3 million. Of this amount UNDP is providing \$1 419 700 and the Government of India is making available staff, services, land and buildings to a total value of \$1 908 000.

"A Nuclear Research Laboratory will be established for the purpose at the Indian Agricultural Research Institute, New Delhi, and additional research facilities will be provided for the Bhabha Atomic Research Centre, Trombay, the Indian Veterinary Research Institute at Izatnagar and the National Dairy Research Institute at Karnal.

"Some of the major subjects to be investigated, using nuclear techniques, are soil fertility; plant nutrition; use of fertilizer and irrigation; breeding improved varieties of crops for high-yielding, resistance to disease, stem strength, increased protein content and nutritive value; control of insect pests; and raising the production of healthy farm animals..."

The project has now been running for just over three years. Progress has not always been smooth, as might be expected in any project of such a complex nature. But, taken as a whole, results are promising.

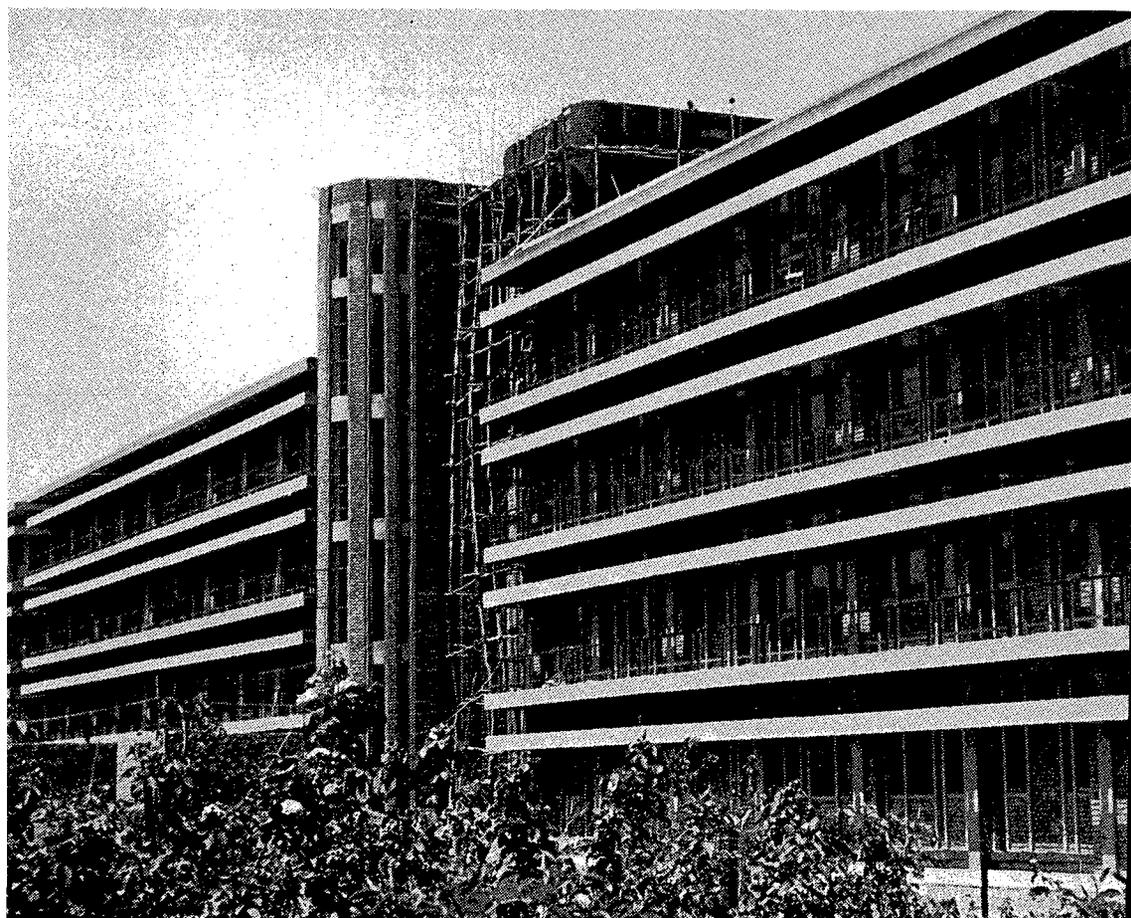
Help where it is needed — when it is needed

Work has been co-ordinated with the Indian Atomic Energy Department and with the Ministry of Food, Agriculture, Community Development and Co-operation. As soon as practical results have been obtained they have been transmitted to the farmers through the extension networks of the Department of Agriculture of each State.

The UNDP is providing training fellowships and the services of experts and consultants in soil fertility, soil physics, plant nutrition and pathology, plant breeding and genetics, entomology, radiochemistry, animal physiology, animal nutrition and pathology, and computer programming. Nuclear instruments, other laboratory equipment and chemicals not available locally and an electronics workshop have also been supplied.

Construction work on the Nuclear Research Laboratory (NRL) has proceeded on schedule; the main building was due to be completed as

The new laboratory building being constructed as part of the Indian Special Fund Project, at the Indian Agricultural Research Institute, New Delhi. Photo: IARI



this issue of the Bulletin went to press. (A photograph of this building accompanies this article.) This in itself is no small achievement. Additionally, a large animal shed has been built at the Indian Veterinary Research Institute (IVRI), to accommodate 16 metabolism cages required for animal nutrition/metabolism work.

In an article such as this, describing a project as big as this, it is not possible to describe each of the activities which is under way. Some parts of the project may, however, be singled out. At the Indian Agricultural Research Institute, New Delhi, for example, 65 mutant strains of rice were tested during the last six-month period to be reported upon in work at two locations — Delhi and Karnal — together with parental control and standard check varieties. Results presented recently showed 19 cultures to be "especially promising" in respect of grain yield and plant type. These cultures were put to large-scale field trials at Cuttack. Three showed particularly high yield — greater than that of an earlier "mutant" variety, IR-8 — and were associated with medium grain and seven days' earlier maturity than IR-8. Further checking in trials at Cuttack was reported to be under way. A second mutant line, Kh. 46, was found to have a fine grain, and a moderately high yield, and to mature 20 days earlier than IR-8.

High yield in itself may not be of much advantage if associated with low protein content in individual grains. Again in work at IARI, 350 mutant cultures analysed for grain protein showed contents varying between 3.8 per cent and 17.81 per cent. Further checking of results is being carried out.

Work similar to this is being carried out not only in other institutes in India but in research centres worldwide; the techniques used are comparatively well-known. One research programme being carried out at the Indian Veterinary Research Institute, Izatnagar, in the field of animal parasitology is of a kind which has received much less publicity — but it is of undoubted value.

Improving the health of sheep

Many sheep in the Jammu and Kashmir State suffer from infestations of lungworm, a parasite which saps the health of the animals, producing in them cough, laboured breathing and a discharge from the nostrils. Sheep on Government farms were found when studied to be comparatively more healthy than those owned by private breeders.

The sick animals can be treated by vaccinating them against the lungworm; at IVRI, it has been found possible to produce a suitable vaccine by radiation attenuation of infective material obtained from lungworm larvae.

The report of a Yugoslav expert, A. Sokolic, working at the IVRI to assist in carrying out the project, tells the story. Paraphrased, it is this. Sheep flocks in Kashmir were examined for lungworm infection during the latter months of 1969 and early months of 1970, before vaccination.

Of all animals examined from government sheep farms during October-November 1969 and March-May 1970, 19.7 per cent and 6.5 per cent

respectively were found to be positive for lungworm infection. The sheep flocks of private breeders during the same periods showed 61.6 per cent and 26.9 per cent infestation.

Post mortem examinations of 61 lungs of local sheep were made to discover which species of lungworm infected the sheep. There were two major culprits; some sheep suffered from both.

Part of the vaccination and post-vaccination assessment work was carried out in high alpine pastures, 3000—4500 metres above sea level. "This", commented Dr. Sokolic, "is due to the peculiar grazing habits of the sheep, which move to these high alpine pastures during the summer months." Each animal was vaccinated with two doses of the radiation attenuated *Dictyocaulus filaria* vaccine (*D. filaria* being one of the two major species of lungworm discovered). Two types of vaccine were tested — one produced at IVRI and the other at another nuclear research institute at Zemun, Yugoslavia, which was established also with UNDP Special Fund assistance. In all, 3215 animals were used in the experiment. Criteria for the assessment of the efficacy of the vaccine used were based on parasitological data, the clinical picture, and differences in body weight gains between vaccinated and control groups of animals.

First, a smaller percentage of animals were found to be infested with the lungworm than before the tests. The number of animals found to be positive for infection was on average 2.6 per cent in those vaccinated with the IVRI vaccine, 3.5 per cent on average for those vaccinated with the Zemun vaccine (produced from a slightly different variety of lungworm), and 24.9 per cent in the non-vaccinated control group. Secondly, the majority of the animals in the vaccinated and in the control groups, with the exception of a few which had not been vaccinated, showed no clinical signs of lungworm infection. The third means of assessment differences in weight gain, showed most striking result.

"A sample of animals picked up at random from the three groups... were weighed in May, 1970 when the present field vaccination trials commenced", wrote Dr. Sokolic. "Further weight records of a sample of animals belonging to these three groups were made at the end of the present study, i.e. in November 1970.

"The average weight gain per animal for different flocks... ranged from 3.6 to 13.8 kilograms with an average of 7.5 kg for those given the IVRI vaccine, 3.7—11.7 kg with an average of 7.2 kg for those given the Zemun vaccine and 2.5—8.9 kg with an average of 4.7 kg for the non-vaccinated control group.

"Statistically, the differences in average weight gain per animal in the respective groups were analysed... Animals belonging to the vaccinated groups showed a significant difference from those of the non-vaccinated control group, indicating thereby that the average weight gains per animal were much better in the animals that had been vaccinated than in those that were left unvaccinated."

So the treated animals were indeed healthier than before. In view of the encouraging results of this experiment a second field trial in a new area of Kashmir is being carried out this year: 2000 sheep, mainly belonging to private breeders, have been vaccinated and 905 kept unvaccinated as controls. Co-operation with sheep breeding authorities in the States of Himachal Pradesh and Uttar Pradesh for screening work on lungworm incidence in sheep have been initiated.

Training and team work

Perhaps the most significant feature of this work is that it is being undertaken by Indian research workers in Indian institutes — with the help of an expert supplied through the IAEA. He is only one of many who have been assigned to help with various parts of the project. In addition, the project has been visited by a number of staff members of the UNDP and of the Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture. Local staff have been sent to other countries to take up fellowships or to participate in training programmes: within the last few months one man has completed six months' training in soil physics at the University of Wisconsin, Madison, and at Ames, Iowa, in the United States; a second completed nine months' training at the Rothamsted Experimental Station, Harpenden, in the United Kingdom; a third continued training in Sweden and Yugoslavia on the use of nuclear magnetic resonance and nuclear techniques for rapid, non-destructive determination of biochemically important compounds in plant matter, and so on.

This is a big project. Its eventual success or failure may take years to assess, in terms of greater agricultural productivity, improvement of living standards — whatever criteria may be chosen. But the indications are good. In the words of the most recent semi-annual report:

“Substantial progress has been achieved in all project activities. With continued concentrated efforts it should be possible to complete the project successfully within the time period specified in the Plan of Operation. The working relations throughout have been excellent and continued hard team work and inter-institutional co-operation will ensure final success.”