# BIOLOGICAL NITROGEN FIXATION RESEARCH PROGRESS AND PROSPECTS

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The BNF research programme is conducted along four main themes and the progress under them during 1988, will be reviewed.

## Cyanobacteria and flood tolerant, stem nodulated $N_2$-fixing plants as biofertilizer for rice

Field surveys conducted in 1987 revealed *Nostoc sp.* to be dominant in rice soils of Sri Lanka, with *Anabaena* and *Calothrix* as sub-dominant species. Selected *Nostoc* strains were screened for tolerance to pH, under laboratory conditions. The results showed an optimum pH of 7.5 for all the strains, with two strains having relatively wider tolerance. However cyanobacteria seldom produce biomasses of agronomic significance in rice fields. It is therefore planned to produce mutants of selected strains capable of secreting part of their Nitrogen and axenic cultures are currently being prepared prior to their treatment with mutagens.

The flood tolerant, stem nodulated legume *Sesbania-rostrata* introduced to Sri Lanka in 1984, has a tremendous potential as a fertilizer for rice. One limitation however is its photoperiodic sensitivity which make the plant to flower early at the expense of vegetative growth. A field experiment showed that a significant increase in nitrogen fixation activity, dry matter production and N-yield can be brought about by pruning the plants just

prior to stem inoculation. Experiments are planned to study the effect of this green manure on the growth and yield of rice.

## Associative $N_2$-fixation on rice

'In situ' field measurement of $N_2$-fixation has shown that certain rice varieties are capable of significant fixation and that the activity tends to be highest prior to flowering certain traditional varieties grown without fertilizer-N did not show higher activity than BG400-1, a new improved, high N-responsive variety. A local isolate which gave consistently high nitrogenase activity in association with BG400-1 has also increased the shoot and root biomass and N-yield of rice plants under laboratory conditions. This isolate can live on $NH_4$ as its sole source of N, has an inducible nitrate reductase enzyme, but will denitrify only under anaerobic conditions. Its a member of the Enterobacterizceae and further, accurate identification is been done at the University of Gent, Belgium.

## Rhizobiology of grain legumes

Studies on the competitive ability of a recommended Niftal strain of rhizobium and a selected local strain on mung bean has shown moderate infectivity over the indigenous population. Better infectivity and higher Nitrogen fixation was shown when single strain inocula were used than mixed strains, perhaps indicating competition between the selected strains. Moderate additions of Molybdenum gave better nodulation, higher nitrogenase activity and increased N-yield in mung plants grown on soil from Girandurukotte, in the Mahaweli 'C' area, where this legume is widely cultivated.

## Occurence and uses of $N_2$-fixing trees

Focus of the survey during 1988 was the central Province, in which three species were recorded for the 1st time. A few other species were also observed in localities where they have not been recorded earlier. Multivariate analysis of the distribution did not show a clear, natural pattern, indicating human interference on their distribution. This was confirmed by the data on uses which showed that many of the tree-species in this province are domesticated than growing naturally. Very few of the tree species are used as food, the major use being as a source of timber. Quite a number are used for medicinal purposes, but such uses are higher from indigenous species than from the exotic ones. Use as green manure if at all, was quite occasional.