

APPLIED BNF TECHNOLOGY
A Practical Guide for Extension Specialists

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A Publication of
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United States Agency for International Development

These materials were prepared and produced by the scientific, training, and communication staff on the NifTAL Project.

**October 1990
NifDOC 011090
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INTRODUCTION

WHY TRAIN EXTENSION SPECIALISTS IN APPLIED BNF TECHNOLOGY?

This course is intended to train extension specialists in the applied technology of biological nitrogen fixation (BNF) of the legume-*rhizobium* symbiosis. While many manuals are available to train research workers in the techniques and science of legume BNF there are few training materials available that focus on the extension of BNF technology to farmers.

In most countries there are significant numbers of scientists trained to conduct BNF research. While critical to developing national BNF programs, quality research by itself does not ensure that farmers will benefit from BNF technology. It is technology transfer at the farm level which often limits the adoption and exploitation of this appropriate technology. Better communication at the extension and farm levels will, therefore, be required for farmers and national economies to fully benefit from BNF technology.

METHODOLOGY OF THIS TRAINING COURSE

Communication skills combined with a solid, realistic understanding of the technology are prerequisites for successful technology transfer. This course emphasizes training in both communication skills and basic information on applied BNF technology. Technology training emphasizes identifying and solving farmers' problems. This training/resource manual is not intended to be a comprehensive work on BNF. Sufficient material, however, is provided so this manual and accompanying materials will serve as a valuable reference for extension workers without access to library services. The writing has been done as simply and directly as possible to facilitate translation to other languages. Course materials emphasize information, demonstrations, and principles that are relevant and useful for extension agents in developing countries. The full course is designed for extension agents who are college educated and actively involved in improving other extension worker's technical skills and their ability to further transfer technology.

This course is based on the belief that despite the complexity of the biological and technical aspects of the BNF processes being taught, understanding the basic working principles of BNF technology is possible by non-scientists. The course is interactive with hands-on demonstrations and exercises, discussions, self evaluation, and review being an integral part of the learning process. Case studies are used for self-evaluation and review. Participants use their newly acquired knowledge of BNF to examine a series of realistic situations extension agents are likely to find in the field. Case studies challenge students to evaluate and diagnose problems and develop an action plan for their solution.

COURSE ORGANIZATION

Training materials are organized in modules. Each module begins with a summary of the key concepts and their relevance to applied BNF technology. A narrative follows which elaborates these key concepts using illustrative materials. Demonstrations of the key concepts augment the narrative and are an important learning tool. Instructions and details for performing demonstrations useful to other extension agents and farmers are provided to aid participants to develop their own training program.

The goal of this modular format is to assist course participants in developing programs at various levels of complexity and duration. All materials have been compiled and written toward ultimately benefiting

audiences ranging from farmers to administrators.

The task of continuing to expand BNF technology by course participants will be made more effective by the addition to course materials of farmer handouts and training aids. A simplified summary of each module including illustrative material has been extracted and placed in a removable folder. These synopses will be useful for extension agent training and are conveniently used for reproduction or translation into local languages. Farmer handouts and illustrative material are designed to be easily reproduced by photocopying.

THE VALUE OF THE COURSE

Farmers will use BNF technology only (1) if they are aware of the potential economic benefit they can realize from its use and (2) if they can properly apply it in the field. Both these prerequisites for success require that farmers have confidence in the extension worker's ability and knowledge of BNF technology. We believe this training manual and course in applied BNF technology can make a contribution to increasing awareness and technology capability in institutions involved in technology transfer.

ACKNOWLEDGEMENTS

Support for the original development of this course was provided by the Secondary Food Crops Development Project (SFCDP) supported by the Government of Indonesia and USAID. Ideas for the philosophy and content of the course were provided by Dr. Saroso Sindhoesarjo (SFCDP) and Drs. E. Edwards McKinnon and Brian Hilton (Academy for Educational Development CTTA Project, USAID S&T). Reviews by R. Kent Reid (South-east Consortium for International Development and Auburn University) and James Worstell (Save The Children) are gratefully acknowledged. Support for revisions and printing of the edition was provided by the Consortium for BNF, a collaboration of several private voluntary organizations, the Peace Corps, and NifTAL.

Development of course materials was a cooperative effort between SFCDP, CTTA, NifTAL, and the BNF Resource Center in Thailand. Princess Ferguson, Anna Gilles, Debra Hughes and Patty Nakao are responsible for the illustrations and graphics. Dr. Nantakorn Boonkerd, BNF Resource Center for South and Southeast Asia, provided useful comments on the course content.

HOW TO USE THIS TRAINING PACKAGE

ABOUT THE FORMAT

This training package is divided into three parts, the modules, training aids and the demonstrations. The primary goal of this course is to enable the participants to be prepared for presenting the materials to others. Therefore, we have included both technical resource information and simplified presentation materials.

ABOUT THE MODULES

The modules are written as a resource and background document. They contain a comprehensive overview of the legume-rhizobia biological nitrogen fixation symbiosis. Each participant will be given two additional books as further resource material. These are the FAO/NifTAL handbook primarily

written by Dr. Joe C. Burton, Legume Inoculants and Their Use, and Methods in Legume-Rhizobium Technology, by Dr. Padmanabhan Somasegaran and Heinz Hoben.

A Summary and set of Key Concepts introduce the material contained in each module. Major topic areas are set apart for ease in following the material. These topic areas are listed in the Table of Contents. Illustrations and tables are liberally used to explain concepts and ideas. The final section of each Module gives a list of case studies and review questions as an additional learning tool and evaluation measure. This section is an opportunity for peers to evaluate the practical aspects of BNF technology and the opportunities and limitations of transferring the technology.

ABOUT THE TRAINING AIDS

A set of training materials is attached to each Module. Extension Specialists who take this course are expected to extend BNF technology through transfer of the knowledge they have gained. These materials consist of a lesson plan, enlarged copies of the Key Concepts, and selected visuals. Also included is a master copy and some samples of a simple to understand pictorial booklet for distribution to farmers. There is a 40-slide set supporting the concepts presented in each module. These training aids are encased in plastic for ease in reproducing and handling.

ABOUT THE DEMONSTRATION SECTION

Many demonstrations will be done to facilitate hands-on learning experiences. These demonstrations are appropriate for carrying out future technology transfer or for understanding important concepts. Complete instructions are given for carrying out selected demonstrations. The purpose and concepts given for each demonstration will be useful in deciding their possible applications. Not every demonstration is appropriate for every situation. Again, the emphasis of this course is on providing as much variety and flexibility as possible to participants in their future BNF technology transfer efforts.

ABOUT THE COURSE STRUCTURE

Giving course participants an overview of the practical applications of BNF is the determining factor in structuring this course. Thus, we begin with an introduction to nitrogen, legumes, and rhizobia. An explanation of their relationship, the legume-rhizobia symbiosis follows. A module on the production and use of inoculants provides the how-to aspect of BNF. Understanding the limitations and benefits of inoculation is the subject of the last two technical chapters. A primer on communication reemphasizes the importance of this aspect of BNF technology transfer. Finally, participants will blend their prior knowledge and professionalism with knowledge gained in the course to develop their own strategy for BNF technology transfer through a planning exercise and presentation practice.