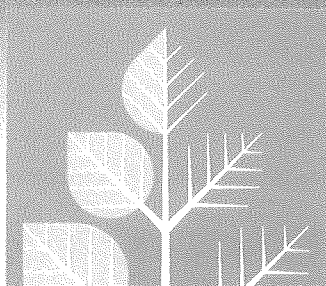
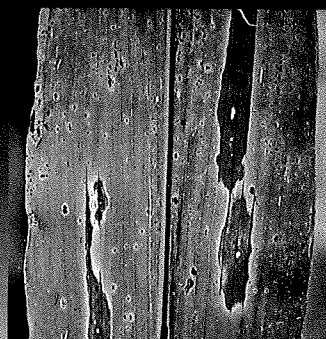
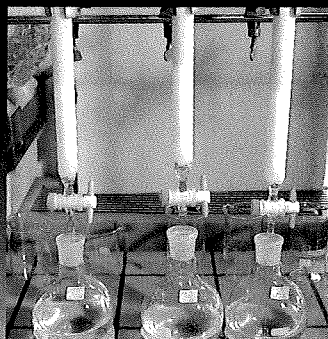




Technical Cooperation
in Rural Areas
Plant and Post-Harvest
Protection

Facts and Figures 1986



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Introduction

Promoting rural areas coupled with conservation of the natural resources in the developing countries is a focal point of German development policy. Safeguarding and improving the population's basic food supply and source of income by means of agricultural production is a prerequisite for any form of further development.

In this context, plant production is of major importance in most countries. Immense worldwide efforts are consequently being made to safeguard and increase harvests.

Although cultivation measures (selection of varieties, tillage, fertilizing etc.) help to safeguard and improve productivity, large amounts of the potential harvest are regularly lost while the crops are still in the fields, as a result of plant diseases, insects, weeds, rodents and other pests. The worldwide losses are estimated at around 30% of the developing countries' potential harvest. Further substantial losses occur during transportation and storage. Plant and post-harvest protection programmes thus play a crucial role in safeguarding plant production.

Technical Cooperation projects in this sector are of particular importance for Third World countries and are much in demand.

The Federal Republic of Germany has been participating in plant protection projects since 1961. GTZ personnel are currently implementing a total of 37 plant and post-harvest protection projects in 28 countries (including six supraregional projects), involving around 70 long-term plant protection experts and an annual budget of around DM 35 million.

Responsibility for these projects is in the hands of "Plant and Post-Harvest Protection" Section 152 of GTZ's "Plant Production, Plant Protection, Forestry" Division 15.

The activities of the Plant and Post-Harvest Protection Section focus on:

- Pesticide residue and formulation control
- Practice-oriented early-warning and surveillance services featuring damage threshold concepts
- Integrated and biological approaches in plant and post-harvest protection
- Control of vertebrate pests
- Post-harvest and storage protection
- Promotion of institutions and advisory services
- Applied research programmes

All plant protection activities are based on the overall concept of integrated plant protection.

Integrated plant protection involves the application of all ecologically and economically appropriate methods of keeping pest occurrence below the economic damage threshold, with particular emphasis placed on the deliberate utilization of natural limiting factors.

Integrated plant protection cannot replace chemical control methods, but must rather incorporate them insofar as this is ecologically appropriate and economically expedient.

The following important aspects play a role in integrated plant protection:

- Natural pest limiting factors, including climatic and locational influences
- Crop rotation measures
- Resistant crop plants
- Economic damage thresholds
- Early-warning systems, including forecasting of pest and disease occurrence

- Selective-action pesticides causing no harm to beneficial animals and insects
- Appropriate combination of control measures, e.g. cultivation measures, physical, biotechnical and biological methods as well as use of chemicals.

Plant protection has always taken many of the above-mentioned aspects into account. However, integrated plant protection focuses greater attention on deliberate preservation and use of natural limiting factors.

In view of the ecological and economic conditions prevailing in developing countries, the integrated approach is of particular significance and is thus an essential component of the projects implemented by the "Plant and Post-Harvest Protection" section. The development and use of biological control methods are of growing importance.

This brochure gives a survey of the projects and publications in the plant and post-harvest protection sector. It is addressed to specialists and institutions dealing with plant and post-harvest protection problems in the Third World, to GTZ personnel and to interested members of the public.

Any enquiries concerning the projects should be addressed to Section 152 "Plant and Post-Harvest Protection".

R. Kaske
Head of Section

J. Friedrichsen
Head of Division

General information for the reader

The projects are arranged in alphabetical order of country. All information relates to the project status as per January 1986 and to the project phase in progress at that time. Any deviations from this general rule are clearly indicated.

Abbreviations:

PN Project number

TC Technical Cooperation

Contents

<u>Country</u>	<u>PN</u>	<u>Project title</u>	<u>Page</u>
Argentina	75.2089.3	Promotion of Citrus Cultivation in the Misiones Province	11
Benin	80.2001.8	Support to the Plant Protection Service	13
Brazil	79.2186.9	Studies on the Resistance of Coffee Plants to Coffee Leaf Rust	15
Burma	82.2089.9	Plant Protection Programme	19
Cape Verde	77.2144.2	Integrated Plant Protection	21
China (PR)	82.2134.3	Biological Control of Pests in Forests	23
Costa Rica	80.2054.7	Plant Protection Training and Advisory Services	25
Cyprus	79.2037.4	Pesticide Formulation Control Laboratory	29
Ecuador	83.2010.1	Control of Coffee Pests and Diseases	31
Egypt	81.2083.4	Field-Rat Control	35
El Salvador	84.2135.6	Integrated Plant Protection	37
Jordan	80.2100.8	Pesticide-Residue Laboratory	39
Kenya	84.2095.2	Control of the Larger Grain Borer	41
Malaysia	79.2167.9	Pesticide Formulation Control and Residue Laboratory	43
Morocco	80.2081.0	Sparrow Control	45
Morocco	81.2005.7	Forest Protection	47
Nicaragua	81.2044.6	Improvement of Plant Protection Services	49
Niger	77.2065.9	Support to the Plant Protection Service	51
Philippines	74.2028.4	Plant Protection Programme	55

Philippines	79.2190.1	Cotton Project	59
Philippines	86.2099.9	Biological Plant Protection	61
Portugal	79.2261.0	Weed Research and Weed Control	63
Somalia	84.2114.1	Prevention of Bird Damage in Cereal Production	67
Sudan	85.2536.2	Plant Protection Advisory Services in Fruit and Vegetable Growing	69
Thailand	75.2046.3	Plant Protection Programme	71
Togo	71.3538.7	Cacaveli Plant Protection Service	75
Togo	84.2111.7	Promotion of Plant Protection Measures	77
Tonga	77.2070.9	Integrated Plant and Post Harvest Protection	79
Tunisia	82.2067.5	Plant Quarantine	81
Western Samoa	77.2043.6	Integrated Crop and Post Harvest Protection	85
Yemen	85.2296.3	Support to the National Plant Protection Service	87
Supraregional	73.2028.6	Pesticide-Residue Project	89
Supraregional	77.2074.1	Post-Harvest Crop Protection	93
Supraregional	77.2233.3	Natural Insecticides from Tropical Plants	95
Supraregional	84.2007.7	Integrated Biological Control of the Larger Grain Borer	99
Supraregional	84.2142.2	Biological Control of Manioc Pests in Africa	103
Supraregional	85.7853.6	Prevention of Post-Harvest Losses in Food Crops	105
Relevant publications			107

Promotion of Citrus Cultivation in the Misiones Province

PN: 75.2089.3

GTZ project leader: A. Marmelicz

Counterpart organization: Instituto Nacional de Tecnologia Agropecuaria

Project location: Montecarlo, Misiones

1. The context

The Argentinian province of Misiones has been deprived of its formerly sound economic basis as a result of a virus disease which has caused the dying-off of sweet oranges. The general income situation is considerably worsened by the fact that smallholder fruit-growing is closely linked with craft and processing enterprises. Climatically, the province of Misiones is ideal for fruit-growing. This labour-intensive type of farming made it possible in the past for families to earn an adequate income despite cultivating relatively small areas.

2. Aim of the project

The aim of the project is to re-create a secure basis for growing citrus and other types of fruit in the Misiones province.

3. Project design/Scheduled results

Investigations into the causes of the virus disease which has caused the dying-off of citrus crops in Misiones are to find ways of controlling the disease and producing virus-free stock. This requires a great deal of experimental and research work. Between 1976 and 1984 a well-staffed and equipped experimental and extension station with 33 hectares of land for experimental purposes was set up in and around Montecarlo and its experimental work is already yielding a number of initial findings. These new findings, together with the extension services provided, have reawakened interest in commercial fruit-growing among the former fruit farmers.

It is hoped that the following additional results will have been achieved by the end of the follow-up assistance phase (1 January 1984 to 31 July 1987):

- Demonstration trials involving various tillage methods will have been evaluated.
- Advice will have been provided on optimizing cultivation methods for citrus and other types of fruit.

- The results of the field trials will have been evaluated and adapted for use in practice-oriented extension work.
- Short-term counterpart upgrading measures will have improved the Argentinian specialists' knowledge and level of training.
- Additional material and equipment will have been provided for the experimental field.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

Assignment of short-term experts and appraisers for up to 7 man-months, supply of technical equipment, seeds and plants for the experiments and trials, short-term upgrading for up to 7 Argentinian specialists, partial assumption of operating costs in special problem situations.

Inputs by project country:

Provision of the necessary specialists, administrative staff and support personnel, continuation of all project programmes started, meeting of operating costs for project facilities, release of specialists for training measures. Implementation of extension programmes.

5. Implementation status

Improvements in the cultivation of citrus and other types of fruit must essentially be viewed on a very long-term basis. The experiments and demonstrations set up in the experimental field are continuously yielding new findings on the cultivation of citrus and other fruits. These findings are to be put into practice and passed on to the growers by the counterpart organization in the course of the follow-up assistance phase.

Support to the Plant Protection Service

PN: 80.2001.8

GTZ project leader: S. Krall

Counterpart organization: Service de la Protection des Végétaux

Project location: Porto Novo

1. The context

Benin possesses few natural resources outside the agricultural sector and the Beninese Government therefore allocates special priority to agricultural production.

The growth of the country's population (around 3 % per year) means that agricultural land is having to be more intensively cultivated and fallow periods shortened; in some places permanent cultivation is becoming necessary on account of the shortage of land. As a result, new crop-growing problems are encountered, the risk of erosion is becoming greater and plant diseases and pests are playing an increasingly important role. The traditional pests have been joined by those which were brought into Africa from other continents and have spread and become established in Benin too. The consequence is that a growing proportion of the country's agricultural production is being destroyed by pests before harvesting or during storage. In addition to the "Defense des Cultures", an institute devoted to research into plant diseases and pests, Benin also has a plant protection service, the "Service Protection des Végétaux", whose task is to put the results of the research into practice and which is thus responsible in particular for demonstration and extension work. Although this 'service' is to play a key role in rural development in Benin, it has been hindered in this role in the past due to a lack of trained staff, experience and resources.

2. Aim of the project

By assisting the Beninese plant protection service, the project aims to promote plant protection extension services throughout the country. Attention is focused on boosting crop production and reducing post-harvest losses.

3. Project design/Scheduled results

The project is to provide material and equipment for the Beninese plant protection service, increase its personnel strength and provide staff upgrading, as well as to develop integrated plant protection programmes that can be implemented at village level. It is intended that the following results should have been achieved by the end of the project:

- The plant protection service will have developed into a qualified advisory institution.
- Pesticides and the necessary equipment will be available to smallholders throughout the country.
- Extension packages covering post-harvest protection, bean treatment, manioc and maize growing, rodent pests and bird-pest control will have been devised, tested, implemented and accepted and applied by the farmers.
- A biological control programme aimed at manioc pests will be in operation.
- The service's quarantine and fumigation centre will be operational.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

1 expert on plant protection extension work for up to 30 man-months, short-term experts for up to 4 man-months, upgrading of two Beninese specialists for up to 3 months each, arrangement of attendance at seminars by 4 counterpart specialists; supply of material and equipment for the plant protection service.

Inputs by project country:

Provision of the necessary specialists, administrative staff and support personnel; meeting of costs for fuel, maintenance, servicing and insurance of official vehicles and other facilities operated by the project, meeting of personnel costs, travelling expenses and cost of board and lodging in connection with staff upgrading.

5. Implementation status

The project is currently in its 2 1/2-year start-up phase. The personnel strength of the plant protection service has been increased, the service given a tighter organizational structure and equipment supplied. Training schemes, demonstrations and extension work are being carried out. In compliance with the decree that quarantine activities must fall within the service's sphere of responsibility, a quarantine and fumigation centre has been set up in the port of Cotonou and has started work.

Studies on the Resistance of Coffee Plants to Coffee Leaf Rust

PN: 79.2186.9

GTZ project leader: Dr. Moraes
Counterpart organization: Instituto Biológico
Secretaria da Agricultura
Project location: Sao Paulo

1. The context

Seen in international terms, coffee rust is one of the most dangerous and economically significant plant diseases. The fungus causing the disease has been firmly established in Brazil since 1970 and is jeopardizing the production of coffee, the country's most important export. Chemical control of coffee rust using fungicides is possible but is also expensive. This places a considerable burden on the coffee producers and also has social effects.

Furthermore, the undoubtedly effective treatment using fungicides has already given rise to a number of secondary problems. Disruption of the biological equilibrium has caused more intensive pest attack to the coffee plants, thereby necessitating the use of additional pesticides and increasing the risks for users, consumers and the environment.

Coffee rust can also be combatted in the long term by breeding resistant coffee plant varieties.

2. Aim of the project

Means of inducing resistance in coffee plants are to be further developed as an alternative to chemical control.

3. Project design/Scheduled results

This is a research project intended to assist Brazil and other Latin American countries in their intensive efforts to combat coffee rust.

The project was started in 1981 with initial training measures and improvement of the counterpart organization's technical facilities. The first operational phase, from 1982 to 1984, covered initial research programmes conducted under Brazilian supervision. The German long-term expert and various short-term experts contributed their knowledge of the latest research technologies.

A second operational phase (June 1984 to May 1987) and the planned follow-up assistance phase (June 1987 to September 1989) will serve to further improve the research laboratory, which is also used as a training centre for coffee researchers from other Latin American countries. In the long term, the envisaged results of the project (some of which will not be achieved for a number of years) are as follows:

- The level of knowledge with regard to scientific research will have been improved.
- It will be possible to induce resistance to the coffee rust pathogen in coffee plants through treatment with metabolism products from microorganisms.
- The biosynthesis and concentration of phytoalexins in the coffee plant, as well as the molecular structure of the phytoalexins, will have been analysed.
- Physiological and biochemical methods will be used to investigate the phases of the life cycle of the coffee rust pathogen *Hemileia vastatrix*.
- Histochemical investigations will be carried out into host-pathogen interaction at cellular level.
- Using serological techniques, it will become possible to distinguish between major physiological strains of the coffee rust pathogen occurring in Brazil.
- Common antigens for early measurement of the resistance level of coffee plants will be in use.
- Biochemical changes following inoculation with the pathogen in the host tissue and in the intercellular spaces of the leaves will have become known.

4. Scheduled inputs (June 1984 to May 1989)

Inputs by the Federal Republic of Germany:

1 expert biochemist for up to 10 man-months, short-term experts and appraisers for up to 13 man-months, long-term scholarships for Brazilian specialists for up to 28 months; laboratory equipment, reagents and other expendable materials; technical literature.

Inputs by the partner organization:

Provision of the necessary specialists, administrative staff and support personnel; meeting of day-to-day operating costs for project facilities; release of scientific specialists for training measures; provision of all necessary equipment and supplies for the project field offices.

Inputs by others:

The Secretariat for International Economic and Technical Cooperation (SUBIN), which is responsible to the Brazilian Ministry of Planning, is providing sizeable grants towards the personnel costs and travelling expenses.

The Brazilian Coffee Institute (I.B.C.) is assisting with the construction of a greenhouse and the development of a special laboratory.

5. Implementation status

Resistance induction which can be reproduced at any time has been achieved in laboratory tests and coffee rust infestation reduced by 90 % by comparison with untreated coffee plants. The tests are now to be continued outdoors on an intensive basis; the 1985 drought in the coffee-growing areas led to this work experiencing a certain amount of delay.

Around 12 counterpart specialists have so far undergone off-project upgrading.

Plant Protection Programme

PN: 82.2089.9

GTZ project leader: N. von Keyserlingk

Counterpart organization: Ministry of Agriculture and Forests, Agriculture Corporation

Project location: Rangoon

1. The context

Agriculture is the most important sector of the Burmese economy. It is being increasingly intensified with government assistance in order to provide food and jobs for the country's growing population and in order to earn foreign exchange through exports. The most important crop is rice.

New high-yield varieties of rice and other crops have already boosted yields to a considerable extent. However, pests and climatic influences pose a permanent threat to the crops, with annual losses valuing around DM 20 million.

The Burmese farmers (mostly smallholders) are unable to cope with the related plant protection problems or to take preventive measures. The lack of understanding for the necessity of plant protection measures, the inadequate knowledge and the users' lack of problem-awareness as regards appropriate plant protection can be ascribed to the inadequate or non-existent extension activities by a plant protection service which is not yet fully operational. Efficient agricultural research and training facilities are likewise lacking.

2. Aim of the project

The intention is to establish an operative, efficient plant protection service, capable of developing appropriate plant protection measures and strategies and of appropriately advising the farmers.

3. Project design/Scheduled results

The project's 3 1/2-year start-up phase involves the provision of initial broad-based technical and organizational support for the Burmese plant protection service now being established. The next phase is to concentrate on the setting-up of an infestation-dependent control system in rice growing. It is envisaged that the following results will be achieved by the end of the project's initial phase:

- A plant protection, diagnosis and extension station will have been set up in each of the six most important crop-growing areas.
- The plant protection service personnel will have become qualified for their work as a result of training and upgrading measures.
- Back-up analyses to obtain data relevant to plant protection will have been carried out.
- The organizational and technical basis for setting-up an infestation-dependent control system for rice growing will have been worked out.
- Appropriate methods and strategies for preventive rodent pest control will have been developed.
- Field tests with a view to obtaining and using natural insecticides from the neem tree will have been carried out and corresponding recommendations drawn up.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

Assignment of 4 long-term experts for up to 116 man-months and short-term experts for up to 24 man-months; implementation of off-project training and upgrading measures for Burmese specialists (112 months of training under long-term programmes and 18 months under short-term programmes); contribution to the setting-up and equipping of 6 plant clinics; supply of equipment and means of transport.

Inputs by project country:

Provision of specialist and support personnel; provision of buildings, premises and facilities; provision of fields for trials and demonstration purposes; procurement of adequate quantities of neem stock; meeting of running costs; implementation of the results of the work.

5. Implementation status

The project started in August 1985. The operational planning will be carried out on site in February 1986. At present, only the team leader is already in Burma. The other experts will follow in the spring of 1986.

Integrated Plant Protection

PN: 77.2144.2

GTZ project leader: Dr. A. Viereck
 Counterpart organization: Ministerio do Desenvolvimento Rural
 Project location: Praia / Sao Jorge

1. The context

In addition to the problem of often inadequate rainfall, crop yields from both dryland farming (approx. 35 000 hectares) and irrigated agriculture (approx. 2000 hectares) in the Cape Verde Islands are limited by pests (mainly insects). Despite the low degree of self-sufficiency (often below 20 %), the safeguarding of agricultural production is one of the major objectives in Cape Verde's development plan.

In general, the major pests in the Cape Verde Islands are locusts, harmful butterfly larvae, beetles, fruit flies, scale lice and virus-transmitting insects, all of which occur in vast numbers. On the island of Santo Antao a species of millipede causes immense damage to sweet potatoes in the irrigated farming areas.

The country's island location means that biological pest control methods offer particularly good prospects of success.

2. Aim of the project

The aim of the project is to develop and introduce integrated and biological methods designed to ensure appropriate pest control in the Cape Verde Islands.

3. Project design/Scheduled results

The project's activities are focused on the development and application of an integrated plant protection concept as well as on the provision of support to the agricultural extension service in the plant protection sector, accompanied by upgrading programmes and the supply of equipment. It is envisaged that the following results will have been achieved by the time the project ends:

- An integrated plant protection concept for dryland farming and irrigated farming will have been developed and will be in use on all the islands.

- An efficient extension service will have been set up, taking particular account of the archipelago's phytosanitary problems. Extension aids will be developed and used in a practice-oriented manner.
- Specialists, technicians and extension officers from the counterpart organization will have undergone training in the Federal Republic of Germany or in other countries, or will have acquired the necessary qualifications through short regional programmes (phytomedicine).
- The national basis for the plant protection service and the study centre will have been expanded. The counterpart organization will have been adequately provided with equipment and expendable materials for use in laboratory experiments, field trials and extension work.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:
 2 GTZ experts (agronomy/plant protection) for up to 179 man-months, short-term experts for up to 21 man-months, scientific assistant for up to 30 man-months; supply of equipment for the extension and training centre, financing of construction measures; various vehicles; laboratory and office equipment and expendable materials; diesel fuel for central electricity generating unit; wage costs for support personnel; travelling expenses and training costs.

Inputs by project country:
 Provision of qualified counterparts as well as administrative staff and support personnel; provision of land for field trials, sites, buildings, furnishings and workshop; gradual assumption of responsibility for diesel-fuel costs; release of agricultural extension officers for upgrading courses.

5. Implementation status

The project, which started in 1977, is currently in its second operational phase (1984 - 1986). Good results have been achieved so far in the area of integrated plant protection, particularly as regards biological pest control. The project is well-equipped. The extension component exhibits a number of shortcomings, as it took years to create the extension service. Quarantine measures, which are particularly important for this island state, could not be started until 1984. Preparations are currently being made for prolongation of the project.

Biological Control of Pests in Forests

PN: 82.2134.3

GTZ project leader: Mr. Yu, Chang-Yi,
 Chinese project manager

Counterpart organization: Ministry of Forestry

Project location: Shenyang

1. The context

In the People's Republic of China the natural forests have been largely destroyed as a result of centuries of ruthless exploitation and permanent over-use. This leads, among other things, to forest devastation, erosion by wind and water, flooding and wood shortages. Since 1949 the country has been endeavouring to extend the forested areas once again by means of large-scale afforestation schemes. Particular importance is attached to protecting the afforested areas. Alongside forest fires and uncontrolled tree felling by the population, it is insects, pathogens, parasitic plants and mice which represent the greatest dangers for the forests.

The use of integrated and biological pest control methods has a long tradition in Chinese agriculture. Endeavours are being made to apply similar methods for the forests; however, the development of biological pest control in this area is hindered by bottlenecks and deficits in the scientific, research and training sectors.

2. Aim of the project

A research institute for integrated biological control of forest pests (responsible for Northern China) is to be established and developed.

3. Project design/Scheduled results

The Chinese counterpart organization is being advised on construction and organizational aspects in the establishment and development of the research institute. The institute's equipment is being supplied by the Federal Republic of Germany. The institute's personnel are to undergo training to qualify them for their tasks. Following a start-up phase scheduled to last three years, practice-oriented basic research is to be started. It is planned that the following results will have been achieved by the end of the project's initial phase:

- The details of the research institute's organizational integration into the forest administration and its internal structure will have been laid down.
- The research institute building will have been constructed and equipped.
- The institute's scientific and technical specialists and administrative staff will have acquired the necessary qualifications for their work.
- A documentation centre for integrated biological pest control will have been set up at the research institute.
- A practice-oriented medium-term programme for the institute's research work will have been drawn up.
- Project management will have been carried out.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

Short-term experts for up to 15 man-months; laboratory equipment, apparatus and facilities for experimental purposes, audiovisual equipment and aids, office equipment and furnishings; training of specialists (48 months under long-term programmes and 20 months under short-term programmes).

Inputs by project country:

Provision of specialists, administrative staff and support personnel; construction of a building for the research institute, provision of the necessary buildings, facilities and vehicles, meeting of running costs; release of specialists for training.

5. Implementation status

Joint operational planning was carried out on site in June 1985; this simultaneously marked the beginning of the project. The agreed three-year project duration will thus run from June 1985 to May 1988.

The Chinese counterpart organization started the construction work for the research institute in the autumn of 1985. It is agreed that the building will be completed by June 1987 at the latest.

Two Chinese specialists, who are currently learning German, will start their six-month upgrading programme in the Federal Republic of Germany in May 1986.

A project progress control by the GTZ is scheduled for the second half of 1986.

Plant Protection Training and Advisory Services

PN: 80.2054.7

GTZ project leader: Dr. G. Jürgens

Counterpart organization: Dirección de Sanidad Vegetal
Ministerio de Agricultura
y Ganadería

Project location: San José

1. The context

The government plant protection service, attached to the Ministry of Agriculture, is of major economic significance in Costa Rica. However, the government agencies are unable to implement on their own campaigns of the necessary scale to control economically important pests and diseases such as coffee rust. Pests and diseases which have to date not occurred in the country represent a potential danger if they are brought in. There is no diagnostic service permitting fast action to protect the crops and it cannot be guaranteed that import and export goods are free of pests and disease. A number of critical factors hinder the performance of the necessary tasks. The specialists and management personnel lack phytomedical knowledge and appropriate training; facilities and equipment are also inadequate, particularly for plant quarantine, the monitoring of crops and pesticides and in the regional service. The central problems on many farms are the inappropriate use of pesticides and insufficient knowledge of alternative methods.

2. Aim of the project

The project is intended to expand and strengthen the plant protection service while at the same time enabling it to devise solutions to plant protection problems and offer them to the farmers.

3. Project design/Scheduled results

The project's activities concentrate on providing specialist and administrative advice to the Ministry of Agriculture agencies responsible for plant protection; this is backed up by training and upgrading programmes. A major role is also played by the development of new alternative plant protection methods and introducing them to the farmers. It is envisaged that the following results will have been achieved by the end of the project:

- The efficiency of the plant protection service will have been improved.
- The technical procedures and equipment used in plant quarantine will have been improved.
- The monitoring of pesticides will have been expanded and the prerequisites for analyses improved; initial data on pesticide residue and formulation control will be available.
- The phytomedical knowledge of the specialists and management staff will have been improved and will enable them to perform the necessary tasks in the plant protection service.
- Recording of the causes of damage will have been carried out and will be permanently updated.
- The monitoring of crops for pests and diseases will have been started with a view to future forecasting and stepped up with a view to preventing pests and diseases from being brought into the country.
- Integrated plant protection will have become a regular part of the work of the plant protection service.
- Practical application of phytosanitary technology will be guaranteed.

4. Scheduled inputs (mid-1981 to mid-1987)

Inputs by the Federal Republic of Germany:

2 long-term experts (plant protection, phytopathology) for up to 132 man-months, short-term experts and appraisers for up to 27 man-months, scientific staff for up to 72 man-months, personnel under local project contract; laboratory and field equipment, vehicles, production inputs; contributions to running costs; production of extension aids; travelling expenses; up to 15 long-term scholarships, short-term upgrading (courses, seminars).

Inputs by project country:

Provision of qualified counterparts, technical personnel for the regional service and quarantine work, support personnel; buildings, vehicles, expendable materials; meeting of running and maintenance costs; provision of support for project programmes by other institutions involved in plant protection.

5. Implementation status

The project was started in 1981 and is currently in the third year of the four-year main phase (mid-1983 to mid-1987). The fundamentally redesigned organizational structure and tasks of the plant protection service are currently being introduced at both central and regional level. The specialist technical work is focused at present on the creation and expansion of diagnosis possibilities, studies on the epidemiology of black stripe in the plantain, recording and integrated control of coconut pests and diseases and the provision of support for post-entry quarantine. The long-term training of the counterparts in the Federal Republic of Germany and in other countries can be concluded after the commencement of training for three specialists in September 1985 and a further specialist in 1986.

A follow-up assistance phase (mid-1987 to mid-1990) is planned.

Pesticide Formulation Control Laboratory

PN: 79.2037.4

GTZ project leader: K. Ziller

Counterpart organization: Department of Agriculture
Plant Protection Service

Project location: Nicosia

1. The context

In 1974 the island of Cyprus was in effect partitioned, as a result of which the Republic of Cyprus lost around 70 % of its agricultural production. It was nevertheless possible to maintain a supply of agricultural produce for the southern part of the country by improving production methods. However, this involved considerable intensification of agricultural production and a sharp increase in the use of pesticides. The necessary agents and their active ingredients are imported from a wide variety of countries and are in part formulated or repackaged on Cyprus itself.

Although Cypriot legislation lays down regulations for the registration, importing, marketing and formulation of pesticides in the country, Cyprus has to date had no facilities for checking the quality of the pesticides used.

2. Aim of the project

The aim of the project is to establish an effective pesticide quality control service.

3. Project design/Scheduled results

The project is intended to enable the counterpart organization to effectively monitor observance of the existing statutory regulations. The project activities are therefore focused on setting-up a pesticide quality control laboratory and training qualified laboratory personnel. These measures are accompanied by continuous advisory services to the registration authority, the pesticide industry and the farmers. It is envisaged that the following results will be achieved by the project:

- A pesticide quality control laboratory will have been set up.
- Highly qualified staff will be available.

- More than 500 quality controls will be carried out each year.
- Standards will have been raised; laws and regulations will have been supplemented.
- Only high-quality pesticides will be available.
- The farmers and the general public will have been informed about the advantages and disadvantages of pesticides, particularly the risks involved, and will act accordingly.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

1 long-term expert (chemist and pesticide analysis expert) for up to 24 man-months, short-term experts for up to 4 man-months, supply of equipment for the quality control laboratory plus expendable materials for the start-up phase, 1 passenger car; meeting of maintenance and repair costs for equipment and vehicle (2 years); wage costs for support personnel; traveling expenses.

Inputs by project country:

Provision of qualified counterparts, staff for running the analytical laboratory, construction of the laboratory building, meeting of laboratory running costs.

5. Implementation status

The project is in the first year of implementation and is designed to have a two-year operational phase. The laboratory building has been completed and the equipment has been installed. The introduction of routine analyses is currently in progress and registration analyses are also being carried out. The inauguration of the laboratory (December 1985) was used as an opportunity to establish initial contacts with consumers' groups, farmers' associations and the pesticide industry.

Control of Coffee Pests and Diseases

PN: 83.2010.1

GTZ project leader: Dr. C. Klein Koch
 Counterpart organization: Ministry of Agriculture with attached plant protection service

Project location: Quito and Tumbaco

1. The context

In Ecuador, coffee is grown in 17 of the country's 20 provinces on around 130 000 farms over a total area of some 400 000 hectares. The fact that it is grown by smallholders means that in socio-economic terms coffee plays a role which should not be underestimated. After petroleum, it is the second most important export product yielding foreign exchange. Around 800 000 people of Ecuador's total population of roughly eight million depend on coffee growing and production for their livelihood. As a result of sociocultural factors and the absence of major phytomedical problems, modernization of the coffee plantations has been neglected in Ecuador, as has also been the case in other Andean Pact countries.

In June 1981 the coffee crops in the south of the country were attacked for the first time by the coffee berry beetle (*Hypothenemus hampei*) and coffee rust (*Hemileia vastatrix*). This led to considerable yield losses in the poorly tended crops, endangering the livelihood of the small farmers.

2. Aim of the project

The aim of the project is to slow down the advance of the coffee berry beetle and coffee rust by means of quarantine measures and, with the aid of ecologically and economically appropriate pest and disease control, to maintain the profitability of coffee growing in Ecuador, thereby safeguarding and preserving the livelihood of small farmers.

3. Project design/Scheduled results

It is envisaged that the following results will have been achieved by the end of the start-up and operational phases:

- The plant protection service personnel will have been upgraded.
- Quarantine stations will have been set up and will be operational.

- Coffee plants resistant to the strains of coffee rust occurring in Ecuador will have been introduced and processed in propagation programmes.
- Tests concerning the epidemiology and control of coffee rust will have been carried out and initial findings will be available.
- Investigations into the rehabilitation and renovation of the coffee plantations will have been carried out and initial findings will be available.
- A concept for integrated control of coffee pests and diseases will have been developed.
- Natural limiting factors and natural enemies of the coffee berry beetle will have been studied.
- The bio-ecology of the major types of pest will have been investigated.
- Effective plant protection methods acceptable in economic and ecological terms will be in use.
- The surveys regarding zonification of coffee growing will have been completed and the findings applied in practice.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

2 long-term experts as advisors for up to 54 man-months, short-term experts and appraisers for up to 8 man-months; supply of materials, machines, means of transport, laboratory apparatus and meteorological instruments; provision of the necessary funds for counterpart training and upgrading, travelling expenses for the assigned experts for travel in Ecuador and elsewhere.

Inputs by project country:

The counterpart organization provides the necessary qualified counterparts, administrative staff and support personnel to ensure proper implementation of the project, meets the running and maintenance costs for the project facilities as well as the costs relating to fuel, maintenance and servicing for the official vehicles, releases agricultural extension officers to enable them to attend upgrading courses; designates and appoints suitable counterparts for training in the Federal Republic of Germany or in other countries.

5. Implementation status

The project is currently in its first operational phase (1 January 1984 to 30 June 1986). Counterpart training has started. The upgrading of the extension personnel has so far come up to expectations and is in line with the planned schedule. The epidemiological investigations and the tests in connection with the development of an integrated control concept have yielded initial results. The newly introduced coffee varieties have been planted; adaptation-testing plots have been created in various parts of the country and are being appraised. The work on zonification of coffee growing is running on schedule.

Prolongation of the project for a further three years as from 1 July 1986 has been planned and initiated.

Field-Rat Control

PN: 81.2083.4

GTZ project leader: Dr. H. Burgstaller

Counterpart organization: Ministry of Agriculture,
General Department
for Rodent Control

Project location: Cairo

1. The context

Plagues of rats have always been a common occurrence in Egypt ever since the days of the Pharaohs. The building of the Aswan Dam led to an increase in the damage caused by rats, as permanent agricultural production offers them ideal living and breeding conditions. The fact that there is no annual inundation by the Nile means that there is no longer any natural rat control.

Wheat is particularly severely hit by rat damage; at the beginning of the project, the damage was estimated at 20 to 25 % of the potential harvest. As Egypt imports 70 % of its staple foodstuffs, the damage caused by rats considerably worsens the generally strained economic situation.

2. Aim of the project

The aim of the project is to establish a specialist institution and to develop an effective national field-rat control system. Through these activities the losses caused by rodent pests in rural areas are to be reduced to economically viable dimensions, which will help to save foreign exchange and raise farmers' incomes.

3. Project design/Scheduled results

The project concentrates on training technicians and advising farmers on how to implement ecologically and economically viable preventive rodent-pest control.

Project activities focus on the development of appropriate methods of preventive rodent-pest control, the practical and theoretical training of technicians and farmers and the economic analysis of the measures.

It is envisaged that the following results will have been achieved by the end of the project:

- The organizational structure of the rodent-pest control service will have been designed.
- A rodent-pest control centre will have been established.
- Appropriate methods and guidelines for rodent-pest control will have been formulated.
- Specialist personnel will have been trained throughout the country.
- National control campaigns will have been organized.
- Information campaigns will have been carried out.
- The farmers' knowledge of rodent pests will have been improved and the farmers will have been motivated to implement control measures on their own.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

7 long-term experts for up to 396 man-months and short-term experts for up to 18 man-months. Supply of materials and equipment, particularly vehicles, laboratory and field equipment, rodenticides and bait-production units. Off-project upgrading of up to 28 Egyptian specialists.

Inputs by project country:

Provision of personnel, budget and premises; meeting of running costs.

5. Implementation status

The project started in September 1982 and is currently in the operational phase. The organizational establishment of the rodent-pest control service at regional level is not yet completed. Guidelines on rodent-pest control have been formulated. Specialist staff have been trained. At the beginning of 1986 the premises for the rodent-pest research and control centre were on the point of completion. The Ministry of Agriculture is facilitating the free sale of rodenticides to the farmers via the cooperatives - an essential prerequisite for rodent-pest control measures by the farmers themselves. Intensification of extension measures for the farmers has been started. Two project field posts have been set up and staffed. The department for monitoring and evaluation of rodent-pest activities is currently being set up. Information campaigns have been prepared and are being operationalised. Field and laboratory tests for rodent-pest control have been largely completed. Future tests will concentrate on developing a forecasting system and obtaining data for economic calculations. A national damage-recording system has been established.

Integrated Plant Protection

PN: 84.2135.6

GTZ project leader: To be designated
 Counterpart organization: Ministry of Agriculture with attached CENTA
 Project location: Santa Tecla

1. The context

Agriculture is the basis of the economy in El Salvador. The principal export crops are coffee and cotton, but their production has declined sharply over the past few years.

In 1980 the Government of El Salvador initiated agrarian reforms under which landless farmers were allocated land of their own. Both national self-sufficiency in staple foodstuffs and increased production of export crops are the aims. Plant protection is of particular importance in this connection. The importing of pesticides swallows up a large proportion of the scarce foreign exchange; consumption on the individual farms is extremely high, particularly for cotton. Falling world-market prices for cotton and rising production costs meant that in the 1984/85 season two-thirds of the cotton farms were no longer able to operate on a break even basis.

The production of staple foodstuffs is hampered by severe pest infestation, with traditional cultivation and storage methods also aggravating the losses.

2. Aim of the project

The project aims to improve the profitability of cotton-growing and increase the availability of staple foodstuffs by means of integrated plant protection measures.

3. Project design/Scheduled results

The Federal Republic of Germany is to improve the project infrastructure and the management of integrated plant protection, and develop integrated plant protection methods. The project is to be established with the CENTA in the areas of "Integrated plant protection for cotton" and "Integrated plant protection for cereals and legumes including post-harvest protection". The integrated plant protection concept is to be transformed into specific appropriate methods directly at the producer level, with intensive exchanges between research institutions, extension services and the target group.

Whereas adequate results are expected in the cotton sector within three to four years, a longer period will be required in the case of cereals and legumes as a number of technical and organizational prerequisites must first of all be created. It is envisaged that the following results will have been achieved by the end of the project:

- Integrated pest control methods for cotton, cereals and legumes, including post-harvest protection, will have been developed.
- Extension aids will have been produced.
- The level of training of research and extension personnel will have been raised.
- Integrated pest control methods for cotton will have been disseminated and components of integrated plant protection, including storage protection, will have become widespread in the case of food crops.
- Pesticide quality and residue controls will have been improved.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

1 expert on integrated plant protection for up to 36 man-months, 2 local experts for up to 72 man-months, scientific assistants for up to 72 man-months, short-term experts for up to 10 man-months, personnel under local project contract; vehicles, laboratory and field equipment; extension aids, expendable materials, working supplies; training and upgrading of counterparts; grant towards financing renovation of project buildings.

Inputs by project country:

Provision of the necessary specialists, administrative staff and support personnel; meeting of costs in connection with operation of project facilities; releasing of specialists for training and upgrading.

Inputs by third parties:

The FAO-UNDP project "Graneros para Pequeños Agricultores" is to supply small farmers with grain storage containers.

5. Implementation status

The project is scheduled to start in mid-1986.

Pesticide-Residue Laboratory

PN: 80.2100.8

GTZ project leader: To be designated

Counterpart organization: Ministry of Agriculture, Plant Protection Department

Project location: Amman

1. The context

In Jordan, pesticides are used intensively but not always appropriately. A lack of statutory regulations and agencies to control the sale and use of pesticides makes it difficult to implement countermeasures. The consequences are cases of poisoning among both humans and animals, excessive residues in and on foodstuffs and serious environmental pollution.

2. Aim of the project

Control measures for monitoring foodstuffs for pesticide residues are to be introduced and implemented in order to ensure that residue levels recorded are in the long term in line with international standards.

3. Project design/Scheduled results

Important governmental decision-makers are to be advised and assisted in the implementation and monitoring of statutory regulations on the use of pesticides. The technical basis will first be created by setting up an analytical laboratory for pesticide-residue monitoring. Parallel to this, Jordanian specialists will be trained to perform the routine analyses in the laboratory. It is envisaged that the following results will have been achieved by the end of the project:

- The residue situation in Jordan will have become known.
- The draft of a pesticides law or appropriate regulations will have been drawn up.
- The results of the residue analyses will be taken into account in extension recommendations.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

1 expert on pesticide-residue analysis for up to 24 man-months, short-term expert(s) for 1 man-month, 1 project vehicle, laboratory apparatus, solvents and chemicals.

Inputs by project country:

Provision of an adequate number of specialists, administrative staff and support personnel, meeting of costs relating to operation of project facilities, releasing of specialists for training measures in Jordan and in the Federal Republic of Germany.

5. Implementation status

The project is currently in the operational phase, which is designed to last from 1986 to 1988. The residue laboratory was set up in 1981 and commenced routine operation in the same year. The GTZ expert on residue analysis will join the project in 1986. Some of the Jordanian specialists have undergone training and upgrading. Initial analysis findings are on hand.

Control of the Larger Grain Borer

PN: 84.2095.2

GTZ project leader: Dr. U. Röttger
Counterpart organization: Min. of Agriculture and Livestock Development (MOALD)
Project location: Nairobi

1. The context

Maize is Kenya's most important staple foodstuff. As a result of poor harvests and high population growth the country has had to import maize since 1980. In the early eighties, a new storage pest, the larger grain borer Prostephanus truncatus (Horn), was brought into the neighbouring country of Tanzania from Central America. Given favourable conditions, this pest can cause a storage weight loss of up to 30 % in Africa in six months. It also attacks cassava and is encountered primarily in smallholders' stores. It spread throughout Tanzania in a short time and in 1985 - according to FAO investigations - caused damage to the value of \$ 27 million.

Starting from Tanzania, this pest is now beginning to spread to neighbouring countries. Reports of its occurrence have been received from Kenya's Taveta Region since 1984, and it is likely that Prostephanus truncatus will soon also spread to other parts of the country. Given the present general conditions it appears impossible to eradicate this pest or totally prevent it from spreading.

2. Aim of the project

The aim of the project is to minimize the smallholders' anticipated storage losses and curb the spread of the larger grain borer by introducing appropriate measures to combat this pest.

3. Project design/Scheduled results

The project is designed as an advisory project. The advisory services will be accompanied by the provision of suitable storage-protection agents. The project is designed primarily for the infested Taveta Region, but is if necessary to extend its activities to newly infested areas. The following results are envisaged by the end of the project:

- Prefabricated houses for the project will have been constructed in Nairobi and Taveta.

 Pesticide Formulation Control and Residue Laboratory

PN: 79.2167.9

GTZ project leader: Dr. G. Vaagt
 Counterpart organization: Department of Agriculture,
 Crop Protection Branch
 Project location: Kuala Lumpur

1. The context

In passing the Pesticide Act in 1974, Malaysia created the legal foundation for regulating all aspects of pesticide use. The greater intensity of agriculture, the higher quality requirements, e.g. for export products, and the population's growing problem awareness as regards the use of pesticides all combine to make heavy demands on the responsible governmental agencies. The principal tasks of the responsible authority, the Pesticides Section, are as follows:

- Registration and approval of pesticides
- Evaluation of pesticides according to toxicological criteria, with regard to biological effectiveness, degradation etc.
- Pesticide quality control (formulation control)
- Execution of residue analyses, including those required under the Food Act
- Determination of waiting periods and maximum quantities
- Monitoring of sales
- Formulation of new guidelines (e.g. for the sale, storage and manufacture of pesticides)

However, the Pesticides Section still requires additional equipment and technical know-how in order to be able to carry out laboratory and field tests more efficiently.

2. Aim of the project

Through the provision of technical equipment and staff training, the Pesticides Section is to be in a position to perform the tasks assigned to it by the relevant legislation.

- Equipment and expendable materials will have been made available.
- Training and extension measures will have been carried out.
- Storage-protection agents will have been made available in the Taveta Region.
- Appropriate control measures will have been introduced in the Taveta Region.
- Biological and economic data on the larger grain borer will have been collected.
- The danger of spreading of the larger grain borer will have been reduced.
- Continuous monitoring of the potential infestation areas will be guaranteed.
- Fumigatable village stores will have been built as a pilot project.

4. Scheduled inputsInputs by the Federal Republic of Germany:

1 expert on post-harvest protection and quarantine for up to 24 man-months, short-term experts for up to 3 man-months, prefabricated house in Nairobi, 2 prefabricated houses in Taveta, supply of materials and equipment, 2 passenger cars and 2 motorcycles, extension and training materials, vehicle servicing and maintenance costs, wage costs and ancillary costs for support personnel, travelling expenses, counterpart training.

Inputs by project country:

Provision of qualified counterparts, meeting of costs for operation and maintenance of project facilities, provision of sites, amendment of plant-protection legislation.

5. Implementation status

The project agreement has been submitted to the Kenyan Ministry of Agriculture for signing.

The project is initially designed to run for 24 months.

3. Project design/Scheduled results

Project activities focus on the creation and equipping of efficient analytical units, i.e. supplementation of the technical equipment of the formulation control laboratory and setting-up of the pesticide residue analysis unit, accompanied by the necessary training programmes.

The following results are envisaged by the end of the project:

- A fully operational formulation laboratory will have been set up.
- A fully operational residue laboratory will have been set up.
- Testing and research programmes will be in progress.
- The results of the work will have been put to use.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

3 long-term experts for up to 72 man-months, short-term experts for up to 6 man-months, 14 short-term counterpart training measures, 2 long-term training measures (Master of Science degree), supply of materials and equipment required for setting up and expanding the laboratory, 1 passenger car, 1 bus, 1 jeep, supply of miscellaneous materials and equipment for training, field tests etc.

Inputs by project country:

Provision of qualified counterparts, personnel for laboratory work, field tests etc., buildings and land, experimental land, meeting of costs relating to expendable materials for laboratory work, field trials, office work, transport etc. Contributions towards rents, maintenance and travelling expenses.

5. Implementation status

The project was started in September 1984 and the routine work for the most important investigations commenced at the same time. The technical equipment of the other working units (registration, approval, biological effectiveness, sales monitoring) was assessed and necessary equipment obtained. Initial results on pesticide residues in vegetables have been obtained. First field tests to determine the degradation behaviour of pesticides and to establish waiting periods have been started. The on-the-job training is being backed up by accompanying instruction. Master's degree training courses (2) were commenced in 1985 and eight short-term training measures have been completed. The project is supporting the setting-up of an information centre for cases of poisoning.

Continuation of the project for a further two years is planned.

Sparrow Control

PN: 80.2081.0

GTZ project leader: L. Mosich

Counterpart organization: Ministère de l'Agriculture et de la Reforme Agraire, Direction de la Protection des Végétaux, des Contrôles Techniques et de la Répression des Fraudes

Project location: Rabat

1. The context

Out of the 5.3 million tonnes of cereals which it requires each year, Morocco is able to produce 4.5 million tonnes itself. The country spends US \$ 100 million each year on making up the shortfall through cereal imports. As the annual population growth of 2.7 % is causing the food-supply problem to become increasingly acute, Morocco is making considerable efforts to boost its agricultural production.

Bird pests destroy up to 10 % of the potential cereal and oil-plant harvests throughout the country. Effective crop protection is therefore an important factor in safeguarding incomes (particularly those of smallholders) and harvests.

2. Aim of the project

Bird damage to cereals and oil-seed crops is to be reduced.

3. Project design/Scheduled results

The project deals with the control of Spanish sparrows (*Passer hispaniolensis*), house sparrows (*Passer domesticus*) and hybrids of the two species. The control methods used to date are to be improved. In particular, efforts are to be made to achieve a drastic reduction in the quantities of chemical control agents (avicides) used or to largely replace them by mechanical or other methods. The following results are envisaged by the end of the current project phase:

- The bird pest centre will have been established.
- Vehicles and equipment will be operational.
- Data will have been collected.
- Monitoring of the efficacy and economic viability of the control measures will be carried out.

- Training and advisory measures will have been carried out.
- Alternative control methods will have been made available.
- Coordinated, countrywide non-chemical control will have been introduced.
- Control measures will be implemented by the centre and on a local basis by the rural population.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

2 long-term experts for up to 72 man-months, scientific assistants for up to 48 man-months, various short-term experts for up to 8 man-months, staff under local project contract for up to 36 man-months; 2 passenger cars, 2 cross-country vehicles, 1 UNIMOG with 2 drift-spraying units, 1 small passenger car, various items of workshop equipment, miscellaneous laboratory equipment and apparatus, passenger-car trailer, bird snares, camping equipment, spare parts; advisory and planning services for the bird pest centre in Salé; training of 3 counterparts for up to 3 months each, training of 3 counterparts in supplementary/long-term studies.

Inputs by project country:

Provision of qualified counterparts and support personnel; construction of project centre in Salé (office and laboratory building, workshop, hangar and aviary); staff for running the centre; provision of agricultural aeroplanes, control agents and fuel and other supplies for vehicles and equipment.

5. Implementation status

The project is currently in the second year of the three-year establishment phase. The large-scale control measures have been substantially improved and the quantities of avicides used drastically reduced. Alternative, non-chemical control methods have been introduced. The bird pest centre in Salé is not yet ready for occupation and delays in the achievement of some of the planned results are therefore likely. The laboratory/office building and workshop will be ready for use and the aviary equipped in the course of 1986.

Forest Protection

PN: 81.2005.7

GTZ project leader: P. Graf

Counterpart organization: Direction de la Protection des Végétaux, des Contrôles Techniques et de la Répression des Fraudes

Project location: Rabat

1. The context

In recent years the Moroccan forests have been increasingly attacked by pests. The Moroccan authorities' past and ongoing forest protection measures, in some cases involving the use of aircraft, have not always met with the anticipated success. The forest service is extremely environment-conscious in its choice of pesticides for forest protection and permits the use of biological agents only.

2. Aim of the project

The quality and capacity of the Moroccan forests are to be preserved by reducing or eliminating biotically caused damage.

3. Project design/Scheduled results

The project is to acquire in-depth knowledge of the causes of mass multiplication of individual pests and use this knowledge to initiate economically and ecologically appropriate pest control measures. The following results are envisaged by the end of the project:

- The forest protection unit will have been set up.
- Forecasting and early-warning systems for the major insect pests will be in operation.
- The significance of other insect pests - particularly those breeding in the wood and bark of trees - and fungus diseases will have been determined.
- Control strategies will have been formulated.
- Practice-oriented study programmes will be in progress.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

Provision of vehicles and equipment; assignment of a forest management expert for up to 36 man-months, a forest entomologist for up to 30 man-months, a scientific assistant for up to 30 man-months and short-term experts for up to 11 man-months; equipping of a forest protection unit at the plant protection service headquarters in Rabat; equipping of 3 forest-protection field stations; training of Moroccan specialists; interim evaluation.

Inputs by project country:

Provision of specialists, administrative staff and support personnel; provision of the necessary offices and laboratories; meeting of running and maintenance costs for project facilities, vehicles etc.

Inputs by third parties:

World Bank loans to finance the purchase of pesticides and chartering of aircraft; financial contributions by forest-owning local authorities in Morocco.

5. Implementation status

The project started in July 1985. A control campaign aimed at the processionary moth has been implemented in cooperation with a short-term expert. Preparations are being made for setting up the first forest-protection field station. The first counterpart arrived in the Federal Republic of Germany in January 1986 to begin his long-term upgrading programme. A ministerial order has separated the field of forest protection from the forest service in organizational terms and allocated responsibility for this area to the plant protection service.

Improvement of Plant Protection Services

PN: 81.2044.6

GTZ project leader: Dr. R. Daxl
Counterpart organization: Ministerio de Desarrollo Agropecuario y Reforma Agraria
Project location: Managua

1. The context

Pests and plant diseases cause average yield losses of 35 % in Nicaragua. The food-supply situation and the farmers' incomes are consequently uncertain. A lack of relevant knowledge means that the methods used to control these pests and diseases are generally inappropriate, leading to one-sided, often careless use of pesticides with the familiar detrimental effects on the country's economy and ecology.

The national plant protection service has been unable to effectively solve these problems, as it is poorly equipped and staffed and the few available specialists have not received adequate training. Furthermore, the various field offices of the plant protection service are not appropriately linked to the headquarters.

2. Aim of the project

The aim of the project is to enable the Nicaraguan plant protection service to successfully perform its functions.

3. Project design/Scheduled results

Project work focuses on developing and implementing appropriate integrated pest control methods and on improving the structure and organization of the plant protection service by means of training, construction measures and the supply of materials and equipment. The following results are envisaged by the end of the project:

- A plant protection centre meeting the country's requirements will have been established.
- Qualified plant protection specialists will have management and decision-making responsibility in important posts.
- Integrated plant protection measures will have been developed for the major crops and made available to farmers.
- Extension aids will have been compiled and published.

- Production methods for *Trichogramma*, *Bacillus thuringiensis*, beneficial nematodes and natural insecticides will have been developed for local conditions and can be used by small-scale industry or the government.
- Pesticide import requirements will have been reduced.
- Important diseases and pests will have been identified and recorded in the relevant literature.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

Assignment of two long-term experts for a total of up to 144 man-months and short-term experts for up to 12 man-months, assignment of scientific assistants for up to 60 man-months, meeting of salary costs for personnel under local project contract; supply of equipment for the plant protection centre; financial contribution to building of the plant protection centre, partial financing of running and maintenance costs; financing of long-term and short-term scholarships for Nicaraguan specialists.

Inputs by project country:

Provision of qualified personnel; provision of plots for trials, sites and buildings, construction of plant protection centre; proportionate financing of running and maintenance costs; provision of equipment and materials for the plant protection stations; releasing of specialists for training and upgrading.

5. Implementation status

The project is currently in the fourth year of implementation; all the official vehicles, numerous items of apparatus and around 450 textbooks have been supplied. The first building for the plant protection centre has been acquired and construction measures started in October 1985. Twelve short-term expert assignments have been carried out, 4 Nicaraguan specialists are currently on long-term scholarships abroad and 10 short training measures/study trips have taken place; long-term experts have provided services for 26 man-months in the field of plant pathology and for 51 man-months in the field of general plant protection. Major plant epidemics have been checked; a large-scale programme for integrated boll weevil control was designed and for three consecutive years insecticide treatment was reduced by more than 30 %; manuals on integrated plant protection for maize, beans and cotton have been published and numerous courses and field days held; methods for the production of beneficial organisms and neem insecticides have been formulated and are being further developed; advice on the control of major plant diseases has been passed on to the farmers.

The operational phase currently in progress is scheduled to end on 31 December 1987; the next stage will be a follow-up assistance phase.

Support to the Plant Protection Service

PN: 77.2065.9

GTZ project leader: M. Zweigert

Counterpart organization: Ministère du Développement Rural
Direction de la Protection
des Végétaux

Project location: Niamey

1. The context

The Republic of Niger has been a net importer of staple foodstuffs for many years. The country is dependent on substantial grain imports and extensive food aid, particularly in years when the situation is especially critical on account of climatic factors. Drought years are often followed by the large-scale occurrence of pests (locusts, bird pests, rats etc.) which substantially reduce the yields expected in normal years.

The uncertain climatic conditions and the occurrence of these pests mean that the usual yield-boosting measures, such as the use of improved seed, fertilizers, or the introduction of new cultivation techniques, have only a limited effect in rainfed farming. Plant protection measures designed to maintain and safeguard the domestic production of staple foodstuffs are essential. As a result of the prolonged drought and above all the catastrophic situation which faced the country in 1984, Niger's agricultural policy gives top priority to achieving self-reliance in staple foodstuffs. To this end, the government is also subsidizing production inputs, including pesticides. This requires considerable efforts in extension work on plant protection if detrimental effects on the country's ecology and economy are to be avoided.

2. Aim of the project

The aim of the German contribution to the project is to enable Niger's plant protection service to provide a farmer-oriented extension programme on plant protection and combat major pests in an appropriate manner. It is intended that government plant protection measures should be increasingly reduced in favour of measures implemented by private individuals.

3. Project design/Scheduled results

The measures focus on technical and material support to the plant protection service and on farmer-oriented plant protection extension services. The service is to be decentralized and responsibility transferred to the regional level. This applies both to large-scale campaigns (bird pests, locusts) and to individual plant protection measures by cooperatives and farmers; however, the infrastructural prerequisites for the latter (availability of pesticides and equipment) have still to be created. The following results are envisaged by the end of the operational phase (1984 - 1986):

- The control measures for plant diseases and pests will have been drawn up and disseminated throughout the country by means of training and extension services.
- The feasibility of the use of hand-held ULV equipment by smallholders will have been demonstrated.
- The service will be using large-scale equipment for controlling mass pests, independently.
- Methods for preventing bird damage will be in use on a damage-oriented basis.
- Plant quarantine stations will be operational.

In addition to consolidating the measures implemented so far, the planned final phase of the project will devote particular attention to plant protection for irrigated crops.

4. Scheduled inputs

Inputs by the Federal Republic of Germany (over the entire project):

Project management/entomology 105 man-months, phytopathology 93 man-months, workshop expert 84 man-months, plant-protection advisory services 75 man-months, control of bird damage/mass pests 70 man-months, short-term experts for 50 man-months, German Volunteer Service (DED) specialists for 300 man-months; construction of an office/laboratory building, a workshop and 6 field stations; vehicles, pesticides, application equipment, laboratory apparatus, extension aids; 3 long-term training measures and a number of short-term upgrading measures for counterparts; partial financing of wages of support personnel; travelling expenses and running costs.

Inputs by project country:

Provision of counterparts for Niamey headquarters and 10 field stations; office building, sites, increasing meeting of operating costs for 2 agricultural aircraft; purchase of pesticides.

Inputs by third parties:

Over the past eleven years the Canadian Government has supplied large quantities of pesticides and equipment. The Canadian contribution in the current phase primarily involves the provision of advice to the plant protection representatives of the plant protection service at Département level.

The German Volunteer Service (DED) is represented at regional level with six specialists who are promoting the introduction of plant protection innovations by means of demonstrations and extension services for the farmers.

5. Implementation status

The project is currently in the eighth year of implementation. Following the expansion of the plant protection service headquarters with combined office/laboratory building and central workshop, six field stations were built, equipped and staffed with DED specialists by 1983. The economically significant pests and diseases affecting food crops have been identified, appropriate control measures developed and publicized throughout the country by means of extension aids and training measures. In 1985 the counterpart organization assumed responsibility for the use of large-scale equipment as well as for the central workshop and the five quarantine stations. The training measures implemented up to mid-1985 in the fields of entomology, phytopathology, application techniques etc. are being continued by Canada. A method developed by the GTZ has substantially reduced the cost of averting bird damage and even halved it by comparison with the use of aircraft. The ULV programme to permit the farmers to implement plant protection measures by themselves has met with an excellent response in the 20 pilot villages. Ecologically-acceptable post-harvest protection measures for smallholders' stores have been introduced throughout the country.

Plant Protection Programme

PN: 74.2028.4

GTZ project leader: E. Pfuhl

Counterpart organization: Ministry of Agriculture,
Bureau of Plant Industry

Project location: Manila

1. The context

Agricultural production in the Philippines is in need of improvement. Harvests must be increased in order to ensure a food supply for the rapidly growing population.

Coconuts, rice and maize are the most important crops in economic terms for the Philippines' smallholders. In rice growing in particular, the farmers' plant protection measures have to date concentrated on the prophylactic use of chemical pesticides. The sharply rising cost of agricultural production inputs and inadequate producer prices are leading to reduced farm incomes and to questionable plant protection strategies on the part of the farmers such as underdosing of insecticides with the subsequent risk of resistance. An integrated programme using the concept of damage thresholds is intended to remedy the situation. Plant protection strategies for maize growing, however, have still to be developed.

2. Aim of the project

The project is promoting a programme by the Philippine Ministry of Agriculture to introduce appropriate plant protection technologies, incorporating the following measures:

- Introduction of a national surveillance and early-warning service for rice and maize
- Institution-building through the establishment of regional plant protection centres
- Pesticide residue and formulation control together with establishment of plant quarantine stations
- Economic evaluation of plant protection programmes
- Promotion of self-help groups.

3. Project design/Scheduled results

The project is endeavouring to promote the concept of integrated plant protection by providing advisory services to the Ministry of Agriculture and the national plant protection authority, the Bureau of Plant Industry. Major importance is attached to institution-building. The following results are envisaged by the end of the project:

- An efficient early-warning system for rice and maize will have been set up in selected areas.
- An integrated plant protection concept for the work at the headquarters and in 12 regions will have been introduced.
- Pesticides will be used more rationally and more selectively from the economic and ecological point of view, with appropriate monitoring.
- Expansion of the quarantine facilities will have been guaranteed.
- Farmers' self-help groups will have been promoted.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

6 long-term experts for up to 266 man-months, short-term experts for up to 18.5 man-months and scientific assistants for up to 3 man-months; vehicles, motorcycles, aircraft, SSB radios, equipment for the central diagnostic laboratory, biological laboratory and residue laboratory as well as literature. Support in the establishment of regional plant protection centres and quarantine stations, and the construction of up to 300 Farmer's Centres.

Inputs by project country:

Provision of qualified counterparts for the early-warning service, biological laboratory, residue laboratory and plant quarantine, recurring costs in connection with buildings, transport, Philippine personnel etc. Implementation of the results of the work.

Inputs by third parties:

The project is also receiving financial support from the European Community (construction measures, supply of materials and equipment).

5. Implementation status

The project is in the eleventh year of implementation. On-going activities aim to reinforce the most important plant protection recommendations for maize and rice and adapt them to poorer general conditions.

The agricultural extension service is being supported by a countrywide radio campaign to supplement the traditional extension services by informing the small farmers about the concept of integrated plant protection. To back up this work, the project is also involved in promoting self-help groups.

A surveillance service for rice has been established and a corresponding system for maize is currently being set up.

The project components "Residue and formulation control" and "Plant quarantine" have already been handed over to the counterpart organization. Four residue laboratories and twelve plant quarantine stations have been established and are operational. Twelve regional plant protection centres have been set up and equipped.

Extensive training programmes and seminars have helped to ensure that the Philippine specialists are now considerably better qualified for their work.

Cotton Project

PN: 79.2190.1

GTZ project leader: E. Pfuhl

Counterpart organization: Philippine Cotton Corporation (PCC)

Project location: Alacan, San Fabian
Pangasinan Province

1. The context

Each year the Philippines imports cotton with a value of around US \$ 40 million which is then processed in the country. In order to reduce foreign exchange expenditure and safeguard the farmers' incomes, the Philippine Cotton Corporation promotes and regulates cotton-growing activities, which have been started in the Philippines only comparatively recently. For this purpose the PCC maintains a dense network of field extension officers and the necessary recording and processing stations.

As the farmers possess little experience in cotton growing, serious errors and financial losses are likely, particularly where pest control is concerned.

2. Aim of the project

The aim is to develop an integrated plant protection concept for cotton which can be passed on to the farmers via the Philippine Cotton Corporation's field extension officers.

3. Project design/Scheduled results

The project activities are focused on applied research and advisory services. The following results are envisaged by the end of the project's operational phase:

- An integrated plant protection concept will have been developed and applied in two ecologically different areas.
- An efficient plant protection service, based on a surveillance system, will have been established.
- Field extension officers and farmers will have been trained in the new methods and will be using them.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

2 long-term experts for up to 105 man-months, short-term experts for up to 12 man-months, 1 scientific assistant for up to 24 man-months, personnel under local project contract for up to 96 man-months; vehicles, motorcycles, spraying equipment, agrometeorological stations, projectors, cameras, laboratory equipment, literature etc.; meeting of costs relating to the training of Philippine specialists in the project country and abroad.

Inputs by project country:

Provision of the necessary specialists, meeting of running and maintenance costs, provision of buildings, amendment of existing regulations in order to permit operation of an efficient extension service.

5. Implementation status

The project is currently in the third year of the operational phase.

The development of an integrated plant protection concept for cotton growers in the Philippines has practically been completed.

A surveillance system, based on field extension officers, has been introduced. All measures realized so far are continuing to be assessed and expanded. Increased efforts are being devoted to methodology and didactics in developing extension aids for the farmers.

The project is scheduled for handover to the counterpart organization on 31 March 1987.

Biological Plant Protection

PN: 86.2099.9

GTZ project leader: To be designated

Counterpart organization: Bureau of Plant Industry

Project location: Manila

1. The context

Agriculture in the Philippines has been severely hit by the general deterioration of the country's economic situation. The farmers' already low income level has dropped still further on account of falling prices for agricultural produce and the simultaneous rise in the cost of production inputs. Chemical agents are used on a relatively large scale in the Philippines for some crops (rice/maize), with even small and medium-sized farms employing pesticides.

The sharp rise in the cost of pesticides has placed an excessive burden on the farmers. From the point of view of both the national economy and the economic situation of the individual farms, it would be desirable to lower pesticide inputs and, in addition, ecological risks could also be reduced.

The two plant protection projects implemented to date in the Philippines (PN 74.2028.4 and PN 79.2190.1) using the damage threshold concept, for example, have endeavoured to gear the use of chemical agents to actual requirements and thus to reduce both costs and ecological problems.

This new project goes one step further and endeavours to accelerate the replacement of chemical pesticides by alternative measures.

2. Aim of the project

The standard of living of smallholder families is to be safeguarded and improved in the long term; this is to be accompanied by the simultaneous cutting of foreign-exchange expenditure and reduction of the ecological damage caused by pesticides.

3. Project design/Scheduled results

The project is based on the integrated plant protection concept. Although not restricted to individual crops, activities will initially focus on crop rotations based on rice and maize.

The project also contains an applied research component to solve specific problems relating to integrated plant protection.

It is envisaged that the following results will have been achieved by the end of phase I (three years):

- Local parasites and predators which can be used to control the major pests in the most important climatic zones in the Philippines will have been established and utilized.
- Applied research will have been carried out in specific areas of biological pest control.
- The farmers will have been advised on integrated pest control methods.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

4 long-term experts for up to 144 man-months, short-term experts (27 man-months) and scientific assistants; vehicles, literature, miscellaneous.

Inputs by project country:

Provision of personnel, buildings and infrastructure; meeting of day-to-day running costs for project facilities and transport.

Inputs by third parties:

The European Community is contributing to the project through the financing of Philippine specialists and the supply of materials and equipment.

5. Implementation status

The project is scheduled to start mid-1987.

Weed Research and Weed Control

PN: 79.2261.0

GTZ project leader: Dr. H. G. Jansen

Counterpart organization: Institute for Agricultural Research and Rural Extension Services (INIAER) at the Ministry of Agriculture

Project location: Oeiras

1. The context

Crop production in Portugal is characterized by an extremely low yield level. Even wheat and maize, the crops grown over the largest areas in the country, have to be imported on an appreciable scale. The yields, which are relatively low even by comparison with countries having similar cultivation conditions, could be increased by improved production techniques. One measure which could make a contribution here is improved plant protection, with weed problems playing a particularly important role. Chemical weed control is widespread in rice, winter grain, maize and vines, while traditional mechanical and manual methods predominate for other crops, particularly vegetables. A number of problem weeds (including *Cyperus* species) could not be satisfactorily controlled to date, despite considerable use of herbicides in places or on account of the inadequate effect of herbicides. At the same time, however, the frequent use of persistent herbicides in the first crop has often caused damage to other crops grown subsequently.

2. Aim of the project

The aim of the project is to integrate effective methods for controlling important weeds into the agricultural extension activities.

3. Project design/Scheduled results

Strategies for controlling important weeds are to be developed which are based on species-specific biological and ecological data and geared to the technical and economic conditions inherent in the production systems involved. The degradation behaviour of herbicides and the phytotoxicity of herbicide residues are to be simultaneously investigated. A training and upgrading programme will give Portuguese technicians and extension officers more indepth knowledge of weeds and their control. Cooperation is at the level of the national weed control centre, whose tasks include both applied research and in particular legislative measures.

There is no direct contact with the farmers; the results obtained are passed on solely via the agricultural extension service. The following results are envisaged by the end of the project:

- Control strategies, particularly for important weeds, will have been developed and set out in the form of extension-aid documents.
- The findings of tests to establish the long-term effect of herbicides will be taken into account in the extension work.
- Technicians and extension officers will have been trained in appropriate herbicide application and will be able to pass their knowledge on to the farmers.
- Portuguese experts will have undergone special training in herbology and will be able to apply their knowledge in the plant protection service.
- Crop-growing extension officers and the extension services will also have been trained in weed control and will be able to apply their knowledge in this field in the course of their extension work.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

1 weed control expert for up to 36 man-months, short-term experts and appraisers for up to 12 man-months, scientific assistants, personnel under local project contract; supply of materials and equipment for field tests (including application equipment, plant protection equipment), laboratory apparatus (including gas chromatograph for residue analyses, climatic cabinets), 2 passenger cars, expendable materials, spare parts, working supplies, supplementary technical literature, training and extension aids; upgrading of up to 3 counterpart specialists for a total of up to 24 months; up to 2 trips by counterparts to seminars, congresses or similar.

Inputs by project country:

Provision of qualified counterparts and support personnel for the project activities; meeting of day-to-day running costs and provision of necessary buildings and land; release of extension officers and technicians for upgrading measures and financing of related travelling expenses; support for the project programme through establishment of contacts with other agencies and semi-governmental organizations.

5. Implementation status

The project is currently in the second year of implementation. A field trials programme of long-term tests has been started. The field trial crops of the first cultivation period are shortly to be harvested; this is expected to yield initial findings with regard to control strategies for Cyperus spp. and on the residue situation in the case of triazine herbicides. A series of pot experiments is being carried out to obtain supplementary knowledge on the biology and competitive behaviour of Cyperus spp. The phytotoxicity of herbicide residues is being determined by bio-tests.

Prevention of Bird Damage in Cereal Production

PN: 84.2114.1

GTZ project leader: J.-U. Heckel

Counterpart organization: Ministry of Agriculture,
Department of Plant Protection and
Locust Control

Project location: Mogadishu

1. The context

Somalia's economic situation depends to a very large extent on agriculture. The agricultural sector employs around 80 % of the population and accounts for 60 % of the Gross National Product. Crop production has fallen in recent years and has dropped to an extremely low self-sufficiency level. The prevention of damage by birds can help to increase the food supply. Grain-eating birds, particularly of the species *Quelea quelea* (red-billed quelea), are widespread in Somalia. They occur on a seasonal and local basis, sometimes in immense flocks, and cause substantial damage to cereals, particularly rice, sorghum and millet.

With the aid of the UNDP/FAO and with financial support from the World Bank, a Bird Control Unit was set up in 1971 at the Ministry of Agriculture. The unit's activities have been confined to reconnaissance and control measures using helicopters and fixed-wing aircraft. A shortage of personnel and equipment has meant that work results were unsatisfactory. A strategy for efficiently preventing bird damage in Somalia in the long term has not been developed.

2. Aim of the project

The intention is to reduce losses in Somalia's cereal production by means of preventive measures and appropriate control of bird pests.

3. Project design/Scheduled results

Familiar and already tested control methods are to be improved to achieve maximum economic efficiency while at the same time devoting equal attention to the environment. In addition, appropriate alternative control methods are being tried out. The farming population is to be involved in the damage prevention measures to a very large extent.

Extension officers and farmers are to be motivated and trained to use these methods. The following results are scheduled for the end of the project:

- The institutional and organizational basis of the Bird Control Unit will have been improved.
- The project will have sufficient equipment and expendable materials.
- Data on the biology and ecology of the red-billed quelea in Somalia will have been collected.
- Training and extension measures will be in progress.
- Strategies for appropriate prevention and control methods will have been developed.
- Continuous surveillance of the areas potentially at risk will have been started.
- Efficient bird damage prevention measures will be carried out in demonstration areas.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

Assignment of 2 long-term experts for up to 51 man-months, assignment of short-term experts and appraisers for up to 8 man-months, assignment of 2 scientific assistants for up to 60 man-months; supply of cross-country vehicles, observation equipment, traps, damage prevention and control equipment, laboratory apparatus and office equipment; financing of operating costs in problem situations, contributions to salaries of a limited number of staff under local project contract and support personnel; counterpart upgrading costs.

Inputs by project country:

Provision of qualified counterparts and support personnel; operating and administrative costs, provision of working premises including basic equipment.

5. Implementation status

The project is currently in the pilot phase, designed to last from October 1985 to December 1987. This is to be followed by an operational phase lasting until December 1990 and subsequently by a follow-up assistance phase up to the end of 1992. The project work commenced on 1 October 1985 with the arrival of the first long-term expert.

Plant Protection Advisory Services in Fruit and Vegetable Growing

PN: 85.2536.2

GTZ project leader: Dr. G. Walter-Echols
Counterpart organization: Ministry of Agriculture and Irrigation, Plant Protection Department

Project location: Khartoum

1. The context

Fruit and vegetable growing is the principal source of income for the land-owning small farmers and tenant farmers living along the Nile. The urban markets cannot be adequately supplied with fruit and vegetables throughout the year. Given the prevailing conditions, the small farmers operate fairly successfully in maximizing their income while simultaneously minimizing risks. The fact that the available potential has so far been insufficiently utilized can be primarily ascribed to the farmers' lack of access to production inputs and to the inadequate extension service, which carries out almost no activities in the field. The incomes of the small and medium-sized farmers along the arms of the Nile can be raised and the quality and quantity of produce for the market also raised.

2. Aim of the project

The project aims to introduce improved fruit and vegetable growing methods.

3. Project design/Scheduled results

The project's activities are focused on the provision of advice to small and medium-sized farms growing fruit and vegetables. Top priority is allocated to the supply of materials and equipment as well as training and upgrading measures to upgrade the agricultural extension services. Activities aimed at assisting private traders are also planned in order to improve the supply of production inputs, and research is to be carried out into specific problems relating to production techniques. The following results are envisaged for the end of the project:

- The farmers will have better access to agricultural production inputs.
- Agricultural extension officers will have been trained.

- Reliable extension recommendations will have been formulated.
- Field stations for advising the fruit and vegetable growers will have been established and will be in operation.
- Biological control of the date scale will have been introduced in the Northern Province.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

4 long-term experts (plant production, economic aspects, plant protection extension services) for up to 94 man-months, 1 project assistant for up to 12 man-months, short-term experts for up to 15 man-months, scientific assistants for up to 72 man-months; supply of equipment for the field stations, pesticides, fertilizers and seed; extension and training materials; passenger cars and motorcycles; counterpart training and upgrading; contributions to financing back-up measures; wage costs for project-contracted and support personnel, travelling expenses.

Inputs by project country:

Provision of qualified counterparts, agricultural extension officers and support personnel for the field stations; meeting of recurring costs in connection with field stations, project vehicles and equipment; creation of an institutional framework for cooperation between the individual agricultural services in the field.

5. Implementation status

The predecessor project (78.2065.7) ended on 31 January 1986 after six years. There has been a smooth transition to the new project. The project leader and the economist have commenced their work with the on-site compilation of the plan of operation. The new project is scheduled to start in February 1986 and is to last for up to 36 months.

Plant Protection Programme

PN: 75.2046.3

GTZ project leader: Dr. J. Schäfer
 Counterpart organization: Ministry of Agriculture and Cooperatives
 - Dept. of Agricultural Extension and
 - Dept. of Agriculture
 Project location: Bangkok

1. The context

At present, the use of pesticides in rice growing in Thailand is based on past experiences of extremely high pest infestations. This leads to high doses of pesticides being used as a preventive measure, placing an unnecessary cost burden on both the individual farms and the national economy, having detrimental effects on the environment and constituting a risk for both consumers and pesticide users.

Extension officers and farmers have to date lacked adequate knowledge to be able to assess the precise need for plant protection measures. It is therefore essential to collect data on pest and disease occurrence, to establish economic damage thresholds and to develop practice-oriented crop surveillance methods and simple decision-making aids for the farmers so that they can implement pinpointed and appropriate plant protection measures. These tasks are the responsibility of Thailand's plant protection service which, however, experiences bottlenecks in technical, organizational and personnel terms. Plant protection technicians must be qualified for this work in selected rice-growing areas of the country.

2. Aim of the project

The project aims to introduce and improve an infestation-dependent control system, in line with the principles of integrated plant protection, for rice-based crop rotations. The general agricultural extension service is to pass this system on to the project's target group, the rice farmers.

3. Project design/Scheduled results

The plant protection programme is integrated into the structure of the Thai plant protection service and performs an advisory function. The recommendations formulated are to be passed on to the farmers via the general extension service.

If the aim of the project is to be achieved, the following results should be realized by the time the project ends:

- Simple surveillance methods, damage thresholds and decision-making aids for the farmers will have been developed by means of applied research.
- Data collection and evaluation will have become an established feature of the existing plant protection organization (use of EDP).
- Training and extension material will have been compiled and the technicians from the plant protection service and the general extension service will have been trained.
- The farmers will have been trained and advised and the adoption rate monitored.
- Project coordination and management will have been carried out.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

4 long-term experts (team leader and management; agricultural economics; integrated plant protection; extension services) for up to 216 man-months, short-term experts for up to 15 man-months; supply of materials and equipment for research and extension work; vehicles, motorcycles; training of counterpart specialists.

Inputs by project country:

Provision of qualified counterparts; provision of the necessary buildings, facilities etc.; meeting of running costs.

5. Implementation status

The project has been in existence since 1975. From 1975 to 1979, attention was initially focused on field-rat control. The project was subsequently expanded into a general plant protection programme and since 1984 has been concentrating on the introduction of an infestation-dependent control system for rice and subsequent crops. It is scheduled to continue until 1988.

To date, the system has been introduced at 24 out of a total of 30 plant protection stations. Applied research has already yielded a number of results with regard to survey methods and loss estimates. The use of EDP for data evaluation has proved successful and the same technique is to be applied to other areas, e.g. project management. Training programmes for plant protection technicians and general extension officers have been started. The heads of the regional stations have

received management training. Back-up programmes in areas relevant to plant protection, such as biological pest control, post-harvest protection, residue and formulation control and rodent-pest control in the villages, have been carried out and are being continued. The passing-on of the control system to the target group - the rice growers - is to be planned, controlled and monitored in detail, in cooperation with the agricultural extension service.

Cacaveli Plant Protection Service

PN: 71.3538.7

GTZ project leader: H. Lausmann

Counterpart organization: Service de la Protection des Végétaux

Project location: Lomé-Cacaveli

1. The context

Around 80 % of Togo's three million inhabitants are directly dependent on agriculture for their livelihood, the majority of them farming smallholdings with an area of two to three hectares. The expansion and intensification of agricultural production, particularly of export crops such as cotton, coffee and cocoa, is confronting Togo with a number of phytosanitary problems. Plant protection problems are also reducing yields in fruit growing, coconut plantations, rice, maize and beans. In the vicinity of urban agglomerations in particular, vegetable growing can only be intensified if the resultant phytosanitary problems are overcome. As far as post-harvest protection is concerned, the substantial losses occurring with traditional maize, millet and bean storage make improved storage facilities essential. For successful exporting, importing and interim storage of agricultural produce, phytosanitary quarantine problems must be solved.

2. Aim of the project

The aim of the project is to increase plant production and reduce post-harvest losses through the creation of an efficient plant protection service with legislative powers.

3. Project design/Scheduled results

The project started in 1971 with the supply of materials and equipment and support in construction measures for the plant protection service. This was followed by scientific and practical programmes designed to test pesticides, application techniques and crop varieties. Since 1981, activities have been focused on extension services. Integration of plant protection extension programmes into the general work of the agricultural extension service is being promoted through the translation of research and test results into practical recommendations, through training and upgrading measures and by means of demonstration programmes. The following results are envisaged by the time the project is handed over:

- Important technical documentation specific to Togo will have been compiled and made available.

- Plant protection personnel and agricultural extension officers will have been trained for the implementation and dissemination of improved plant and storage protection measures by means of internal and external training and upgrading schemes.
- Plant and storage protection technologies will have become known to the farmers as a result of continuous demonstrations.
- The extension work carried out by the Sokodé, Kara and Dapaong regional plant protection services will have become more effective.
- The success of the project will have been guaranteed.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

Most of the inputs have already been furnished, as the project is on the point of handover.

13 long-term experts (556 man-months), short-term experts (32 man-months); construction of two stores, a workshop, a garage, an administrative building with conference room and a building complex for a regional service; equipping of workshop, laboratories and administrative buildings; supply of pesticides and related equipment; vehicles, extension aids; setting-up of a counterpart fund, long-term counterpart training for 33 members of the service's personnel.

Inputs by project country:

Provision of qualified counterparts (from 4 in 1971 to 49 in 1985), personnel for field trials and campaign teams; sites for plant protection headquarters, land for trials and a regional service, renting of buildings for two regional services; meeting of running and maintenance costs for counterpart-organization facilities as well as related buildings and land; meeting of costs for fuel, maintenance and servicing for vehicles used by counterpart organization; handling of counterpart fund; support for the project programme by motivating and mobilizing the local agricultural extension services and increasing their awareness of plant protection problems.

5. Implementation status

The project is in the last year of its follow-up assistance phase (1984 to March 1986). In order to provide the counterpart organization with further support, the implementation of a number of additional measures following project handover (infrastructural improvement of experimental field, establishment of a regional plant protection service in the Plateaux Region) is recommended, together with the purchase of a number of replacement items for the vehicle pool and office, laboratory and treatment equipment.

Promotion of Plant Protection Measures

PN: 84.2111.7

GTZ project leader: A. van Elsen
 Counterpart organization: Service de la Protection des Végétaux
 Project location: Lomé-Cacaveli

1. The context

The major staple foodstuffs in Southern Togo are maize and manioc; their importance extends well into the 'Centrale' Region. In the early eighties new pests constituting a danger to these crops were brought into Africa from Latin America. These pests - the larger grain borer in the case of maize and the mealy-bug and the green spider mite in the case of manioc - cause losses of between 30 and 60 % in both of these crops. There are no traditional plant-protection measures or natural enemies in Togo which could be used to combat the newly introduced pests.

2. Aim of the project

The project's aims are control of the larger grain borer and biological control of manioc pests.

3. Project design/Scheduled results

The implementation of a national biological control programme aimed at the principal manioc pests and the introduction of appropriate storage and control methods among smallholders are to reduce losses, stabilize manioc production and ensure a supply of staple foodstuffs for Togo's population. The following results are envisaged by the end of the project:

- All important natural enemies supplied by the IITA in Ibadan will have been released in Togo's principal manioc-growing areas.
- Staff from Togo's plant protection service will be adequately qualified for their tasks in the field of biological pest control.
- The spread, settlement and efficiency of the imported pest predators will have been monitored.
- The population development and the further regional spreading of the larger grain borer will have been restricted.

- The storage of shelled maize in sacks, which is a considerably better method from the point of view of combatting the larger grain borer, will have been introduced as an alternative form of storage.

- The fumigation-proof collective store (Cacaveli type) will have been introduced and disseminated at village level as an alternative form of storage.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

2 long-term experts (entomologist, storage protection) for up to 48 man-months, short-term experts and appraisers for up to 8 man-months, 2 staff under local project contract; 3 passenger cars, 4 motorcycles; cooperation agreements; production of training and extension aids; fumigation equipment; literature.

Inputs by project country:

Provision of qualified counterparts, setting-up of a "Biological Pest Control" section and a "Storage Protection" section; laboratories and offices; meeting of running and maintenance costs for project facilities; personnel for mobile pest-control unit; amendment of existing laws and regulations.

Inputs by third parties:

Natural enemies of the manioc pests for the purpose of control measures are to be bought from the IITA in Ibadan.

5. Implementation status

The project started with the arrival of the team leader in December 1985. The second long-term expert started work in January 1986.

Integrated Plant and Post Harvest Protection

PN: 77.2070.9

GTZ project leader: Dr. D. Stechmann
 Counterpart organization: Ministry of Agriculture, Fisheries and Forests
 Project location: Nuku'olofa

1. The context

Subsistence farming and fishing constitute Tonga's only natural resources. Plant products (coconuts, yams, bananas, watermelons, vegetables) account for over 90 % of the country's export earnings. Population pressure (137 inhabitants/km²) with an almost fixed feudalistic system of land distribution, migration from the isolated outer islands and foreign trade and payments problems are necessitating the diversification and intensification of economic activities. The fragile ecosystems (coral islands with no surface waters, exposure to the wind, hurricanes, almost total deforestation) mean that the traditional "intercropping system under coconut palms" must be retained. Non-indigenous insect species, plant diseases, weeds, etc. brought into the country from outside have repeatedly threatened individual crops in the ecosystem and are necessitating ever greater expenditure on plant protection.

2. Aim of the project

The project aims to set up a countrywide government plant protection service and, by means of research, training and extension services, to develop plant-pest control methods which are acceptable in both ecological and economic terms.

3. Project design/Scheduled results

The facilities and personnel of the Ministry of Agriculture's research department and extension service are to be promoted and services provided for the farmers. The project is designed on an integrated basis: an agricultural economist has been assigned to the Ministry's planning department, scientists are working on the research farm and a counterpart specialist is coordinating cooperation with the extension service.

During the project's start-up phase the pests and diseases occurring in Tonga were identified and investigated, market and input analyses carried out, field tests and surveys of damage and control strategies started and a research and extension centre set up. It is planned that the following results will have been achieved by the end of the operational phase:

 Plant Quarantine

PN: 82.2067.5

GTZ project leader: Dr. G. Baumann
 Counterpart organization: Ministry of Agriculture, Direction de la Production Végétale
 Project location: Tunis

1. The context

The major role played by agriculture in Tunisia in ensuring the food supply and as a source of foreign exchange means that crop production must be safeguarded by means of effective plant protection measures. This includes in particular an efficient plant quarantine service to prevent dangerous pathogens, pests and weeds from being brought into the country and becoming established. The Tunisian plant quarantine service is faced with bottlenecks in terms of both organization and efficiency.

The major shortcomings can be summed up as follows:

- Outmoded quarantine legislation
- Unsatisfactory organization
- Staff inadequately qualified
- The service is inadequately equipped; no preparations have been made for action in the event of economically significant pests or diseases being brought into the country. One danger at present is the high risk that a dangerous date-palm disease may be brought into the country and may spread. The livelihood of Tunisian farmers, seed producers, florists and importers and exporters of plant products is being substantially impaired by new pests and diseases brought into the country.

2. Aim of the project

The project aims to establish an efficient quarantine service. This is to be achieved by equipping the quarantine organization within the Tunisian plant protection service and ensuring that its staff are qualified for their work.

3. Project design/Scheduled results

The basic principle is to minimize the risk of pests and diseases being brought into the country with imported plants, accompanied by minimum interference with trade through regulations and controls.

- Safety precautions, including those relating to quarantine, will have been improved.
- All work areas will be staffed with counterparts.
- The majority of the extension officers, as well as around 50 % of the farmers, will be correctly implementing recommendations.
- Biological control programmes will have become known and will have been started.

4. Scheduled inputs (1 November 1984 to 31 October 1988)

Inputs by the Federal Republic of Germany:

Assignment of 2 long-term experts for up to 84 man-months, assignment of scientific assistants for up to 30 man-months; supply of laboratory apparatus, equipment, extension aids, vehicles; meeting of costs for the training of up to 6 counterpart specialists.

Inputs by project country:

Meeting of running and maintenance costs, provision of the necessary specialist personnel, provision of scholarship recipients (and ensuring that their dependents are adequately provided for).

5. Implementation status

The project started in 1978 and is scheduled for handover at the end of 1988. Particular attention is being focused at present on expanding the scholarship programme and making the research and extension activities more specific. All sections are now staffed by counterparts and a second group of potential candidates is still undergoing training. The range of extension aids has been considerably expanded and numerous training courses (including two international courses) have already been held. Biological pest control is a focal point of the project but requires activities designed on a longer-term basis.

The project activities are focused on the establishment of an efficient plant quarantine service capable of taking effective action. In addition, cooperation between the Tunisian plant quarantine service and relevant international organizations and plant protection services in the products' countries of origin and destination is to be stepped up. Awareness of plant quarantine problems on the part of Tunisian importers and exporters as well as travellers is to be increased by information campaigns. The following results are envisaged by the end of the project:

- An organizational concept for plant quarantine will have been formulated.
- A proposal for an updated quarantine legislation will have been drawn up.
- A technical manual (quarantine handbook) for the service's technical staff will have been produced.
- Contingency plans for the event of dangerous pests or diseases being brought in will have been drawn up.
- The buildings for the service's headquarters in Tunis and the frontier control points will have been constructed and equipped.
- Agencies, companies and travellers affected by quarantine measures will have been informed.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

2 long-term experts for up to 96 man-months, short-term experts for up to 15 man-months; 2 long-term training measures (36 months each), short-term training measures, financial contribution to construction of the new quarantine service headquarters in Tunis.

Inputs by project country:

Provision of qualified specialists and personnel to man the entry points; construction of a new quarantine service headquarters building (until its completion: provision of premises for laboratories and offices); meeting of running and maintenance costs for project facilities and equipment; creation of administrative prerequisites for project implementation, particularly with regard to updating of quarantine legislation and cooperation with agencies outside the Ministry of Agriculture.

5. Implementation status

The project is in the second year of implementation (total duration 4 years, project started in August 1984). A situation analysis and the plan of operation have been drawn up.

Preparations for the long-term and short-term counterpart training and for the assignment of short-term experts have started. The organizational concept for the Tunisian plant quarantine service and the contingency plan for occurrence of the date-palm 'bayoud' disease will shortly be completed.

Integrated Crop and Post Harvest Protection

PN: 77.2043.6

GTZ project leader: Dr. H. Hammans
Counterpart organization: Ministry of Agriculture with
Department of Agriculture
Project location: Apia

1. The context

Western Samoa is dependent on agriculture to a very large extent: Around 70 % of the labour force is involved in agriculture and this sector accounts for 45 to 50 % of the Gross National Product. The average annual per-capita income of US \$ 800 underscores the importance of subsistence farming in safeguarding the food supply. Exceptionally high imports and a decline in the traditional export products - bananas and cocoa - are having an increasingly detrimental effect on the country's trade and foreign-exchange balances. As the country's principal resource, agriculture is called upon to play an important role in combatting this negative trend. Optimized cultivation methods to raise harvest yields and measures to prevent losses resulting from crop pests are particularly essential to safeguard the population's basic food supply and exports in the future.

2. Aim of the project

The plant protection service in Western Samoa is to be placed in a position to develop and disseminate appropriate - i.e. ecologically and economically acceptable - plant protection programmes.

3. Project design/Scheduled results

The promotion of plant protection is to help to improve crop production in Western Samoa in both quantitative and qualitative terms with a view to ensuring the country's own food supply and increasing exports.

To this end, institution-building activities, training and extension work are being implemented. Following a two-year operational phase, the following additional results are envisaged by the end of the handover phase (May 1984 to April 1987):

- The Samoan plant protection service will operate along international standards.

- Basic control strategies will have been formulated for the most important pests.
- Studies on the economic significance of plant protection measures will have been carried out.
- The adoption of plant protection recommendations by the agricultural extension service will have been guaranteed.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

4 experts for up to 36 man-months each, short-term experts for up to 6 man-months; supply of materials and equipment, vehicles, wage costs for personnel under local project contract; travelling expenses.

Inputs by project country:

Provision of qualified counterparts and personnel for work on the project tests; provision of sites for the construction of project buildings and houses for project personnel, provision of land for experimental purposes; meeting of electricity costs and vehicle fuel costs.

5. Implementation status

One of the major tasks in the last phase of the project is the reintegration of the project personnel who have been studying at various universities. Particular attention is also being paid to passing-on of the project results via the extension service.

The present level of training of the Samoan personnel suggests that the project will continue to operate effectively, with informal follow-up assistance, following its handover in May 1987.

Support to the National Plant Protection Service

PN: 85.2296.3

GTZ project leader: Dr. R. Link
 Counterpart organization: Ministry of Agriculture
 General Plant Protect. Dept.
 Project location: Sana'a

1. The context

The Yemen Arab Republic is still among the countries with high population growth and declining agricultural production. Technical Cooperation in the plant protection sector between the Yemen Arab Republic and the Federal Republic of Germany has been in progress since 1973 when a GTZ project (PN 73.2109.4) helped to establish the national plant protection service. The project ended in September 1985.

2. Aim of the project

The aim of the new project (starting in April 1986) is the introduction of appropriate integrated plant protection methods among farmers in North Yemen via the plant protection extension service. By broadening extension work to cover the most important crops, pre-harvest losses are to be further reduced and the small farmers encouraged to carry out "intelligent" plant protection measures. The national plant protection service is also to be promoted in the future.

3. Project design/Scheduled results

This is an advisory project with additional emphasis on strengthening the counterpart organization (institution-building). The following results are envisaged by the time the project ends:

- The early-warning and extension service will be using integrated plant protection methods.
- Plant quarantine will be operating in line with international standards.
- The counterpart organization will possess the capability to competently select and approve appropriate new pesticides.
- Integrated plant protection methods will have been geared to local conditions and adopted by the extension service.

- Specialists from the counterpart organization will have undergone training.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

5 experts (project leader, early-warning service, advice on integrated plant protection, testing of agents) for up to 156 man-months, short-term experts for up to 12 man-months; upgrading of Yemenite specialists for up to 138 man-months; official travel by German experts; supply of 6 vehicles, materials for laboratory and field tests, training and extension aids; financing of working supplies.

Inputs by project country:

Provision of personnel and buildings, meeting of running, maintenance and administration costs; making available of materials and equipment supplied; releasing of personnel for upgrading.

5. Implementation status

The predecessor project (73.2109.4) ended as scheduled on 30 September 1985. There has been a smooth transition to the new project on the basis of verbal notes. The project leader is already on site and has commenced the planning work.

The project is scheduled to start in April 1986 and is to last for up to 36 months.

Pesticide-Residue Project

PN: 73.2028.6

GTZ project leader: Dr. R. Thiel

Counterpart organization: Participating ministries and institutions in the project countries

Project locations: Darmstadt and Schopfheim

1. The context

The intensification of agriculture has brought a worldwide increase in the use of pesticides. Numerous studies have demonstrated that this intensive and - particularly in developing countries - often inappropriate use of pesticides results in considerable residues in and on foodstuffs and export products derived from plants. Awareness of this problem and the growing worldwide efforts to protect the environment make it necessary to assist the project countries in the handling of pesticide residue problems, in pesticide quality control and in all related areas.

2. Aim of the project

The project aims to improve the independent execution of pesticide residue analyses and quality control tests by counterpart institutions and Technical Cooperation projects and to ensure that pesticides are put to appropriate and environmentally-sound use.

3. Project design/Scheduled results

With its two laboratories in Darmstadt (residue control) and Schopfheim (formulation control), the project is designed to provide central support to agricultural Technical Cooperation projects and their counterpart institutions in solving problems in connection with the use of chemical pesticides. The following results are envisaged by the end of the project:

- Counterparts and GTZ personnel will have received relevant training or will have participated in upgrading measures.
- The specialist advice provided by the project will be taken into account in the planning and implementation of projects.
- Counterpart institutions will be advised by the project on a case-to-case basis.

- Technical Cooperation projects and counterpart institutions will make use of the specialized and technical assistance provided by the project.
- The analysis capacity of 1200 analyses per year for residue and formulation control will be guaranteed.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

5 long-term experts for up to 180 man-months, various short-term experts for up to 15 man-months, laboratory and test equipment, literature, glassware, spare parts, financing of short-term training programmes for counterparts, with particular emphasis on promoting the development of local capacity for analyses and investigations in project countries. In selected countries, surveys of samples are carried out.

Inputs by project countries:

Provision of specialists, administrative staff and support personnel for the project activities in the project country, meeting of running and maintenance costs for project facilities, establishment of contacts with organizations implementing plant protection measures.

5. Implementation status

The project performs service functions for Technical Cooperation projects on a considerable scale. Following a start-up phase (1973-1977) and the first operational phase (up to 1983), the project is now in its second operational phase, which is scheduled to last until 31 December 1986. The project's principal task will continue to be the training and upgrading of counterparts. In addition, continuous work is being done on adapting analysis methods to the specific conditions in project countries.

The project is helping to supervise counterpart laboratories in:

Morocco, Sudan, Syria, Sri Lanka, Thailand, Philippines, Dominican Republic, Costa Rica, Panama.

Promotion of local laboratories is scheduled in:

El Salvador, Ecuador.

Ongoing contact is maintained with GTZ plant protection projects in matters concerning pesticide formulation and residue control and assistance provided when necessary:

Malaysia, Cyprus, Jordan.

Sampling surveys are regularly carried out in individual countries upon request. To date, one or more surveys have been conducted in Togo, the Yemen Arab Republic, Niger, Morocco, Cyprus, Syria and Jordan.

In addition, the capacity of the two laboratories in Darmstadt and Schopfheim is used for special investigation programmes and six to eight-week short-term training and upgrading programmes held twice a year. Extension aids are being produced and a new information brochure compiled. The project is to be extended by an additional operational phase scheduled to last several years.

Post-Harvest Crop Protection

PN: 77.2074.1

GTZ project leader:

R. Harnisch

Counterpart
organization:The project works together with the
respective ministries and agencies
in the project countries

Project location:

Hamburg
Field station in Togo until
31 December 1986
Field station in Malawi from
1 January 1987**1. The context**

Throughout the world, immense post-harvest losses occur in stored produce. It is more economical to preserve what has been harvested than to continually try to raise production in order - among other things - to compensate for the post-harvest losses. As a rule, the links between the "input" - i.e. appropriate, loss-minimizing storage methods - and the "output" - i.e. an indirect increase in production - are not fully recognized. The inadequate food supply in most developing countries can to a large extent be ascribed to disregard of this problem and to a lack of know-how for developing potential solutions.

2. Aim of the project

This supraregional project aims to reduce post-harvest losses in developing countries.

3. Project design/Scheduled results

On account of the know-how deficit in this field, priority is given to training agricultural extension workers and plant protection technicians in all aspects of loss-minimizing storage. The same applies to the provision of advisory services to governmental and semi-governmental agencies. On the basis of this service function and the multiplier effect it triggers off, the target group of all the project's activities is the smallholder population and the consumer. By implementing appropriate investigation programmes, the project can offer innovations of a pilot nature which are starting points for potential solutions to the post-harvest protection problems of the project countries. These innovations form the basis, among other things, for practical know-how transfer. The results envisaged for the end of the project can be outlined as follows:

 Natural Insecticides from Tropical Plants

PN: 77.2233.3

GTZ project leader: Prof. Dr. H. Schmutterer

Counterpart organization: Relevant institutions in the project countries

Project location: Gießen
Institute for Phytopathology and Applied Zoology at the Justus Liebig University

1. The context

Chemical pesticide use is being intensified in the developing countries too in an effort to safeguard and increase agricultural production. Continually rising prices and infrastructural problems, however, impose considerable restrictions on their use. Moreover, chemical pesticides involve risks for human health and for the environment, particularly when improperly used.

The use of suitable pesticides from natural sources can represent an alternative to synthetic preparations on account of the low production costs, the ease of application and the lower toxicity to both man and animals.

The leaves and fruit of the neem tree (*Azadirachta indica*) contain active ingredients with insecticidal, hormonal and repellent properties. It is likely that these active ingredients will, following simple local treatment, be suitable for use as pesticides.

2. Aim of the project

The aim of the project is to ensure that in selected areas the pesticides derived from neem can be manufactured and used by the small farmers themselves.

3. Project design/Scheduled results

The project's start-up phase and first operational phase concentrated on research work.

The initial phase, which lasted from 1978 to 1980, was followed by a first operational phase which continued until August 1984 and devoted attention for the most part to laboratory tests and the investigation of active ingredients. The following results are envisaged by the time the second operational phase ends in August 1987:

- Institutions and other Technical Cooperation projects in developing countries will have been assisted and advised on issues of storage and post-harvest protection.
 - Extension officers, plant protection technicians and store personnel will have been trained.
 - Information materials will have been made available.
 - Study programmes on specific post-harvest problems will have been completed.
 - Fumigatable small stores for village communities will be ready for use.
 - Project field stations 1 and 2 will have been established.
4. Scheduled inputs (mid-1977 to 31 December 1986)

Inputs by the Federal Republic of Germany:Project headquarters:

Experts (storage protection, advisory services) for up to 198 man-months, specialist (secretary/laboratory assistant) for up to 84 man-months, short-term experts for up to 36 man-months, scientific assistants for up to 144 man-months; provision of instructional and training materials, funds for upgrading seminars, meeting of costs of premises and maintaining operational capacity of project headquarters, cooperation agreements with research institutes; including: 3 scientific assistants, 2 laboratory assistants, funds for materials and equipment, publications.

Project field stations:

Experts on storage protection for up to 84 man-months, assistants for up to 60 man-months; supply of materials and equipment for the field station; extension and training materials; 3 passenger cars; cost of support personnel, travelling expenses.

Inputs by project country:

Provision of specialists; meeting of running and upkeep costs for project facilities, as well as servicing, fuel and maintenance costs; mobilization of governmental organizations for the project measures.

5. Implementation status

The project is currently in the seventh year of implementation. Working on the basis of "trainer training", relevant know-how has been imparted at a total of 37 bilateral workshops and international seminars attended by some 800 participants. As a back-up measure, the project supplies information materials and extension aids. The project is to be extended for a further four years.

- The problems involved in collecting, processing (good quality) and storing the neem seeds, as well as in preserving their germination capacity, will have been solved.
- Effective extracts will be obtained from various parts of the neem tree.
- Questions relating to toxicity will have been adequately clarified.
- The effective spectrum of the neem preparations with regard to pests, their most important natural antagonists and the non-target organisms will have been largely established.
- The investigation results will have been adapted to practical requirements and prepared for passing-on to selected target groups.
- A pilot installation for extracting neem products will have been constructed and will be operational.

Application of the findings in agriculture in developing countries is currently being started in Togo, Burma and the Philippines. There is close cooperation with the plant protection project in Nicaragua. A project field station in the Dominican Republic is to commence operations in 1986.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

3 experts on entomology and plant protection for up to 36 man-months each (locations: Gießen, Philippines and Dominican Republic), specialized scientists for up to 174 man-months, short-term experts for up to 7 man-months, technical assistants and project-contract personnel; oil mills, vehicles, laboratory apparatus, spraying equipment; training of counterparts.

5. Implementation status

The project is in its second operational phase (1984 to 1987).

Methods of obtaining neem kernel extracts have been developed. Extracts have been obtained from neem kernels gathered in Togo and other countries and their properties investigated.

The insecticidal, hormonal and repellent effects of the natural substances have been tested on various insect pests in laboratory and field trials. Specialists from various countries, particularly those in West Africa, have been familiarized with the technique for applying neem preparations and are using it.

World-wide work findings in this field were discussed with other working groups and set out in specialized publications at two international conferences (1980 and 1983). The third international conference is to be held in 1986 in Nairobi. The project's next operational phase will devote increased attention to implementing pilot measures at village level.

Integrated Biological Control of the Larger Grain Borer

PN: 84.2007.7

GTZ project leader: Dr. A. Laborius

Counterpart organization: Ministries of Agriculture in the project countries in Central America and Africa

Project location: Hamburg

1. The context

The larger grain borer (*Prostephanus truncatus* Horn), a store pest, was brought into Tanzania in the late seventies and in 1984 was also found in Togo. In both of these newly infested regions it causes damage on a hitherto unknown scale, above all to maize cobs stored in the traditional manner in the husks, whereas in its area of origin - Central America - the damage remains within reasonable limits. It is suspected that effective antagonists of this pest are to be found there.

Chemical control of this pest is economically viable only if there is a simultaneous transition from traditional cob storage to loose storage. This causes considerable problems for small farmers.

It is assumed that natural antagonists of the larger grain borer exist in its region of origin and that these have not been found to date in Africa.

2. Aim of the project

The aim of the project is to identify antagonists and other factors which inhibit reproduction of *P. truncatus* in Central America and to investigate the possibility of transferring these inhibitive factors by comparing the ecosystems in Central America and Africa.

3. Project design/Scheduled results

The project's activities are focused on scientific investigations to clarify the ecology of the larger grain borer in Costa Rica and Tanzania. The results are compared, the various environmental factors identified and their practical applicability for the biological/integrated control programme examined. If this yields positive results, efforts are to be made in subsequent phases of the project to reduce losses in traditionally stored maize to an acceptable level by introducing the antagonists.

The identification of microbial pathogens in Central America and the related laboratory investigations are being financed out of European Community funds. These activities have been coordinated with those of the project. The following results are envisaged by the time the project ends:

- The ecological environment of the pest in Central America will have been clarified.
- The ecological environment of the pest in Tanzania will have been clarified.
- Reproduction-inhibiting effects of the antagonists from both areas under investigation will have been studied under laboratory conditions.
- A decision will have been taken as regards the expediency of transferring antagonists and/or microorganisms to Africa.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

Project leader (storage protection) for up to 39 man-months, 3 scientific assistants for Central America, East Africa and the Federal Biological Institute for Agriculture and Forestry (BBA) in Berlin for up to 108 man-months, short-term experts for up to 6 man-months; supply of materials and equipment for laboratory and field tests, office supplies, 3 passenger cars and related running and maintenance costs, procurement of test materials for office, laboratory and field use; wage costs for technical assistants; services for the Universities of Hamburg and Kiel and the BBA in Berlin.

Inputs by project countries:

Provision of workplaces for scientific assistants, making available of internal installations and facilities.

Inputs by third parties:

Provision of premises and facilities by BBA Berlin and Universities of Hamburg and Kiel; provision of support in implementation by Technical Cooperation projects in Costa Rica and Tanzania. Financing of a scientific assistant out of European Community funds, allocated to the Chair of Storage Protection at the University of Kiel. This assistant is integrated into the project's investigation programme.

5. Implementation status

The project is initially designed to last for around three years and started at the end of 1984. The scientific assistant for East Africa, based in Tanzania, started work in September 1985. The practical investigations in Costa Rica and at the BBA in Berlin have been in progress since the beginning of 1985. Parasites and predators as well as bacterial and fungal pathogenic agents hostile to *Prostephanus truncatus* have been identified.

However, the investigations into their mode of action and degree of efficacy do not yet permit any assessment of their subsequent suitability for biological/integrated control measures in Africa. It has not yet been possible to carry out comparisons with the conditions in the infested African regions.

Biological Control of Manioc Pests in Africa

PN: 84.2142.2

GTZ project leader: --

Counterpart organization: International Institute
for Tropical Agriculture,
IITA

Project location: Ibadan, Nigeria

1. The context

Manioc is traditionally an important crop in Africa's humid tropics, as it has no special site requirements and is easy to grow. Manioc has ensured the survival of families farming on a self-sufficiency basis even when other crops have failed. Manioc yields in Africa are being substantially reduced by two pests brought in from South America in the early seventies, the green spider mite (Mononychellus tanajoa) and the mealy-bug (Phenacoccus manihoti).

These pests are continuing to spread, so that the extent of the damage and its economic significance for over thirty African countries in the manioc-growing belt are necessitating control measures. Alongside the breeding of resistant manioc varieties, biological control of the pests using antagonists brought in from South America promises to be successful in the long term.

2. Aim of the project

Biological control methods are to be developed in order to reduce manioc losses.

3. Project design/Scheduled results

The central research institution, the IITA, has already carried out important preliminary work on controlling manioc pests. The programme has the political backing of twenty African countries. Together with other donors, the Federal Republic of Germany is making a number of financial contributions towards the cost of the research and control programmes carried out under the responsibility of the IITA. The following results are envisaged by the time the programme ends:

- Research into the mealy-bug and the green spider mite will have been carried out.
- Installations for large-scale breeding of natural predators will have been expanded.

 Prevention of Post-Harvest Losses in Food Crops

PN: 85.7853.6

GTZ project leader: Mr. A. Richter

Counterpart organization: United Nations Economic Commission for Africa (ECA)

Project location: Addis Ababa

1. The context

Between 1970 and 1980 cereal imports by African countries increased from 4.2 million tonnes to 15.2 million tonnes per year. At the same time, around 7 million tonnes of cereals already produced or stored were lost each year, a quantity which would cover the annual requirements of 45 million people. Post-harvest losses in cereals can be ascribed in particular to insects and rodents and to a lesser extent to fungi and their metabolism products. Technical shortcomings in storage as well as errors in the transport and marketing chains are promoting the occurrence of pests on a threatening scale.

The ECA has for some years been endeavouring to compile situation analyses and programme proposals for Africa, taking account of the different conditions in the individual regions.

2. Aim of the project

Implementation proposals for the use of effective post-harvest protection methods are to be formulated for selected countries in the region.

3. Project design/Scheduled results

The project is not intended to carry out direct development work in a specific case, but rather to formulate the bases and planning for future campaigns and projects. The project is integrated into the ECA in organizational and operational terms.

A six-month orientation phase (December 1985 to July 1986) is to be followed by an eighteen-month operational phase. The subsequent phases of the project will be designed following project evaluation in mid-1987. The following results are envisaged by the end of the project:

- The post-harvest protection situation with regard to cereals, legumes and root crops will have been recorded and analysed in selected countries or sub-regions.

- Pilot measures involving the practical use of pest predators in various infested African countries will have been started.
- The technical personnel in the participating countries will have been trained in biological control of the manioc pests.
- Advisory and information materials, together with technical manuals, will be available.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

Provision of a number of annual financial contributions for the IITA towards the cost of scientific specialists and support personnel, short-term experts, vehicles, laboratory equipment, upgrading and pilot measures in various countries infested by the pests.

Inputs by counterpart organization:

The IITA has technical and organizational responsibility for scheduled implementation of the agreed programme.

Inputs by third parties:

The programme receives financial support from Switzerland, Austria and a number of other countries, as well as from various national and international organizations.

5. Implementation status

Biological control measures using imported pest predators have already yielded initial successes (establishment of a pest predator over a large area). The large-scale breeding of various pest predators is in progress and release techniques are being developed. IITA release programmes are running in a number of countries, but require continuous logistical support.

- Post-harvest protection programmes will have been formulated.
- The action and project proposals will have been submitted to the governments concerned.
- Training measures will have been carried out or initiated.
- International intergovernmental and regional activities will have been coordinated.

4. Scheduled inputs

Inputs by the Federal Republic of Germany:

1 expert on post-harvest protection/project management for up to 24 man-months, short-term experts for up to 8 man-months; office supplies, working equipment, instructional materials and visual aids; financing of services by the ECA.

Inputs by counterpart organization:

The ECA (a UN organization) is to make available offices, working materials, infrastructures including telex, telephones, support personnel, specialist personnel, typists, travelling expenses etc., against payment.

5. Implementation status

The orientation phase started on 1 December 1985 with the arrival of the expert in Addis Ababa. The plan of operation for the first phase has been drawn up.

Relevant publications

Special publications which cannot be obtained from booksellers are required for project work. Therefore they can only be supplied by Section 152 in exceptional cases, and against payment of the cost.

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