WAGENINGEN UR
For quality of life

# HORTIN Annual report 2005

Horticultural Research Cooperation between Indonesia and the Netherlands


agriculture, nature and food quality

IAARD - ICHORD

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For quality of life

# HORTIN Annual report 2005

## Horticultural Research Cooperation between Indonesia and the Netherlands

W.J. van der Burg & A.P. Everaarts (Editors)

Wageningen
March 2006

If you think you could contribute to the goals of HORTIN in any way, please contact the Programme management.

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# I. General

1. Programme number: 424

2. Title: Horticultural research cooperation between Indonesia and the Netherlands

3. Working title: HORTIN

4. Programme leader and leading institute: W.J. van der Burg, Plant Research International (PRI)
   Programme secretary: A.P. Everaarts, Applied Plant Research (APR)

5. Participating institutions:
   - Indonesia: IVEGRI, IOCRI, IFRURI, CISTROPHRES, DINAS Pertanian (Riau),
   - Netherlands: Plant Research International (PRI), Applied Plant Research (APR) Centre for Genetic Resources (CGN), DLV-Agriconsult Horst,
   - Participating companies: Agriom BV, CNC/Exotics BV, Fides-FGB, Asian Perlite Industries, PT East West Seed Indonesia, Cibodas Mas Biotek, Tirta Agri Kencana; Al Itifaq, Hero, Bimandiri, Edik.

6. Duration: 1 January 2003 - 31 December 2006

7. Budget 2005 (k€):

| *Amounts in €* | *Available 2005* | *Expenditure 2005* | *Transferred to 2006* |
|---|---|---|---|
| *Transferred from 2004* | *19,530* | *19,530* | |
| *Regular programme funds* | *480,000* | *439,700* | *40,300* |
| *NAP-funds* | *10,000* | *6,700* | *3,300* |
| *Total* | *509,530* | *465,930* | *43,630* |

   3.3 k€ NAP will be transferred to 2006 for extra training possibilities. 43.63 k€ results from unused non-allocated funds and remaining budget of the halted garlic project and will be used to compensate for the budget reduction by 10% (48 k€) in 2006.

8. Type of programme: Policy support programme (BO)

9. (Potential) users of the results: Respective Ministries of agriculture, Indonesian and Dutch agribusiness (breeders, producers of plant starting materials, agricultural supply companies, traders, exporters), Indonesian and Dutch knowledge institutions, Indonesian primary producers

10. Composition of the Programme Board (BC):
    Chairman: W.J.C. Huisman (IH-LNV)
    Secretary: C.G.J. van Leijen (EC-LNV)
    Members: C.M.M. van Winden (DL-LNV)
    B. Vrolijk (IZ-LNV)

# II. Report on 2005

## Introduction

HORTIN is a programme that is carried out in the framework of the Administrative Arrangement between the Indonesian Agency for Agricultural Research and Development (IAARD, Indonesia) and the Ministry of Agriculture, Nature and Food Quality (LNV, Netherlands). Execution is vested in Plant Research International (PRI) and Applied Plant Research (APR) in the Netherlands and the Indonesian Centre for Horticultural Research and Development (ICHORD) with the following three horticultural institutes: the Indonesian Vegetables Research Institute (IVEGRI) in Lembang, the Indonesian Ornamental Crops Research Institute (IOCRI) in Segunung, and the Indonesian Fruit Research Institute (IFRURI) in Solok, West Sumatra.
HORTIN is being monitored by a Programme Board on the Netherlands side and the Joint Indonesian-Dutch Working Group on Agriculture and Fisheries (WGAF, or Landbouwwerkgroep, LWG).
Goal is to strengthen Indonesian horticultural research through joint research, capacity and institution building, and in this way to encourage research activities that are interesting for public-private partnerships.

HORTIN focuses on the development of environmentally sustainable technologies for horticultural production and food safety. Much attention is given to knowledge dissemination and institution building. Ultimate goal of the programme is to stimulate trade relations between Indonesia and the Netherlands. Public-private partnerships are encouraged.
All projects have been formulated for the full 4 years of the project duration.

*Figure 1. Fruit juice seller in front of one of the ICHORD institutes.*

## General issues

### 10th Working Group on Agriculture and Fisheries between Indonesia and the Netherlands

The last few years regular meetings are taking place between the respective Ministries of Agriculture: the annual meeting of the joint Working Group on Agriculture and Fisheries (WGA) and the trilateral partnership meetings. The latter also include Malaysia. This year the meetings were both held in Kuala Lumpur.

The following is taken from the agreed minutes of the WGA of 16 June 2005 and relates to HORTIN:

*'Current HORTIN programme will end in December 2006. Both sides expressed the wish to continue the programme beyond 2006 and also agreed to jointly develop a position paper on the priorities of future research cooperation, taking into account the need to closely link the programme with the Indonesian research priorities.'*
At this moment a draft document on the position of Indonesia has been produced and is circulating in Jakarta. It will be presented to the Dutch authorities before long, and will be used to formulate a joint judgement and outlook.

## Business meeting

HORTIN organised a meeting for Dutch businessmen to get acquainted with the possibilities of setting up businesses in Indonesia in the field of horticulture. The opening speech was presented by Mr Jusuf, Indonesian Ambassador to the Netherlands. He was accompanied by Mr Budi Perianto, Head of Economic Affairs.

After that, a number of speakers gave short presentations: firstly, presentations by Joost van der Burg, presenting HORTIN, and Arij Everaarts, who presented a joint presentation on all the protected cultivation projects.
Next were three persons who told about their business experiences in Indonesia: Mr André Smaal of AGRIOM, Mr. Kees Ammerlaan of Kees Ammerlaan BV, and Mr. Gérard Grubben, on behalf of ENZA seeds BV.
The series of presentations was concluded by two presentations of subsidy intermediates: Mr Ruud van Wensen of EVD and mrs Isje Mass, of INA (the Indonesian Netherlands Association).

About 400 invitations were direct-mailed to about as many companies. Only 15 private sector people attended. Despite this low turnout, the afternoon can be called successful. The representatives who did attend all stayed until the last minute, fervently discussing ideas and possibilities. We are still in discussion with some of them.

Amongst other attendants were the Chairman and Secretary of the HORTIN Programme Board, several representatives of Wageningen UR, and most project leaders were present. For many of whom this afternoon was useful as well.

*Figure 2. Mr Jusuf giving his opening speech.*


*Figure 3. Cover of brochure of the business meeting.*

## Cluster internationaal

The final programme management structure of Wageningen UR was finished with the creation of a 'Cluster Internationaal': a regrouping of all international projects under one leadership. This cluster manager will take over some of the programming, management and reporting tasks. HORTIN had a special position being a programme under a bilateral agreement and retained its management structure with its own Programme Board until 2005.

# Policy issues

HORTIN contributes to three important elements of Dutch foreign policy: promotion of trade, knowledge dissemination and institution building.

## Promotion of trade

Main aim of HORTIN is to assist Indonesian and Dutch companies in establishing working relationships. In this third year of the programme, this was done with several approaches.

Some projects started in HORTIN with good business contacts and contracts, but most projects were entirely new, with new subjects, new approaches and new institutional partners on both sides. At all occasions, during meetings in the Netherlands as well as in Indonesia, the programme management emphasises this issue and acts as an intermediate whenever possible. The success of making good business contacts is the responsibility of the individual project leaders, who with their counterparts give this high priority. This aspect of the programme proved more difficult than during the previous years, when during BIOBREES 1 and 2 many agribusiness projects could be initiated. Due to the global economic crisis, the political and economic instability of Indonesia, enhanced by repeated extremist violence, Dutch companies have now become very reluctant to invest in Indonesia, having more stable and advanced alternatives in the region.

In 2005 a special effort was made to encourage trade relations. On 21 June a business meeting ('bedrijvenmiddag') was organised.
This meeting was organised for Dutch businessmen to get acquainted with the possibilities of setting up businesses in Indonesia in the field of horticulture. The opening speech was presented by Mr Jusuf, Indonesian Ambassador to the Netherlands. He was accompanied by Mr Budi Perianto, Head of Economic Affairs. After that, a number of speakers gave short presentations: two presentations on the aims and results of HORTIN, three on business experiences in Indonesia, and two on subsidy possibilities by EVD and INA.
About 400 invitations were direct-mailed to about as many companies. Only 15 private sector people attended. Despite this low turnout, the meeting can be called successful. The company people who did attend all stayed until the last minute, fervently discussing ideas and possibilities. Discussions with some attendants are still on-going.

## Knowledge dissemination

This third year was the year of harvesting: all projects have obtained very interesting results. The enthusiasm with which the project leaders engaged into the new areas of research was mutually encouraging. All projects have organised one or more seminars or workshops in Indonesia this year, PROTFLOW even three. This was possible because many of the projects are obtaining results which are important for the farming community.
These meetings have two main objectives, first, to get the knowledge out to the target groups, and second, to get into contact with them in order to generate feedback and to jointly discuss possible future ventures. For this reason companies were always invited and have participated enthusiastically.
In all cases in which farmers are involved the presentations were given in or translated into Bahasa.
Several publications have been published or are in preparation. Plans have been discussed to prepare guidelines, books and websites in 2006.

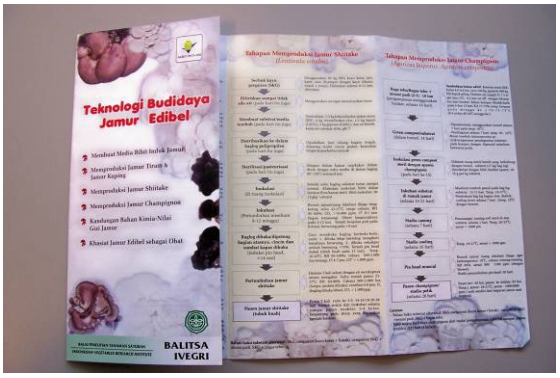


*Figure 4. New brochure of IVEGRI describing the cultivation steps of the most important mushroom species.*

## Institution building

Much attention was given to two aspects: staff training and upgrading of their research facilities.

*Scientific exchange*

A number of Indonesian staff visited the Netherlands as guest researcher.
During a two week period in November 2005 two members of the GENEBANK project team received training in the Netherlands on genebank management.
A member of the HAPLIN team visited Plant Research International for a half year training on haploid technologies.
An employee of the seed company PT Ewindo, responsible for seed health testing, received a two month training at Plant Research International. During her stay she was trained in different detection methods for isolation and characterisation of bacterial pathogens.
PROTVEG2 project staff supervised Mr Impron with the evaluation of his research data on greenhouse climate for his PhD.
Also much on-the-job training was done, supervised long-distance by correspondence and by regular visits by the Dutch project leaders. The QUALITY team organised a short audit training for project participants of IVEGRI, to enable them to supervise the GAP experiments, use the checklists and support the farmers.

Several Indonesian partners successfully applied for IAC-fellowships in 2006, but most regretfully the ministry of LNV cancelled the entire fellowship programme.

*Material issues*

Although HORTIN has not been designed to support the Indonesian institutes financially, in most projects money was transferred to lessen the most serious material constraints. This could be to organise workshops, to build experimental greenhouses, to pay for a survey, or to dig a well for irrigation. Without these interventions only a fraction of the results presented here would have been obtained.

# Results

Much progress has been made, which is presented in the individual project reports in the annex. The garlic project was stopped by the Dutch Programme Board per 1 April 2005, due to insufficient outlook on business opportunities. The other projects are running well. Below a short summary per project is given with the projects in alphabetical order.

## FRUITFLY

In 2005 experiments to control fruit flies were carried out in passion fruit orchards in West Sumatra and in a mango plantation in East Java. In passion fruit orchards of about 1.5 ha, 3 regimes were compared: 1. no control measures, 2. trapping of male fruit flies, 3. trapping combined with sanitation (removal of weeds and fallen fruits). Evaluation of trap catches and damage estimations of fruits were done regularly. It appeared that numbers of flies in traps and damage of fruits were highest in the orchards without control measures and lowest in the orchard where both trapping and sanitation were practised. In this orchard passion fruits of export quality are produced (export to Singapore) which results in 3-fold higher prices per fruit for the farmer. In December 2005 Ahsol Hasyim and Willem Jan de Kogel organised workshops and field excursions in both the passion fruit area and the mango plantation. Approximately 25 people attended each workshop.
At IFRURI in Solok the team of Ahsol Hasyim has started to study the behaviour of fruit flies in response to plant odours. This research is facilitated by PRI. The first interesting outcome of this research is the finding that certain plant extracts from wild plants collected in the passion fruit area attract fruit flies very efficiently. PRI has identified several compounds in these extract by GC-MS analyses.
These pure compounds will be evaluated at IFRURI for their attractiveness to fruit flies. In the long-term this may lead to new more-effective attractants than the present ones.

Genderang Perang untuk
Bactocera papayae *Ditabuh*

*Mulai mengancam*

*Figure 5. One of two articles on fruit flies in a journal for professionals ('Trubus').*

Involvement of the private sector: cooperation with Australian research team on poisonous protein baits, made from waste material from breweries was hampered by a negative travel advice for Australian citizens to Indonesia. Discussions with Agrisense and Certis, producers of attractants and (bio) control agents, indicated that they were not interested in starting business in Indonesia.

Highlights: **Results of the trials in passion fruit are good; combination of trapping and sanitation results in export quality fruits. This farmer received a price for best farming practice! Two plant extracts were found that were more effective than the commercial attractant.**

## GARLIC

The report on the biodiversity of garlic accessions was finished. Garlic accessions were compared on the basis of AFLP patterns to construct phylogenetic relationships between garlic and their wild relatives in the subgenus *Allium*. Three primer enzyme combinations were used to obtain 609 AFLP markers. Close relationships were found between *A. sativum* and some wild *Allium* species. Some of these wild species may be of interest for garlic breeders to improve the crop for certain important traits.
In addition a number of 20 garlic accessions were planted in soils with and without arbuscular mycorrhizal fungi to examine the effect of these fungi on the yield of garlic accessions. Unfortunately, the project was discontinued by the Dutch Programme Board. Other financial sources allowed us to continue this study however, and large differences were found in response to the application of mycorrhizal fungi. This may certainly be of interest to Indonesian farmers who have to compete with garlic imported from China, but it needs further study.
Highlight: **Identification of wild *Allium* relatives closely related to garlic and identification of large variation in response to arbuscular mycorrhizal fungi between garlic clones.**

## GENEBANK

Aim of this project is to assist IOCRI with the development of a management system for the genetic resources collection of tropical ornamentals. During the third year of the project considerable progress was made in characterisation and acquisition of new collection material at IOCRI. More than 150 accessions of orchids were characterised in 2005 on the basis of a descriptor list developed in 2004. The IOCRI orchid collection which predominantly consists of species from the genera *Dendrobium, Vanda* and *Phalaenopsis*, was enlarged by 71 accessions during this period. The orchids were obtained from breeders & growers who had collected the material previously at different locations in Indonesia (Java: Malang, Surabaya, Jakarta, Lembang, Sumatra: Bangka-Balitung). The IOCRI Araceae collection (*Aglaonema* and *Philodendron*) was enlarged by ten accessions of *Aglaonema* and seven *Philodendrons* and characterised using the IOCRI descriptor list.
Based on discussions in the second project year the IOCRI genebank database was restructured into a more flexible database. The improved database is based on the Systems Development Life Cycle (SDLC) using waterfall models and three issues have been addressed this period in order to implement such a system at IOCRI, namely: (1)

*Figure 6. Ten new Aglaonemas have been described and added to the IOCRI collection.*

Planning (interview with users, identification the problems and opportunities, budget & resources, scope of information, information needs)_, (2) Analysis (system work flow, identification of the type of data; standardisation

data for decode table, decide the user privileges), and (3) Design (database, process data flow, system (input screen layout, output and reports screen layout)).
Knowledge transfer was intensive, through training of two staff members of IOCRI in the Netherlands for a two week period and a working visit of one week by the Dutch project leader in Segunung, which involved also a workshop on genetic resource management.
Involvement of the private sector: Not applicable for this project.
Highlight: **Improved tropical ornamental collection via characterisation and acquisition and development of tailor-made database system**

## HAPLIN

The introduction of haploid plant production technologies is necessary to raise the level of the breeding programs in Indonesia. Procedures for cabbages and hot pepper do exist already elsewhere, but they have to be adapted to Indonesian accessions and conditions. A second topic in the project is to develop a protocol for the production of haploid plants in *Anthurium* in order to establish a more sophisticated cultivation system in the crop, giving new economic potential for both Dutch and Indonesian enterprises.
The year 2005 was a very fruitful one in HAPLIN. Together with Ir. Budi Winarto, guest-worker from IOCRI awarded with an IAC-fellowship for six months, we were able to demonstrate that common *Brassica* microspore culture procedures also worked well in Indonesian cabbage types. Different plants gave different yields of haploid embryos in culture, but this was due to the fact that donor-plants had been raised from a landrace. Ir Winarto practised also the shed-microspore culture protocol with hot pepper, and produced the haploid plants. Finally, he was returning home as a well-trained person in microspore culture of the two crops and would be charged with assisting IVEGRI in implementing the technology at Lembang. IVEGRI, however, had not finished the fitting up of the microspore culture laboratory, so implementation had to wait. Also good progress was made with *Anthurium*; the first haploid plants were produced using an adapted anther culture procedure. Also this success was owed to a considerable extent to Ir. Winarto.

*Figure 7. DAPI examination of cultures during the practical course on microspore culture at BB-Biogen.*

A workshop and a practical course on microspore culture were organised at the Research Institute for Agricultural Biotechnology and Genetic Resources (BB-Biogen), Bogor, with participants from IOCRI, IVEGRI, the Indonesian Tropical Fruit Research Institute, and the host institute. All these institutes are belonging to IAARD but cooperation is limited; our workshop was memorised as their first official joint collaboration, for which a special agreement was signed to allow this activity to be held. Part of the practical course was a try-out of the haploid production procedures for hot pepper and cabbage. Fortunately, all requisites were available and the protocols could be

conducted properly, demonstrating that haploid technology is practicable in labs in Indonesia. Problem however was the high frequency of contaminated cultures, and much attention was therefore paid to how to grow healthy plants under tropical conditions.
Involvement of the private sector: contra-financing from the SenterNovem 'InDuAnthurium' project was continued in 2005, demonstrating the interest from the private sector. A Dutch breeding company is interested to use the procedure of haploid production in hot pepper and is considering collaboration with Saung Mirwan for exploitation on the Indonesian market.
Highlight: **First haploid plants were produced in Anthurium, and it seems that the problems with endogenous bacteria are to overcome!**

## MUSHROOM

Aim of the project is to introduce mushroom research into Indonesia. IVEGRI intends to establish a centre for mushroom research and the project supports this by providing training, introduction of methods for collecting, characterization and storage of cultures, and by performing collaborate research on spawn production, development of growing media etc.
Dr Etty Sumiati, the Indonesian project leader, has visited several farms, companies and research institutes to give advice, gather information and collect commercial mushroom strains. Including strains obtained from the PPO collection, the IVEGRI collection has expanded in 2005 with 52 strains.

*Figure 8. Site visit with MUSHROOM team.*

Strains of shiitake and oyster mushrooms have been tested at IVEGRI for yield and data will become available in 2006. Seven different raw materials have been tested for their suitability to prepare spawn (the inoculum for mushroom substrate). The best ingredients were bagasse and nitrogen rich additives.
The Dutch project leader visited Indonesia from 30 April to 4 May. A number of farms/companies were visited throughout Java and Bali in order to promote the research group of IVEGRI. Two large button mushroom companies were identified that showed interest in participating in a project to use bagasse as mushroom substrate in a new processing system. The Dutch company Christiaens Group is still interested in getting a project funded to develop this new substrate processing procedure.
Ca. 250 oyster mushroom strains from the PPO collection have been genotyped on species level. Strains of one of the species, i.e. *Pleurotus ostreatus* (common oyster mushroom), have been genotyped on strain level and a selection of 40 genetically different strains were selected to be tested for production. Two parallel growing rooms were used to test the fruit body production at 16 and 22 °C, respectively. Strains were identified that show a good

production at 22 °C and are thus suitable for Indonesian climate conditions. These strains will be sent to IVEGRI in 2006.
Involvement of the private sector: No companies were involved in the project this year. Several Indonesian companies have shown interest in using bagasse as substrate.
Highlight: **A number of superior oyster mushroom strains were identified and will be available for IVEGRI and thus the Indonesian mushroom farmers.**

## PROTFLOW

The project aims at developing improved low-cost greenhouses for commercial flower production at mid and high elevation. This year an experiment was carried out with chrysanthemum to determine the optimum rooting conditions under Indonesian circumstances. Four different rooting media were studied: arang secam, coco peat, vermiculite, and perlite+vermiculite, two EC levels of fertiliser, and 4 frequencies of watering were applied. The effect on the development of the cuttings was measured. It appeared that the highest cutting weight is found in burned rice husk ('arang secam'), coco peat and vermiculite by an EC of 1.5 mS $cm^{-1}$. Using arang secam the highest weight is found with watering every 3 days; with the other media this is the case with water every 4 days.

*Figure 9. The HORTIN-type house with top ventilation.*

A second experiment was done in the bamboo and the Malaysia type house. Treatments differed in frequency of watering, frequency of leaf removal (against Japanese white rust) and type of greenhouse. The resulting levels of production and product quality were compared. The water moisture availability was measured with tensiometers. From this experiment it appeared that the stems in the bamboo house were shorter than the stems in the Malaysia type house. The branches in the Malaysia type house however, were heavier. The heaviest and the best quality of the chrysanthemum stems came from the Malaysia type house with a watering frequency of four times per week. No differences in the occurrence of Japanese white rust were found between the houses nor the leaf removal strategies. In both houses yields were lowered by the leaf removal practice.

Measuring the radiation inside both houses showed that the Malaysia type house has 21 % more light available. The mean maximum temperature during the chrysanthemum cultivation was 29.6°C in the bamboo house and 30.2°C in the Malaysia type house. The mean minimum temperatures were 16.4°C and 17.2°C respectively. The tensiometer measurements showed that the soil in the Malaysia type house was drier than in the bamboo house. This is caused by the difference in radiation inside the houses.
Based on our experiences, a third plastic house in Malaysian style was built, but now with ventilation in the roof. This plastic house, the HORTIN type house, was constructed by a local contractor in August.

Involvement of the private sector: In 2005 the area manager of Fides-FGB visited Indonesia. In April different chrysanthemum nurseries were visited with the project leaders of PROTFLOW. The area manager showed on a workshop a film of the Fides company and discussed with the participants about the royalty costs and the advice from Fides to the customer-growers. A meeting was organised between the area manager of Fides-FGB, the project leaders of PROTFLOW and the centre for Plant Variety Protection in Jakarta. At short notice Fides will only undertake limited activities in Indonesia. Contracts will be concluded with two large chrysanthemum nurseries.
Three workshops were given at IOCRI in Segunung, one in April and two in September. In April 72 participants were present (chrysanthemum growers and advisers). The first workshop in September was held in Segunung and attended by 24 advisers; the second workshop was in Cipanas and was attended by 49 chrysanthemum growers and advisers.
Highlight: **Very successful workshops, interesting experiments, and a new improved type of greenhouse that is now locally available.**

## PROTVEG1

The project aims at developing an improved low-cost greenhouse for commercial vegetable production at mid- and high elevation. Two types of greenhouses were built at IVEGRI in Lembang: a local bamboo and a wooden house of the 'Malaysian type'.
During the first experiment in 2004 problems arose with the water supply. The water proved to be contaminated with bacteria and fungal spores and this resulted in the loss of a lot of plants caused by bacterial wilt. Since then a well was drilled and from May 2005 fresh, clean water became available for the experiments.

*Figure 10. An exception: sweet peppers in protective containers ready for dispatch.*

The aim of the experiments in 2005 was threefold. In the first place experiments were carried out in the two plastic houses to establish production levels per greenhouse. Secondly, stem density was investigated and in the third place the effect of different plant treatments was studied.
Results showed that the production level in the Malaysian type plastic house was about 10 % higher compared to the bamboo house, just like in 2004. From the experiment it became evident that production per $m^2$ with 8.3 stems per $m^2$ was one kg higher compared to the density of 6.7 stems per $m^2$. Finally plant treatment also had a large effect on yield, especially on grading size. Traditionally every at the third node all fruits are removed, while at the other nodes all fruits are kept. Fruits are only removed when at an early stage the farmer sees that a fruit is damaged.

With the alternative plant treatment, on the first three nodes only one fruit was kept and the rest is removed in order to give the plant more vegetative growth at the start. Later on only one fruit per node was kept.
The main conclusion is that with the implementation of new production methods yields can increase with three kg per $m^2$. At the end of the year the observations were not yet completely finished.
These results were presented to the farmers at a workshop which was held on December 7, 2005. During the workshop also two farms were visited. About 50 farmers attended.
In 2005, eight different varieties were planted as a demonstration trial inside the two plastic houses.
As in PROTFLOW, a third plastic house was built in the last quarter of 2005. This HORTIN-type plastic house is a modified Malaysian plastic house in which top ventilation is present.
Involvement of the private sector: Two companies in Indonesia, East West Seeds Indonesia (EWINDO) and CV Tirta Agri Kencana (TAK), are much interested in the plastic houses and experiments and proposed co-operation. R. Rodenburg (EWINDO) and Pak Andi Batto Pabekka (TAK) together visit IVEGRI biweekly and offer advice and guidance to the project. Both companies actively took part in the workshop.
For the variety demonstration trial De Ruiter Seeds, Bruinsma Seeds and Rijk Zwaan Seeds donated seeds.
Highlight: **Production of sweet pepper in the newly introduced Malaysian type greenhouse, in combination with new cultivation techniques, resulted in a substantial yield increase. Preliminary calculations show that revenues per square meter increase with the new methods.**

## PROTVEG2

This project aims at stimulating the development of a greenhouse system with natural ventilation especially adapted to the tropical lowland and with protection against pests. Major technological problems to solve are to avoid high temperature caused by intensive radiation, to save water and to allow integrated pest management. The development of an integrated design is crucial to enhance the opportunities in the production of good quality products with rational use of inputs.

*Figure 11. Tomatoes covered with pesticides.*

In 2005 two experiments were conducted:
An evaluation of the potency of *Verticilium* sp. and *Menochilus sexmaculatus* for controlling *Thrips parvispinus* on sweet pepper, and the determination of control thresholds of *Thrips parvispinus* on sweet pepper.
Spraying on the basis of control thresholds resulted in a considerable decrease in the number of insecticide applications in comparison with calendar spraying. The biological treatments were effective and sufficiently reduced insect densities while maintaining yield levels. The experiments will be repeated in 2006, in a period when insect pressures are higher.

At the end of 2005 the Indonesian PhD student Impron came to Wageningen to further analyse data on greenhouse climate and tomato growth that had been gathered from experiments performed at EWINDO. The thesis will evaluate various greenhouse designs in terms of climate and consequences for crop growth and production, and will result in recommendations for optimum combinations of greenhouse design and cultivation methods for the lowland tropics.
The 2-day multi-stakeholder workshop on integrated crop management (scientists, extension workers, farmers, pesticide companies, 50 participants in total) resulted in an overall picture of current pesticide policy and identification of factors that influence pesticide use. The agro certification system in Indonesia (Prima-2 and Prima-3 certificate) was another important topic presented by SISAKTI during this workshop. In this manner integrated crop management was linked to food safety and food quality. It is concluded that this participatory approach did not only assist in linking production practices which are required for sustainable production, but also helped the farmers prioritising their activities. Through discussion and debate the farmers decided to start a new producer group focusing on Integrated Pest Management.
Involvement of the private sector: We agreed with EWINDO that where possible they give advice to the PROTVEG2 team in the experiments that are planned in 2006. Also we continue discussions with several parties on future cooperation.
Highlight: **Workshop on integrated crop and pest management with 40 farmers and other stakeholders in the vegetable production chain.**

## QUALITY

The project aims at developing and testing a certifiable protocol for the safe production and product quality of vegetables in Indonesia. In 2004 a Good Agricultural Practice was developed based at an HACCP-analysis, interviews and discussions with chain partners. Goal in 2005 was to test this GAP in practice. For this a kick-off meeting, a test in practice and an evaluation meeting were organised. The test took place from May to October. During these six months farmers worked with checklist and registration forms. The IVEGRI project members were acting as auditors.

*Figure 12. Personal hygiene measures as a base for food safety in the proces of packing.*

They audited the farmers three times and they learned a lot on the bottlenecks and opportunities the HORTIN-GAP checklist and forms gave to the farmers. Besides the HORTIN-GAP, an analysis of pesticide residues on the crop was organised.

Evaluation took place in November 2005 based on discussions with the project team, group discussions with the participants and with two representatives of supermarkets. The discussion was focused at questions worked out in the monitoring & evaluation plan. The general impression was very positive. All farmers completed the test and they were proud to join it. Checklist and forms are well suited for their purpose, except for a few possible improvements. Participants made recommendations to the Indonesian government to speed up the implementation of the national certification programme and to improve regulation and communication on pesticide registration and labelling.
A message for growers and chain organizations was: development of Good Agricultural Practices must go hand in hand with improvement of product quality to get access to markets with higher price level.
Involvement of the private sector
Indonesian growers, traders and supermarkets are directly involved in the project.
During the test, two Indonesian trade / processing companies were involved: Bimandiri and Edik. The companies deliver vegetables to supermarkets. The companies were important for the recruitment of farmers for the test and to discuss the results. Two supermarkets in Bandung were visited (Carrefour and Hero) to discuss GAP, tracking and tracing, product quality and Indonesian versus international standards. The vegetable managers were involved during the evaluation meeting in Lembang. APR supported IVEGRI in working out a project proposal for the Horticultural Partnership Programme (HPSP). During a meeting in Ciwidey of partners of this project (farmers, Al Itifaq, Hero, IVEGRI), APR presented a lecture. The project is focussed at delivering vegetables (carrots) of good quality to Hero. Al Itifaq is very interested in HORTIN-GAP and can be a partner in a follow up.
Highlight: **GAP auditors trained and all partner-farmers completed the GAP test successfully.**

## SEEDS

Aim of this project is to provide a basis for managing the most important seed-borne diseases of vegetables (tomato, pepper, and shallot) in Indonesia. A second survey of the presence of seed-borne diseases of tomato, hot pepper and shallot was conducted on Central and East Java by observing field crops on 15 locations and by analysing 20 to 29 seed samples per crop, either directly or after growing plants from seed. In tomato and hot pepper, *Alternaria solani* and mosaic viruses were identified as the major seed-borne pathogens. In shallot, *Fusarium oxysporum, Alternaria porri* and two viral diseases (OYDV and SYSV) were found as major seed-borne pathogens.

*Figure 13. Bacterial spot (Xanthomonas campestris pv. vesicatoria) on tomato.*

Six more drafts information leaflets have been prepared for: *Fusarium oxysporum* (basal rot), *Alternaria porri* (purple blotch), *Erwinia* soft rot, *Botrytis* neck rot in *Allium*, *Xanthomonas campestris* pv. *vesicatoria* (bacterial spot) on pepper and tomato, and *Colletotrichum* (anthracnose) on pepper. The leaflets will be used for the preparation of information books on diseases in tomato, hot pepper and shallot.

Different seed treatments were evaluated to eradicate bacteria, fungi and viruses in tomato and pepper seed. Also methods for detection of TMV and *Colletotrichum* in hot pepper seed, and *Alternaria solani* in tomato seed have been evaluated.
The 2nd HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia was held in Lembang from 5-9 September 2005. In the first day seminars were held on phytosanitary regulations in Indonesia, on aspects of sustainable vegetable seed production and strategies for seed-borne diseases on vegetables. The seminars were attended by 46 participants. The second and third day existed of a practical course, in which 11 participants from different seed testing laboratories were trained in internationally accepted standard procedures.
Ir. N. Vajrina, seed health manager at EWINDO, received a STUNED scholarship for a two month training period from 16 March to 15 May in the Netherlands. She was trained in seed health testing procedures at PRI.
Involvement of the private sector: During the workshop, seed specialists from PT Selektani and EWINDO were trained. EWINDO has provided seed samples and information on the occurrence of seed-borne diseases. Mrs Nur Vajrina of PT Ewindo has been trained for a period of 2 months within PRI on detection and identification of seed-borne pathogens.
Highlight: **Improved seed treatments to eradicate seed-borne pathogens of tomato and pepper seed were described**

For more detailed project information, please refer to the annexes.

# Communication

It is important to reach the final target groups, like farmers, researchers, businessmen, and policy makers. Apart from the issues mentioned under Knowledge dissemination (workshops, staff exchange), a number of activities was initiated to increase the 'visibility' of the programme.
As has been mentioned, a Business meeting was organised in June.

The Kennisonline website, especially targeted to officials of the Dutch Ministry LNV, was kept updated with new reports and other electronic output. The website was renewed, is currently being filled, and HORTIN's new URL is :http://www.kennisonline.wur.nl/BO/BO-10/424/beschrijving .htm.
A contribution was made to the journal 'Made in Holland', a publication of the EVD (Agency for International Business and Cooperation), part of the Ministry of Economic affairs. The issue of the magazine was a special on Dutch education and research. In the wider context of WUR (Wageningen University and Research Centre) one page was devoted to the goals of HORTIN (see illustration).


Exchanging practical horticultural knowledge

HORTIN – *Horticultural Research Cooperation between Indonesia and the Netherlands* – is a programme in which three institutes affiliated to the Indonesian Centre for Horticultural Research and Development are working together with Wageningen UR. The programme has a mainly practical objective. Joost van der Burg, the programme leader at Plant Research International (Wageningen UR): 'The purpose of HORTIN is to stimulate development in Indonesia by generating and disseminating knowledge through research which is carried out by public-private partnerships. The results of HORTIN are ultimately intended to facilitate B-to-B relations.' HORTIN will run until 2008 and encompasses ten separate projects. The subjects include fruit fly control, improving mushroom production in Indonesia, the sustainable cultivation of flowers and vegetables in plastic greenhouses that have been adapted to local conditions and plant disease management. Van der Burg: 'By contrast with the 1970s, programmes like HORTIN really are bilateral. It is a collaborative programme, not a development programme. Indonesia profits from our knowledge about modern production systems, while the Dutch research institutes gain experience in applying their knowledge to other crops and under different conditions. After all, what do we in the Netherlands know about growing oranges or tea?'

*Figure 14. Article in 'Made in Holland'.*

The Indonesian partners also published in Indonesian journals for professionals (FRUITFLY), a brochure was made for the information of farmers on how to cultivate mushrooms (MUSHROOM), and scientific publications in Bahasa were prepared (FRUITFLY).
The Indonesian HORTIN project leaders also presented their work at the annual Expo Hortikultura Indonesia in Batu (East Java), where Mrs Dr Sumiati gave a course on mushroom growing for a large audience.

Communication with the Programme Board is relatively intense: every quarter a progress report is produced. Other relevant reports of potential interest to the board members are supplied as well. The programme management meets with the Board twice a year. The spring meeting is organised to discuss the outcome of the previous year for which an internal annual report is being produced. After comments this report is made final and a reader-friendly version is being produced for external relations. This last one is printed and provided with a coloured cover. The fall meetings are designed to discuss the proposed work plan for the next year. After amendments based on comments by the Board, the work plan is submitted to the Ministry for approval. By mid December the Ministry usually announces its decision.

# Constraints

The main constraints, *viz.* mobility and equipment, have been brought under the attention of the Working Party on Agriculture last year. We noticed with satisfaction that efforts have been made to alleviate these problems.
Also this year, the mobility of Indonesian researchers could be increased due to serious efforts on both sides. We are glad that we could welcome quite a number of the trainees from Indonesia.

Some essential equipment is still missing in Indonesia that is essential for the application of new technologies such as haploid methods and mushroom culture. The budget is the main constraint and again a lot of effort has been made to free funds from the Dutch budget. We trust this, in combination with the extra efforts done by Indonesia, will result in adequately-equipped laboratories.

# Economic, social and environmental considerations

The Netherlands is a member of the Organisation for Economic Co-operation and Development (OECD). The OECD has guidelines for multinational enterprises, regarding for instance labour, environment and human rights. The HORTIN programme, carried out under the responsibility of the Dutch Ministry of Agriculture, Nature and Food Quality, aims to operate according to the General Policies of the OECD guidelines.
HORTIN tries to contribute to economic, social and environmental progress by developing sustainable horticulture. The development of protected vegetable cultivation serves the purpose of more continuity in production throughout the year, resulting in a more evenly spread labour demand and higher farmer's income. Biological control of insects aims to reduce pesticide use, contributing to environmental protection. Science and technology development takes place in a way that addresses local market needs. Local capacity building is encouraged by transfer of knowledge and training. Transparency in financial matters and organisational principles has been encouraged and documented. Information on the programme is regularly updated and readily accessible. Awareness of and adhering to the general principles of the Guidelines will be promoted within the programme.

# Conclusion

HORTIN has started up innovative and applicable research in a strong partnership. Many projects are yielding important results, much more is to come if permitted to continue with a follow-up phase. Introduction of new breeding and seed technologies, improved technologies for protected cultivation, creating a scientific basis for mushroom culture, creating a framework for on-farm quality management, etc are examples of this.
The Indonesian institutes have benefited greatly from the international exposure, the updated knowledge, the interaction with the private sector, and the development of skills of how to focus research on market requirements.

*Acronyms and abbreviations*

| English acronym | Indonesian acronym | Full English name |
|---|---|---|
| ACIAR | | Australian Centre for International Agricultural Research |
| AIAT | BPTP | Assessment Institute for Agricultural Technology |
| APR | | Applied Plant Research (PPO, the Netherlands) |
| B2B | | Business-to-Business |
| RIABGR | BB-Biogen, Balitbiogen | Research Institute for Agricultural Biotechnology and Genetic Resources |
| BC | | HORTIN Programme Board, Netherlands |
| CGN | | Centre for Genetic Resources, Netherlands |
| CISTROPHRES | Lolittan Jehortis | Citrus & Subtropical Horticultural Crops Research Station |
| CSA | | Centre for Standardisation and Accreditation in Indonesia |
| DINAS | Dinas Pertanian | Extension Service |
| DK | | Department of Knowledge (of Dutch MoA) |
| Ewindo | Ewindo | PT East West Seed Company, Indonesia |
| GAP | | Good Agricultural Practice |
| HACCP | | Hazard Analysis Critical Control Points |
| HPSP | | Horticultural Partnership Support Programme |
| IAARD (formerly AARD) | (Badan) 'Litbang' | Indonesian Agency for Agricultural Research and Development |
| IAC | | International Agricultural Centre |
| ICHORD (formerly CRIH) | 'Pushor' | Indonesian Center for Horticultural Research and Development |
| IFRURI (formerly RIF) | Balitbu | Indonesian Fruit Research Institute |
| INA | INA | Indonesia-Netherlands Association |
| IOCRI (formerly RIOP, IOPRI) | Balithi | Indonesian Ornamental Plants Research Institute |
| IPB | Institut Pertanian, Bogor | Agricultural University, Bogor |
| IPM | | Integrated Pest Management |
| ISOM | | Subsidy regulation for International Business Collaboration (SenterNovem) |
| IVEGRI (formerly RIV, Lehri) | Balitsa | Indonesian Vegetable Research Institute |
| NAP funds | | Non-allocated funds (LNV Netherlands) |
| PGR | | Plant genetic resources |
| PRI | | Plant Research International |
| PSOM | | Subsidy regulation for International Investment (SenterNovem) |
| SenterNovem | | Subsidy Agency of the Dutch Ministry of Economic Affairs |
| WGA | | Working Group on Agriculture ('Landbouwwerkgroep') |
| WUR | | Wageningen University and Research Institute |

# Horticultural research cooperation between Indonesia and the Netherlands (HORTIN)

## 1. Project title

: Fruit fly control in Indonesia
**FRUITFLY**

## 2. Project number

: PRI 7400020500

## 3. Project leaders

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## 5. Participating organisations

- Plant Research International, Wageningen, the Netherlands.
- Indonesian Fruit Research Institute, Solok, Indonesia.

## 6. Objectives

*Long-term objectives*

One of the constraints in fruit farming in Indonesia is the decrease of fruit quality and quantity as a result of attack by fruit flies. The FRUITFLY project has the objective to develop and implement trapping devices to control fruit flies. These traps are based on attractants that are strongly attractive for male fruit flies. By mass trapping of the male flies the population growth of the fruit flies can be strongly reduced. This technique is referred to as male annihilation. Aim is to develop this control method in the Indonesian situation, leading to increased yield and (export) quality of the fruits and thus a better income for the farmers. Secondly the use of traps and lures will contribute to a reduction in the use of pesticides.

*Short-term objectives*

In order to achieve the long-term objectives the project will initially focus on the following aspects:

- Identify the problem: what are the most important fruit fly species in which crops?
- Identify effective attractants and bioactive compounds.
- Compare different trap types and optimize trap position and amount of lure.
- Show on commercial scale the effect of the control measures

# 7. Results

## 7.1. Output and impact

Following activities were planned for 2005:

1. Field trials with fruitfly trapping systems at selected locations during the whole year. Monitoring trap catches and fruit damage/yield. This is a proof of concept trial at a scale of about 5 ha.

2. Evaluation (Literature study) on other control measures to be integrated with the trapping system (e.g. protein baits, removing damaged fruits).

Activity 1: Field trials were conducted in passion fruit on West Sumatra. Numbers of fruitflies and quality of fruits were assessed in control orchards, orchards treated with fruitfly traps and orchards treated with fruitfly traps and sanitation (removal of fallen fruits and weeds). The preliminary results show that damage in control orchards is about 60%, in fruitfly trap treated orchards about 40% and in the orchard where also sanitation is practiced 20%. The farmer that practices sanitation produces export quality (to Singapore) and won a price from Jakarta for best farmer!

*Figure 15. Demonstration of a fruitfly trap by Ahsol Hasyim in a passionfruit orchard in West Sumatra.*

These trials are being continued in 2006.
A second field scale experiment has been started in a 15 ha mango plantation in East Java. The measures that are practiced here are fruitfly traps and wrapping of fruits.
Activity 2: Two other methods than trapping are being used in the field scale experiments: sanitation and wrapping of fruits (mango). A third option is a lure&kill system based on protein baits that are attractive for female flies. This option is under discussion with Australian researchers who have experience with this technique. Planning was to meet these people in November 2005 in Indonesia but Australian citizens were given a negative travel advice from their government and therefore didn't visit Indonesia.
Activity 3: Testing of the attractiveness for fruitflies of several plant extracts. Two plant extracts were found that were more attractive in field experiments than the commercial attractant. The extracts were analyzed with GC-MS at PRI to identify which chemical compounds were present. The result has been reported to IFRURI.

## 7.2. Training, technology transfer and knowledge exchange

Three activities were planned for 2005:

1. Training course on fruitfly identification for scientists from IFRURI. It is our intention to arrange this course with an Australian fruitfly expert.
2. November/December: workshop/farmer-field school to transfer experience of field trials to farmers
3. November/December: visit of De Kogel to Indonesia for evaluating 2005 and planning 2006

Activity 1: This was not carried out. In previous communications with the Australians it was agreed that people from IFRURI could join the workshops they would organize in Jakarta. However, because of a negative travel advice for Indonesia from the Australian government, these courses were not given.
Activity 2: Two workshops with farmers were held. The first was in East Java with 25 participants from local mango orchards. The second was held in West Sumatra with 25 passion fruit growers. Both workshops included lectures, demonstrations and field excursion.
Activity 3: In November De Kogel visited IFRURI. The first results of the field trials were discussed as well as the wish of IFRURI to get assistance to set up chemical ecology facilities. It was agreed that next year De Kogel will give some lectures on this topic at IFRURI and that PRI will perform chemical analyses of plant extracts and assist with setting up facilities and providing IFRURI with chemical reference compounds.

## 7.3. Involvement of companies

I have discussed the possibilities for the participation in the project of Certis Europe and the GB-based company Agrisense. They were very reluctant to expand their activities in Indonesia.

## 7.4. Reports and publications

- Muryati & Ahsol Hasyim. 2005. Sebaran Spesies lalat buah di Indonesia.
- Ahsol Hasyim, Muryati & Willem Jan de Kogel. 2005. 6 Pilihan Kendalikan Lalat Buah. Trubus 425-April 2005/XXXVI, pp. 94.
- Ahsol Hasyim, Edison H.S., Agus Sutanto & Muryati. 2005. Genderang Perang untuk Bactocera papayae Ditabuh. Trubus 426 Mei 2005/XXXVI pp. 36.
- Muryati, Ahsol Hasyim & Willem Jan de Kogel. Distribusi species lalat buah di sumatera barat dan Riau, submitted
- Ahsol Hasyim, Muryati & Willem Jan de Kogel. Efektivitas model dan ketinggian perangkap dalam menangkap hama lalat buah jantan, Bactrocera spp., submitted

*Figure 16. Workshop in West Sumatra on fruitfly control.*

### 7.5. Presentations

- Fruitfly control in Indonesia. Poster presentation by WJ de Kogel & Ahsol Hasyim at Business meeting at PPO-AGV, Lelystad on June 21.
- Fruitfly control 2005. Presentation by WJ de Kogel & Ahsol Hasyim at East Java.

## 8. Available information

- Fruitfly control 2005. Presentation by WJ de Kogel & Ahsol Hasyim at East Java.

# Horticultural research cooperation between Indonesia and the Netherlands (HORTIN)

## 1. Project title

: Revitalising Indonesian garlic agriculture
**GARLIC**

## 2. Project number

: PRI 7600016400

## 3. Project leaders

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## 5. Participating organisations

- Plant Research International, Wageningen, the Netherlands
- Citrus and Subtropical Horticulture Research Station, Batu, Indonesia
- Indonesian Vegetable Research Institute, Lembang, Indonesia

## 6. Objectives

*Long-term objectives*

The project will contribute to:
The revitalisation of the Indonesian garlic agriculture by means of socio-economical and agronomical methods.

*Short project description*

The market in Indonesia for indigenous garlic has drastically decreased in the last decade due to large garlic imports from China. Currently it is hard to find large garlic cultivation areas in Java, the former centre of production in Indonesia. At the moment the indigenous Indonesian garlic production can only be found in more remote places on the Indonesian archipelago (for example on Lombok). If no counter measures are taken the indigenous Indonesian garlic will become extinct soon. To contribute to the revitalisation of the Indonesian garlic agriculture, the project focuses on socio-economic and agronomic/breeding topics. This involves increase of knowledge in the area of garlic strains which can be used for a better garlic cultivation in Indonesia, the application of mycorrhizal fungi in garlic cultivation, the application of meristem culture in garlic cultivation and the garlic statistics (hectares planted, production values, etc.).

# 7. Results

## 7.1. Output and impact

The following activities were planned to be carried out in 2005:

1. Research on mycorrhizal fungi to improve the garlic yield by CISTROPHRES and PRI.
2. Updating and maintenance of a garlic economic data base by IVEGRI.
3. Study on the effect of meristem culture on garlic yield CISTROPHRES and PRI.
4. Writing a paper on the construction of a tropical garlic core collection by CISTROPHRES and PRI.
5. Training on the use of mycorrhizal fungi for garlic cultivation by CISTROPHRES and PRI.

The project was halted by 1 April 2005, but the following could be realised:

While working on the construction of a tropical garlic core collection, we continued a study on the biodiversity of garlic accessions was finished. Garlic accessions were compared on the basis of AFLP patterns to construct phylogenetic relationships between garlic and their wild relatives in the subgenus *Allium*. Three primer enzyme combinations were used to obtain 609 AFLP markers. Close relationships were found between *A. sativum* and some wild *Allium* species. Some of these wild species may be of interest for garlic breeders to improve the crop for certain important traits. Unfortunately, we were unable to finish the paper before April 1, 2005.

In addition a number of 20 garlic accessions were planted in soils with and without arbuscular mycorrhizal fungi to examine the effect of these fungi on the yield of garlic accessions. Unfortunately, we were not allowed to continue this work in the framework of the HORTIN programme. Fortunately, other financial sources allowed us to continue this study. We found large differences in response to the application of mycorrhizal fungi. This may certainly be of interest to Indonesian farmers who have to compete with garlic imported from China, but it needs further study.

## 7.2. Training, technology transfer and knowledge exchange

Training activities were planned for the period of April– August and had to be cancelled.

## 7.3. Involvement of companies

Involvement of companies was planned to take place in May and had to be cancelled.

## 7.4. Reports and publications

Results of the analysis of the garlic core collection are currently being used for the writing of a paper.

## 7.5. Presentations

A presentation on prospects of the Hortin Garlic project was given for the Committee.

# 8. Available information

The powerpoint presentation is available.

# Horticultural research cooperation between Indonesia and the Netherlands (HORTIN)

**1. Project title** : Management of field collection of tropical ornamentals
**GENEBANK**

**2. Project number** : PRI 7500004500

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## 5. Participating organisations

- Centre for Genetic Resources, Wageningen, the Netherlands.
- Indonesian Ornamental Crop Research Institute, Segunung, Indonesia.

## 6. Objectives

The overall objective is to optimise the conservation of the collections of tropical ornamentals of IOCRI by conducting the following activities:

- To improve collection management, a range of activities with the final goal to optimise the conservation and utilisation of the material (e.g. inventory of existing collections, acquisition of new sources, optimal maintenance of accessions, established methods to characterise and/or evaluate the material and conservation techniques).
- Documentation of the available information to improve utilisation of the collection. Standardisation of descriptors needs to be realised. It also may need to be investigated what type of data base information system is required for the available data (passport, characterisation/evaluation and storage data).
- Contribution in the training of young scientists of IOCRI in the field of PGR (Plant Genetic Resources).

# 7. Results

## 7.1. Output and impact

*Output*

For the third project year the following highlights are presented:

- More than 150 accessions of orchids were characterized in 2005 on the basis of a descriptor list for orchids developed in 2004 during this project.
- The IOCRI orchid collection which consists predominantly of species from the genera *Dendrobium, Vanda* and *Phalaenopsis*, was enlarged by 71 accessions. The orchids were obtained from breeders and growers who had collected the material previously at different locations in Indonesia (Java: Malang, Surabaya, Jakarta, Lembang, Sumatra: Bangka-Balitung).
- The IOCRI Araceae collection (*Aglaonema* and *Philodendron*) was enlarged by ten accessions of *Aglaonema* and seven Philodendrons and characterized using the IOCRI descriptor list.

*Figure 17. Orchid collection at Cibodas botanical garden.*

- *In vitro* conservation and encapsulation (synthetic seeds) on Zingiberaceae and IOCRIs' commercial varieties was conducted. Research showed that via encapsulation species from the Zingiberaceae can be kept alive during a period of 8 months in a non-liquid MS medium without sugar but with 2.5% sodium alginate. *In vitro* conservation of *Chrysanthemum* and carnation is possible for a period of one year.
- Database management:
  - the structure of the database information system was redesigned.
  - the database needed improvement for passport and character data.
  - additional data such as registered plant data, pre-evaluation data were needed.
  - model of conceptual scheme and database logical/entity relationship was designed.
- Development of the improved information system was based on the Systems Development Life Cycle (SDLC) using waterfall models, which consists of seven steps, namely:
  - Planning (interview with users, identification the problems and opportunities, budget & resources, scope of information, information needs),
  - Analysis (system work flow, identification of the type of data; standardization data for decode table, decide the user privileges),
  - Design (database, process data flow, system (input screen layout, output and reports screen layout),
  - Development (coding and scripts programming),

  - Testing (for different kind of users and evaluation the system),
  - Implementation, and
  - Operation and Maintenance.
  - Currently the status of the information system developed by IOCRI is progressed until step 3 (system design).
- One day workshop on Management of Genetic Resources was held on 15 June 2005 at IOCRI's headquarters at Segunung. Three papers were presented namely:
  - Centre for Genetic Resources, the Netherlands (CGN)- an overview by Chris Kik
  - Allium base broadening with specific reference to onion introgression by Chris Kik
  - Ornamental crops germplasm system information (OCGIS) web based by Andy Pramurjadi.
- Two staff members of IOCRI were trained from 12-23 November, 2005 at CGN. Andy Pramurjadi concentrated on documentation and Kurniawan Budiarto concentrated on genebank management.
- Training of one of the IOCRI staff members on Agrobiodiversity did not take place as the criteria set by the TOEFL test were not met.

*Figure 18. Lily collection and breeding activities at IOCRI.*

*Impact*

During the visit of Chris Kik at IOCRI in June 2005, general and more detailed discussions on genebank management of ornamental crops with the members of the Germplasm Working Team of IOCRI took place. Furthermore in November 2005 a training programme for Andy Pramurjadi and Kurniawan Budiarto, both members of the IOCRI germplasm working group, was carried out in the Netherlands. Both activities have contributed to the knowledge increase of the IOCRI genetic resource management team, but also they gave on the CGN side a better understanding of the problems Indonesian genebanks are facing. The workshop held in Indonesia was a particular success as it reached many researchers from various research institutes and triggered discussions on genebank issues. Also the presentations of the two IOCRI team members in the Netherlands were interesting as they gave a detailed insight in the activities of both researchers to establish a genebank management system. Also the visits in Indonesia and the Netherlands to a number of private companies, active in ornamental plant breeding and production, was very important as it gave insight to both CGN and IOCRI staff how genetic resources could be utilised.

### 7.2. Training, technology transfer and knowledge exchange

During a two week period in November 2005 two members of the IOCRI germplasm team, namely Andy Pramurjadi and Kurniawan Budiarto, received a training in the Netherlands focused on genebank management. The training consisted of discussions with CGN curators, private companies and PRI researchers on genebank issues. Furthermore presentations were given by the Indonesian researchers on their specific roles in genebank management.
Chris Kik visited IOCRI in June 2005 and general discussions took place with the IOCRI staff on various issues ranging from plant pathology to in vitro culture and detailed discussions took place on genebank management. Also private production companies were visited as well as the orchid collection of Cibodas botanical garden.

### 7.3. Conclusions

During the third year of the project progress was made in acquisition of new collection material and the management of ornamental crops at IOCRI. Based on discussions in the second project year, the IOCRI genebank database was restructured into a more flexible database. The knowledge transfer was also successful, and both sides benefited from it.

### 7.4. Reports and publications

- Kik, C., 2005. Mission to IOCRI – GENEBANK, Visit to Indonesia from June 11 -18, 2005. HORTIN Mission report 24. pp.12.

### 7.5. Presentations

- Centre for Genetic Resources, the Netherlands (CGN) - an overview. Presentation by C. Kik at Workshop on Management of Genetic Resources, June 15, 2005. IOCRI, Segunung.
- Allium base broadening with specific reference to onion introgression. Presentation by C. Kik at Workshop on Management of Genetic Resources, June 15, 2005. IOCRI, Segunung.
- Ornamental crops germplasm system information (OCGIS) web based. Presentation by A. Pramurjadi at Workshop on Management of Genetic Resources, June 15, 2005. IOCRI, Segunung.
- Some topics in IOCRI genebank management. Presentation by K. Budiarto at Meeting CGN, November 22, 2005. Wageningen.
- IOCGIS- Indonesian Ornamental crops Germplasm Information System. Presentation by A. Pramurjadi at Meeting CGN, November 22, 2005. Wageningen.

## 8. Available information

- Kik, C., 2005. Mission to IOCRI – GENEBANK, Visit to Indonesia from June 11-18, 2005. HORTIN Mission report 24. pp.12.
- Centre for Genetic Resources, the Netherlands (CGN)- an overview. Presentation by C. Kik at Workshop on Management of Genetic Resources, June 15, 2005. IOCRI, Segunung.
- Allium base broadening with specific reference to onion introgression. Presentation by C. Kik at Workshop on Management of Genetic Resources, June 15, 2005. IOCRI, Segunung.
- Some topics in IOCRI genebank management. Presentation by K. Budiarto at Meeting CGN, November 22, 2005. Wageningen.
- IOCGIS- Indonesian Ornamental crops Germplasm Information System. Presentation by A. Pramurjadi at Meeting CGN, November 22, 2005. Wageningen.

# Horticultural research cooperation between Indonesia and the Netherlands (HORTIN)

## 1. Project title

: Introduction of haploid technology in breeding programs in Indonesia; hot pepper, cabbage, and Anthurium
**HAPLIN**

## 2. Project number

: PRI 7700017100

## 3. Project leaders

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## 5. Participating organisations

- Plant Research International, Wageningen, the Netherlands.
- Indonesian Vegetable Research Institute, Lembang, Indonesia.
- Indonesian Ornamental Crop Research Institute, Pacet, Indonesia.
- Research Institute for Agricultural Biotechnology and Genetic Resources (Balitbiogen), Bogor, Indonesia.
- SenterNovem, the Netherlands, with respect to the matching InDuAnthurium project, wherein Agriom BV, Aalsmeer, is the participating commercial company.

# 6. Objectives

Three major objectives of the project are:

- With hot pepper and cabbage, to transfer existing microspore culture technology to Indonesia, to implement procedures at IVEGRI, and to exploit doubled haploid plants (DHs) produced for the benefit of F1 hybrid variety breeding in Indonesia. In earlier joint research, PRI and IPB, Bogor University, successfully developed a new procedure of microspore culture for Indonesian hot pepper genotypes. It would be obvious that IPB can be of great help to IVEGRI in implementing the new developed procedure, and therefore both institutes are asked to arrange co-operation.
- With *Anthurium*, to develop a protocol for haploid plant production from gametes in cooperation with IOCRI, and to produce DHs for facilitating future breeding and production of F1 hybrid varieties, allowing replacing expensive in vitro propagation by cheap seed propagation methods.
- To contribute to the development of a team of Indonesian researchers who are highly trained in haploid technology. The proposed project will train one researcher from IVEGRI and one from IOCRI. We would suggest that Dr. Ence Darmo Jaya Supena, IPB Bogor, would also join in the expert team. Recently, in 2004, he graduated to receive his PhD at Wageningen-UR on microspore embryogenesis. This team of three researchers will be challenged to further diffuse haploid technology in other important crops in Indonesia.

To conclude, the project aims (i) to increase the expertise in modern plant breeding tools such as haploid technology in Indonesia, (ii) to stimulate bilateral co-operation between research institutes in Indonesia and The Netherlands, and (iii) to promote commercial partnerships between agribusiness private sector enterprises of both countries

# 7. Results

## 7.1. Output and impact

Three activities were carried out in 2005:

1. Transfer of hot pepper and cabbage microspore culture technology to the local institute IVEGRI, with as main tasks:
    - for PRI, to adapt the common Brassica microspore culture protocol to local Java cabbage types,
    - for IVEGRI, to equip the microspore culture laboratory,
    - for PRI, to demonstrate that both the Brassica and the hot pepper procedures could be put to work in Indonesia.
2. Development of a microspore culture protocol for *Anthurium*, a joint task for PRI and IOCRI.
3. Training and knowledge transfer.

During the reporting period, Mr Budi Winarto MSc., staff of IOCRI, received an IAC-fellowship and visited PRI for training from February to August. During that period, many joined experiments were performed dealing with all three activities for 2005. Actually, on the authority of Dr. Suyamto, director of ICHORD, and approved by Dr. Udin Nugraha and Dr. Iteu Hidayat, IVEGRI, Mr Budi was also in charge of learning the cabbage and hot pepper procedures and transferring these technologies to IVEGRI.

*Figure 2. Anthurium plants grown from microspores: about 16% of them are haploid.*

With respect to the first task in activity 1, initial microspore cultures with plants of Java cabbages raised to flower in Wageningen were not successful, and therefore to improve the protocol several parameters were tested, e.g. various temperature pre-treatments, addition of growth regulators (TIBA, PCIB, auxin and cytokinin) to the medium, and modifications of the sucrose concentration, among others also the use of polyethylene glycol instead of sucrose. Only as of early April, when starting from a fresh batch of donor-plants, first embryo producing cultures were obtained. As a matter of fact the common Brassica protocol was applied, with microspores isolated from 4.6-4.7 mm flower buds and incubated for 1 day at 32°C followed by transfer to 25°C. Embryo yield was ranging from 1-20 embryos produced per ml microspore suspension, but not all plants were responsive. There appeared a high variation in ability to produce embryos between the donor-plants, which were from seed obtained from IVEGRI from an open pollinated landrace. Adjustment of the high temperature treatment changed some individual recalcitrant plants to become responsive. Finally, a good two hundred embryos were obtained, of which a hundred germinated well and were brought along by Mr. Budi to Indonesia. Unfortunately, they did not survive after transfer into soil in Indonesia. Notwithstanding this, it can be concluded that the Brassica microspore culture procedure works with the Java cabbages. More details are given in the HORTIN mission report 23.
For the second task in activity 1, IVEGRI continued efforts to fit up the microspore culture laboratory, but the goals were not reached at the end of the year and microspore cultures could not be started yet (see for listed essential equipment and apparatus HORTIN mission report 13).

To demonstrate that the Brassica and the hot pepper procedures could be put to work in Indonesia, a try-out was performed at the Research Institute for Agricultural Biotechnology and Genetic Resources (Balitbiogen), Bogor, where most necessary equipment is available. Like Balithi and Balitsa, Balitbiogen also belongs to ICHORD, but cooperation between these institutes is not common, as it is infringing their specific tasks. For our purpose to have the try-out, a special agreement was signed between the three institutes, which was memorised as the very first official joint collaboration. The try-out activities were part of the practical course of the Microspore Culture workshop in September. Prior to the try-out, plastic consumables and some handy laboratory requisites have been sent in order to facilitate executing the microspore isolation and culture during a course. Very nice-looking cultures were prepared by all students, demonstrating that the protocols are repeatable in a local lab in Indonesia. The students were convinced that they would be able to get similar cultures with the less sophisticated requisites, such as glass Petri dishes etc. They are used to in Indonesia and it just needs a bit more time. Finally, unfortunately, most cultures showed contamination, mostly bacterium infections, which were likely derived from the donor-plants, whose cultivation was not that well conducted (shortage of time) for the practical course. Even though embryos were not obtained, the try-out has shown that the brassica and hot pepper procedures could be put to work in a local Indonesian laboratory.

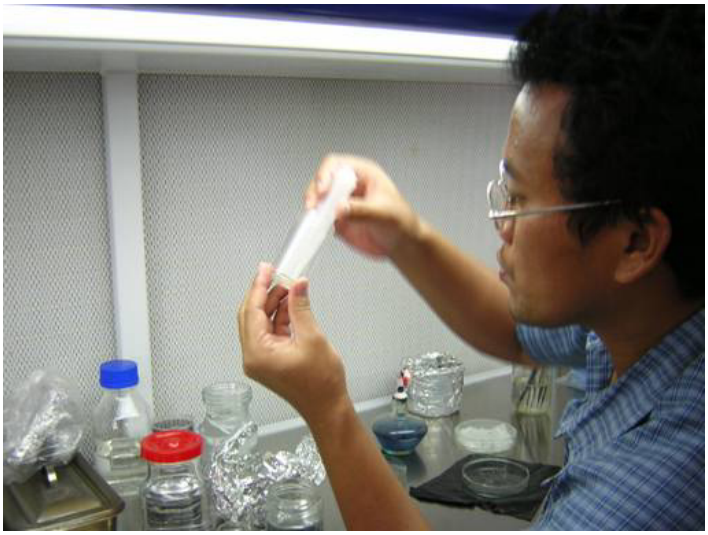

*Figure 19. Crushing of Brassica flower buds and washing of the isolated microspores.*

For the second activity, both PRI and IOCRI continued research in *Anthurium* in order to develop a suitable protocol for microspore embryogenesis. The bacteria contamination in isolated microspore culture procedures kept being a problem and progress looked quite hopeless. Therefore, in order not to waste all time with fighting against bacteria, we changed to studying microspore embryogenesis in *Spatiphyllum*, an allied species of *Anthurium* and without bacteria contamination in culture. This switch to another species was approved by SenterNovem and also by the Dutch Management Board of HORTIN. Haploid plants would also contribute to the breeding and propagation of *Spatiphyllum*, an ornamental that is also of economic importance in Indonesia. A successful microspore embryogenesis procedure for *Spatiphyllum* would likely be transferable to *Anthurium*, when for the latter the bacterium would have been solved anyhow. But, the research in Spatiphyllum was of short duration, because colleagues of Budi Winarto got a breakthrough in *Anthurium*. After thorough selection for anthers that did not express infection, they succeeded in producing callus and to regenerate haploid plants (16%)

In the frame of the third activity Jan Custers visited the partner institutes in Indonesia from 15 to 24 September. He contributed to the Microspore Culture workshop held at Balitbiogen and visited IOCRI and IVEGRI on 21 and 22 September respectively:
At IOCRI, a fruitful discussion took place with Dr. Kusumah Effendie and the staff in the project. With respect to the positive results with *Anthurium*, consequences were emphasised of the confidentiality condition in the tripartite contract between PRI, Agriom and IOCRI. Possibilities were discussed to improve the IOCRI laboratory apparatus, such as an overhaul of the microscope and delivery of a second hand refrigerated centrifuge from PRI.
With IVEGRI the difficulties of establishing a haploid facility and the involvement of IVEGRI staff in the project were discussed. Finally it was decided that Dr. Iteu would continue to be the scientist responsible for haploid production in cabbage and hot pepper and will proceed with her planning.
Summarising it can be concluded that the HAPLIN project, apart from equipping the IVEGRI lab, has made quite good progress in 2005.

## 7.2. Training, technology transfer and knowledge exchange

Microspore culture workshop:
A workshop on microspore culture was organised at Balitbiogen, September 13-20, containing introductory lectures, instructions about apparatus and protocols, and a practical course. Officially 14 participants were taking part, but mostly five more people, technical assistants and students from Balitbiogen, were attending and they were most eager to conduct the practical trainings. Participants were from five ICHORD institutes; Balitbiogen (5), Balithi (5), Balitsa (2), Balitbu (1), and Lolit Jeruk (1). Each group received for introduction and further reading a recently published handbook on haploid plant production (Maluszynski *et al.*, 2003, Doubled Haploid Production in Crop

Plants; a Manual, Kluwer Acad. Publish., 428 pp.). More details on the workshop are given in the HORTIN mission report 26.

Training in Wageningen:

- Mr Budi Winarto MSc., IOCRI, received an IAC-fellowship for 2004 and he used this for a visit and training at PRI from February to August 2005.
- Mr Djoko Pinilih, IVEGRI, applied for an IAC-fellowship for 2005, but unfortunately he didn't pass selection.
- Mrs Asih Kartasih Karjadi, IVEGRI, and Mr Kurniawan Budiarto Msc., IOCRI, applied for IAC-fellowships in 2006, for 2 and 6 months, respectively, both were selected but then suddenly the ministry of LNV cancelled the entire fellowship program.

### 7.3. Involvement of companies

InDuAnthurium contra-financing in 2006 will amount k€ 15.
Based on our results within HORTIN and BIORIN, a Dutch private company is considering starting commercial partnerships with Indonesia and will request for PSOM subsidy from SenterNovem. Activities involved will concern haploid technology in hot pepper.

### 7.4. Reports and publications

- Budi Winarto, 2005. HAPLIN training mission report; visit to Wageningen from February 2 to July 30 2005. HORTIN mission report 23.
- Custers, J., 2005. HAPLIN microspore culture workshop and coordination mission to Indonesia from September 15 to 24, 2004. HORTIN mission report 26.
- Suskandari Kartikaningrum, Sri Rianawati, Minangsari D. and Fitri Rahmawati, 2005. Microspore culture workshop and practical course, September 13-20, 2005. Report (BB Biogen), Bogor. 4 pp.

### 7.5. Presentations

- Key topics for successful microspore culture, ploidy manipulation, and use of DAPI staining, presentation by J. Custers at HAPLIN microspore culture workshop. September 16, 2005. Balitbiogen.
- The HORTIN research programme; its focus, partners, and projects. Opening Ceremony lecture, presentation by J. Custers at HAPLIN microspore culture workshop. September 19, 2005. Balitbiogen.
- Brassica microspore culture; a model for training and world-wide production of DHs, presentation by J. Custers at HAPLIN microspore culture workshop. September 19, 2005. Balitbiogen.
- Putting hot pepper shed-microspore culture to work in Indonesia, presentation by J. Custers at HAPLIN microspore culture workshop. September 19, 2005. Balitbiogen.
- Microspore embryogenesis: fundamental aspects, presentation by J. Custers at HAPLIN microspore culture workshop. September 20, 2005. Balitbiogen.
- Opportunities to develop microspore embryogenesis protocols for new species, presentation by J. Custers at HAPLIN microspore culture workshop. September 20, 2005. Balitbiogen.

## 8. Available information

- Suskandari Kartikaningrum, Sri Rianawati, Minangsari D. and Fitri Rahmawati, 2005. Microspore culture workshop and practical course, September 13-20, 2005. Report (BB Biogen), Bogor. pp. 4.
- Photo presentation

# Horticultural research cooperation between Indonesia and the Netherlands (HORTIN)

## 1. Project title

: Improving mushroom production
**MUSHROOM**

## 2. Project number

: APR 620154

## 3. Project leaders

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## 5. Participating organisations

- Applied Plant Research, the Netherlands
- CNC Exotics, the Netherlands
- Indonesian Vegetable Research Institute, Indonesia

## 6. Objectives and short project description

The objectives of the HORTIN Mushroom program are:

- Exploration, isolation, collection, and conservation of germ plasm of edible mushrooms both for indigenous and cultivated/exotic species and strains, as a germ sources for research activities.
- To identify superior edible mushroom strains for a limited number of species by carrying out growing trials of strains of different origins under defined conditions.
- To increase productivity of edible mushrooms by varying substrate formulations and supplements for the selected best strains of a limited number of cultivated species.
- Improvement of preservation of edible mushrooms.

The project aims at establishing a research group at IVEGRI, Lembang, skilled in applied research for edible mushrooms. The group will build up a collection of commercial and indigenous strains that will serve to improve source materials. This group will then support growers to improve mushroom production.
In the first year of the project a large number of mushroom farms have been visited to obtain a good impression of the needs of mushroom growers and to find commitment and cooperation of Indonesian companies with the project. A number of days have been spent by the Dutch project leader to teach the project leader at IVEGRI especially in collecting and maintaining source materials (strains).

# 7. Results

## 7.1. Output and impact

Indonesia

- Several farms and companies have been visited this year by the Indonesian project leader, Mrs Dr Etty Sumiati. Visits have been made to obtain information on problems, to advise and to collect spawn materials. The latter is meant to build up and maintain a collection of all strains used in Indonesia.


*Figure 21. Testing oyster mushroom for IVEGRI.*

- 52 Strains were obtained from Indonesian companies, farms and institutes, and from APR. These strains are now maintained at IVEGRI.
- Six strains of shiitake (Lentinula edodes), including strains from APR and 6 strains of oyster mushrooms (Pleurotus ostreatus) were tested for yield in the growing facility of IVEGRI. An additional set of 6 strains of each species is under test now. Results on the best producing strains will be available in 2006.
- Seven different mixtures of raw materials have been tested as substrate for spawn production for shiitake. The suitability of the medium was tested by measuring the time needed to colonise the substrate. For this, the APR strain MES 02089 was used. The best ingredients appeared to be bagasse with addition of a nitrogen source.
- Different substrate formulas are tested now to improve production of shiitake. Results will be available in 2006.
- Dr. Etty Sumiati has given a short course at the Techno-Expo in Malang on cultivation of four species of mushrooms. Attendees were students, small farmers, and starters in mushroom business from East Java.

The Netherlands

- The Dutch HORTIN Mushroom project leader visited Indonesia from 30 April to 4 May. The reason for this visit were:
  To give publicity to the HORTIN project, and to promote “what can IVEGRI do for companies in the mushroom industry”.
  To find out if button mushroom companies are interested in a new procedure to use bagasse for making substrate (compost). This demand will be interesting for the Dutch company Christiaens Group that is interested to develop this new technology in cooperation with companies in different countries, including Indonesia.
  To find out if companies are prepared to pay for new shiitake strains that have appeared to be useful for production under Indonesian growing conditions (tested at APR).

- Several strains have been sent to IVEGRI for their performance under Indonesian growing conditions.

- Ca. 250 *Pleurotus* strains from the APR collection have been genotyped in order to identify all that belong to the species *P. ostreatus* (common oyster mushroom). These included strains collected from Indonesian farms, institutes and companies by Mrs Etty Sumiati. 168 Strains were identified as *P. osteatus*.
- These 168 were subsequently genotyped in order to determine the genetic variability withing the species *P. ostreatus*. 68 Different genotypes were identified.
- Based on the genotypic differences and data on the origin of the strains, a selection was made of 40 strains and tested in 2 parallel cells at 16 and 22 °C, respectively.
- Nine strains were identified that might be useful for Indonesian farms/companies. All strains had a higher yield than the Indonesian reference strains. These strains will be transferred to IVEGRI and tested under Indonesian growing conditions.

*Figure 22. The newly bought laminar flow cabinet from HORTIN funds.*

## 7.2. Training, technology transfer and knowledge exchange

IVEGRI and APR have applied for a Nuffic grant in order to give Mrs Etty Sumiati and a co-operator a tailor made course in mushroom breeding. This knowledge will be used in a follow-up of the present HORTIN project.

## 7.3. Involvement of companies

Dr. Imelda Adidarma (Cibodas Mas Biotek) owns a shiitake and oyster mushrooms production unit. She has visited the Netherlands from April 29 to May 1. We have visited a number of companies, among those CNC Exotic Mushrooms (CEM). Ibu Imelda is interested in obtaining the equipment and knowledge of CEM for making and sterilising substrate for shiitake cultivation.
CEM and APR have filled in an intake form for PSOM in order to see if this would be a way to obtain financial support. We have received a negative reply from PSOM and thus have to find other ways to support this knowledge/equipment transfer.
CNC Exotics will provide the culture media free of charge for the experiments with *Pleurotus eryngii* at APR.

## 7.4. Reports and publications

- Sonnenberg, A.S.M. and E. Sumiati, 2005. Genotyping and evaluation of oyster mushroom strains (Report).
- Sonnenberg, A.S.M. and E. Sumiati, 2005. Improving mushroom production. Visit to Indonesia from March 30 – April 4, 2005. HORTIN mission report 30. 10 pp.

## 7.5. Presentations

- Cultivation of four species of mushrooms. Presentation by Dr Etty Sumiati at the Techno-Expo in Malang.

## 8. Available information

- Sonnenberg, A.S.M. and E. Sumiati, 2005. Genotyping and evaluation of oyster mushroom strains (Report).
- Sonnenberg, A. S.M. and E. Sumiati, 2005. Improving mushroom production. Visit to Indonesia from March 30 – April 4, 2005. HORTIN mission report 30. pp. 10.
- Sumiati, E., 2005. Teknologi Budidaya Jamur Edibel. Brochure Balitsa.

# Horticultural research cooperation between Indonesia and the Netherlands (HORTIN)

## 1. Project title

: Sustainable tropical plastic house flower production systems
**PROTFLOW**

## 2. Project number

: APR 41616001

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## 5. Participating organisations

- Applied Plant Research, Naaldwijk, the Netherlands.
- Indonesian Ornamental Crops Research Institute, Pacet, Cianjur, Indonesia.
- Fides-FGB, de Lier, the Netherlands

## 6. Objectives

*Long-term objectives:*

The project will contribute to:

- The development of plastic house structures and growing techniques for protected flower production in the tropical climate conditions of Indonesia. The structures and techniques have to match the needs of the local farmers.
- An increase in the productivity and quality of growing flowers in plastic houses in Indonesia.

*Short-term objectives:*

In order to achieve the long-term objectives the project will focus on the following aspects:

- An identification of the problems and the potential of existing flower production under plastic in Indonesia.
- The development of simple structures of plastic houses for flower production, which are suitable for the farmer and the climatological conditions in Indonesia.
- A study of the feasibility of available technology for flower production in plastic houses under tropical highland conditions.

- The development of technological components for flower production under plastic. This includes simple drip irrigation and integrated nutrient management systems for flower production in plastic houses.

# 7. Results

## 7.1. Output and impact

The following activities were to be carried out in 2005:

1. Building a plastic house with ventilation in Segunung.
In August a plastic house with permanent ventilation in Segunung was constructed, an improvement of the so-called Malaysia type house. The posts are supported by a foundation of concrete. The framework is made of wood. For construction of the roof a simple stencil was made. To fix the plastic on the roof clamps were homemade at the institute. The plastic house was constructed by a local contractor.

2. Research activities

2.1 Research on optimum rooting media and the effect of fertilisers and frequency of irrigation during the rooting period of *Chrysanthemum*

Main goal of the experiment was to examine which of the rooting media ('arang secam' -burned rice husk-, coco peat, vermiculite, perlite+vermiculite) is to be preferred under Indonesian circumstances and to examine the effect of applying fertilisers with different EC values (EC 1.0 mS $cm^{-1}$, EC 1.5 mS $cm^{-1}$) and the effect of frequency of irrigating (every day, every 2, 3 or 4 days) during the rooting period on the development of the cuttings.
The main conclusions of the trial were:

- The longest cuttings were produced in rice husk and coco peat with a daily watering.
- EC 1.5 mS $cm^{-1}$ generally gave a longer stems than EC 1.0 mS $cm^{-1}$

*Figure 23. Mr Prins (Fides Co.) gives a presentation.*

2.2 Research on the differences inside the bamboo- and the Malaysia type house in frequency of watering, the effect of leaf removal against Japanese white rust on the production and product-quality.

The main conclusions were that the tallest branches were produced in the Malaysia type house with a watering frequency of twice a week and the heaviest branches were produced with four times per week.
None of the leaf removal intensities had any effect on the presence of Japanese rust, it only influenced plant growth negatively. Measurements of the soil moisture indicated that the soil in the Malaysia type house was drier and needs

more water due to the higher light intensity and/or the slightly higher temperature (+ 0.8°C) as compared to the bamboo house.

## 7.2. Training, technology transfer and knowledge exchange

In 2005 courses on cultivation of *Chrysanthemum* and PROTFLOW workshops were given in April and September at IOCRI in Segunung. In April 72 participants were present (*Chrysanthemum* growers and advisers). Two workshops were given in September: a workshop for advisers (24 participants) in Segunung and a workshop for *Chrysanthemum* growers and advisers (49 participants) in Cipanas. Presentations were on various technical issues in relation to protected cultivation, including the use of tensiometers and water management, four instructions on Chrysanthemum growing, and one on the proposed third greenhouse.

## 7.3. Involvement of companies

In 2005 Mr Focco Prins (Area manager of Fides-FGB) visited Indonesia. On 13, 14 and 15 of April different *Chrysanthemum* nurseries were visited with Ruud Maaswinkel and Yoyo Sulyo. At a workshop on 14 April Mr Prins showed a film of the Fides company and discussed with the participants about the topics of royalty costs and the advice Fides normally gives to the growers who buy cuttings.
The Centre for Plant Variety Protection in Jakarta was visited by the project leaders and Mr Focco Prins. The procedure of the centre, which is similar tot the procedure in the Netherlands, was explained by Ir. Sugiono Moeljopawiro.
At short notice Fides will only undertake limited activities in Indonesia. Contracts will be concluded with two big *Chrysanthemum* nurseries

## 7.4. Reports and publications

- Maaswinkel, R.H.M. and Sulyo, Y., 2005. Sustainable tropical plastic house flower production systems (PROTFLOW). Visit to Indonesia from April 12 – 21, 2005. HORTIN mission report 21. 24 pp.
- Maaswinkel, R.H.M. and Sulyo, Y., 2005. Sustainable tropical plastic house flower production systems (PROTFLOW). Visit to Indonesia from September 11 – 21, 2005. HORTIN mission report 25. 48 pp.

## 7.5. Presentations

- Presentation for the HORTIN advisory board: activities in 2003 and 2004 (in Dutch), presentation by R.H.M. Maaswinkel, March 2005. Wageningen.
- Tensiometers and water management, presentation by R.H.M. Maaswinkel at IOCRI workshop, April 14, 2005. Cianjur, Indonesia.
- Proposal for the third house, presentation by R.H.M. Maaswinkel at IOCRI workshop, April 14, Cianjur, 2005. Indonesia.
- Sistem budidaya tanaman hias pada lingkungan terkendali (in bahasa Indonesia), presentation by Y. Sulyo at IOCRI workshop, September 14-16, 2005. Cianjur, Indonesia.
- Cyclical lighting at *Chrysanthemum*, presentation by R.H.M. Maaswinkel at IOCRI workshop, September 14-16, 2005. Cianjur, Indonesia.
- Mother plants, cuttings and rooting of *Chrysanthemum*, presentation by R.H.M. Maaswinkel at IOCRI workshop, September 14-16, 2005. Cianjur, Indonesia.
- Water management, presentation by R.H.M. Maaswinkel at IOCRI workshop, September 14-16, 2005. Cianjur, Indonesia.
- Pests and diseases in *Chrysanthemum*, presentation by R.H.M. Maaswinkel at IOCRI workshop, September 14-16, 2005. Cianjur, Indonesia.

## 8. Available information

- Maaswinkel, R.H.M. and Sulyo, Y., 2005. Sustainable tropical plastic house flower production systems (PROTFLOW). Visit to Indonesia from April 12 – 21, 2005. HORTIN mission report 21. pp. 24.
- Maaswinkel, R.H.M. and Sulyo, Y., 2005. Sustainable tropical plastic house flower production systems (PROTFLOW). Visit to Indonesia from September 11 – 21, 2005. HORTIN mission report 25. pp. 48.
- Presentation for the HORTIN advisory board: activities in 2003 and 2004 (in Dutch), presentation by R.H.M. Maaswinkel, March 2005. Wageningen.
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- Cyclical lighting at *Chrysanthemum* , presentation by R.H.M. Maaswinkel at IOCRI workshop, September 14-16, 2005. Cianjur, Indonesia.
- Cyclical lighting at *Chrysanthemum* (in bahasa Indonesia), presentation by R.H.M. Maaswinkel and Y. Sulyo at IOCRI workshop, September 14-16, 2005. Cianjur, Indonesia.
- Mother plants, cuttings and rooting of *Chrysanthemum* , presentation by R.H.M. Maaswinkel at IOCRI workshop, September 14-16, 2005. Cianjur, Indonesia.
- Mother plants, cuttings and rooting of *Chrysanthemum* (in bahasa Indonesia), presentation by R.H.M. Maaswinkel and Y. Sulyo at IOCRI workshop, September 14-16, 2005. Cianjur, Indonesia.
- Water management, presentation by R.H.M. Maaswinkel at IOCRI workshop, September 14-16, 2005. Cianjur, Indonesia.
- Water management (in bahasa Indonesia), presentation by R.H.M. Maaswinkel and Y. Sulyo at IOCRI workshop, September 14-16, 2005. Cianjur, Indonesia.
- Pests and diseases in *Chrysanthemum* , presentation by R.H.M. Maaswinkel at IOCRI workshop, September 14-16, 2005. Cianjur, Indonesia.
- Pests and diseases in *Chrysanthemum* (in bahasa Indonesia), presentation by R.H.M. Maaswinkel and Y. Sulyo at IOCRI workshop, September 14-16, 2005. Cianjur, Indonesia.

# Horticultural research cooperation between Indonesia and the Netherlands (HORTIN)

## 1. Project title

: Sustainable tropical plastic house vegetable production systems
**PROTVEG1**

## 2. Project number

: APR 510310

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## 5. Participating organisations

- Applied Plant Research, Lelystad, the Netherlands.
- Indonesian Vegetable Research Institute, Lembang, Indonesia.
- East-West Seeds, Purwakarta, Indonesia.
- Tirta Agri Kencana, Cibabat, Indonesia.

## 6. Objectives

*Long-term objectives:*

The project will contribute to:

- The development of plastic house structures and growing techniques for protected vegetable production in the tropical climate conditions of Indonesia. The structures and techniques have to match the needs of the local farmers.
- An increase in the productivity of growing vegetables in plastic houses in Indonesia.

*Short-term objectives:*

In order to achieve the long-term objectives the project will focus on the following aspects:

- An identification of the problems and the potential of existing vegetable production under plastic in Indonesia.
- The development of simple structures of plastic houses for vegetable production, which are suitable for the farmer and the climatological conditions in Indonesia.

- A study of the feasibility of available technology for vegetable production in plastic houses under tropical highland conditions.
- The development of technological components for vegetable production under plastic. This includes simple drip irrigation and integrated nutrient management systems for vegetable production in plastic houses.

The project aims to contribute to an increase in protected vegetable production in Indonesia. New technologies will be introduced and developed with regards to construction and type of plastic used for plastic houses. Improved systems for drip irrigation will contribute to integrated nutrient management and efficient use of water under protected cultivation. Suitable and sustainable ways of protected vegetable cultivation increase crop productivity and quality, thereby contributing to a higher farmers' income.
The project aims to be instrumental to the development of activities of Dutch agricultural firms in Indonesian vegetable horticulture.

# 7. Results

## 7.1. Output and impact

Four activities were carried out in 2005:

- An experiment was started in the plastic houses with sweet peppers, comparing the two plastic house types, bamboo construction versus Malaysia type, at two different plant densities, being 8.3 stems per m2 and 6.7 stems per m2, and with two plant treatments. With the first plant treatment, plants were treated comparable to practice in Indonesia in which all fruits of two nodes per three nodes are kept on the plant. With the second treatment the first node is cleared and at the following three nodes only one fruit is kept. After that only one fruit per node is kept.

*Figure 24. Inspection of the experiments by Mr. R. Rodenburg of East West Seeds.*

- Secondly, a demonstration trial with 8 different varieties was carried out. Seeds were supplied by Dutch companies. Results from this will be only presented to the companies involved because it did not represent a formal comparison.
- In 2004 a start was made with drilling a spring for clean water supply. A well was drilled because in 2004 it was noticed that the piped water, which was used for irrigation, was contaminated with fungal and bacterial spores and this resulted in the presence of bacterial wilt in the sweet pepper crop. After some setbacks caused by difficulties in drilling due to the rocky soil, the well was finally completed in May 2005.
- In September 2005 a start was made with the construction of a third plastic house. This HORTIN-type plastic house will be a modified version of the already existing Malaysian style type plastic house present at the site, but this time with top ventilation.

Mr. A. Pabekka, director of CV Tirta Agri Kencana, an agricultural supply and trading company and Mr. R. Rodenburg of East West seeds were involved in the project as advisor. In 2005 they regularly, once or twice every month, visited IVEGRI and advised about the cultivation in the sweet pepper trial.
The experiments started in July and were carried out with the variety Edison of East-West seeds.
The first preliminary results are showing, as was the case in 2004, a higher production of the sweet pepper plants in the Malaysian style plastic house. Also in 2005 higher light levels were measured inside the Malaysian style plastic house compared to the bamboo plastic house. During the year it was noticed that the roof got dirty faster compared to the first year, and that absolute light levels dropped significantly. For that reason it should be considered to clean the roof every half year. Nevertheless, production levels are exceeding the production levels of last year in both the Malaysian and Bamboo house. This is partly due to the improved cultivation conditions caused by a clean water supply and having more experience in steering growth on fertigation and water volume.
In both plastic houses a higher yield per square meter was present at the high density with 8.3 stems/m2 compared to the low density with 6.7 stems/m2. Between plant treatments difference in total yield is not so clear but in the second plant treatment more fruits in the desired grading size were present, thus resulting in better financial revenue.
A full report of the experiments will become available after the experiment is terminated in 2006.

*Figure 25. Construction of a modified Malaysian type plastic house.*

Due to the limited budget in 2006, only experiments in the Malaysia plastic house and modified Malaysia plastic house will be carried out. Experiments in the bamboo house will be only carried out if additional funding can be obtained.
Since the density with 8.3 stems in combination with the new plant treatment showed promising results the new experiments will be carried out according to those treatments. So far only plants with 2 stems per plant were tested. In 2006 plants with 2, 3 and 4 stems per plant at a density of 8.3 stems/m2 will be compared.

## 7.2. Training, technology transfer and knowledge exchange

On 7 December a workshop was organised for local farmers. At the workshop farmers could examine the experiments in the plastic houses and results of the experiments were presented. During the workshop also an excursion to 2 sweet pepper farms was organised. The workshop was attended by about 40 persons of whom 30 were farmers.

*Figure 26. Excursion at a sweet pepper farm.*

From the excursion farmers could see two ways in management in order to increase profitability of the sweet pepper cultivation. At the first farm that was visited farmers could see how this farm tries to benefit from gaining a higher market price by producing high quality sweet pepper for export and for this it has a high cost price per square meter. On the other hand, the second farm chose for another approach by reducing cultivation costs. They mix their own nutrients at the lowest price possible. In sweet pepper cultivation the share of costs for nutrients is about 33% of the cost price per square meter. Besides the costs of the plastic house and equipment, crop protection and costs for seeds and raising of plants have a share of about 33% and 20% respectively.

### 7.3. Involvement of companies

R. Rodenburg, Indonesia, East West Seeds Indonesia, and Pak Andi Batto Pabekka, CV Tirta Agri Kencana, together, visit IVEGRI once or twice a month and offer advice and guidance to the project.
For demonstration purposes Rijk Zwaan, De Ruiter, East West Seeds and Seminis (Bruinsma) donated seeds of 8 different sweet pepper varieties.

### 7.4. Reports and publications

- Putter, H. de, 2005. PROTVEG1 report. Visit to Indonesia from June 21 – July 6, 2005. HORTIN mission Report 24. 35 pp.
- Putter, H. de, 2005. Sustainable tropical plastic house vegetable production systems. Visit to Indonesia from December 2 – 17, 2005. HORTIN mission Report 28. 13 pp.
- Gunadi, N., A.P. Everaarts, Witono Adiyoga, Tony K. Moekasan, Subhan, H. de Putter and L. Prabaningrum, 2005. Sustainable vegetable production systems under tropical plastic house conditions. Research Report 2. HORTIN Programme. 55 pp.
- Putter, H. de. and N. Gunadi, 2005. Sustainable Tropical House Vegetable Production Systems. Demonstration trial with 9 different Sweet Pepper varieties: Preliminary report. HORTIN Research Report 4, 16 pp.

### 7.5. Presentations

- The growth of sweet pepper at two densities under two types of plastic house. Presentation by N. Gunadi and H. de Putter at Participatory workshop on Sweet pepper production in plastic houses. December 7, 2005. Lembang, Indonesia.

## 8. Available information

- Putter, H. de, 2005. PROTVEG1 report. Visit to Indonesia from June 21 – July 6 2005. HORTIN mission Report 24. 35 pp..

- Putter, H. de, 2005. Sustainable tropical plastic house vegetable production systems. Visit to Indonesia from December 2 – 17, 2005. HORTIN mission Report 28. 13 pp..
- Gunadi, N., A.P. Everaarts, Witono Adiyoga, Tony K. Moekasan, Subhan, H. de Putter and L. Prabaningrum, 2005. Sustainable vegetable production systems under tropical plastic house conditions. Research Report 2. HORTIN Programme. 55 pp..
- The growth of sweet pepper at two densities under two types of plastic house. Presentation by N. Gunadi and H. de Putter at Participatory workshop on Sweet pepper production in plastic houses. December 7, 2005. Lembang, Indonesia.

# Horticultural research cooperation between Indonesia and the Netherlands (HORTIN)

## 1. Project title

: Protected cultivation of vegetables and Integrated Pest Management
**PROTVEG2**

## 2. Project number

: 730002440

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## 5. Participating organisations

- Plant Research International, Wageningen, the Netherlands.
- Indonesian Vegetables Research Institute, Lembang, Indonesia.

## 6. Objectives

In tropical lowland of Indonesia conventional crops are grown in the open field. Heavy wind and rainfall and various plant diseases often damage the open field vegetables. The use of pesticides often leads to unacceptably high levels of residues in the products, pollution of the environment (air, water, and soil) and health hazard for the farmers. The development of a new greenhouse design is crucial to enhance the opportunities in the production of high quality products. In order to support this development, it is necessary that the construction of a greenhouse developed for the regional circumstances, goes hand in hand with the optimisation of the indoor a-biotic conditions and an environmentally-friendly growing system, including integrated pest management.

# 7. Results

## 7.1. Output and impact

The challenge of this project is the development of a greenhouse system with natural ventilation especially adapted to tropical lowland and with protection against pests. Major technological problems to solve are to avoid high temperature caused by intensive radiation, to save water and to allow integrated pest management.
After the construction of six greenhouses at Purwakarta, together with the industrial partners, equipment to measure the greenhouse climate has been installed (sensors for temperature, humidity and light). In a multidisciplinary approach, experts on greenhouse design, crop growth and crop protection worked together to face the technological challenges. Anne Elings evaluated the tomato production. With PROTVEG2 funds, a new greenhouse has been constructed at IVEGRI on the basis of the greenhouses constructed previously at Ewindo, Purwakarta. The construction is made of bamboo, covered with nets. A chimney-shaped opening in the top ensures ventilation. The greenhouse is used for thrips control experiments. Two experiments have been performed: determination of a control threshold for *Thrips parvispinus* on sweet pepper and evaluation of the potency of *Verticilium* sp. and *Menochilus sexmaculatus* (ladybird beetle) for controlling *Thrips parvispinus* on sweet pepper. Results from the evaluation of this one natural predator and one microbial product are promising. We discussed the possibilities to repeat the experiment during the coming dry season when pest densities are higher and air humidity lower.
E. den Belder discussed the outcomes of the interviews (the technical survey) with Widjaya Hadisoeganda (the new project leader of PROTVEG2), Dr. Laksminiwati Prabaningrum (Nita), and Ir. Tonny Moekasan. To determine farmers' knowledge status on IPM and its implementation, and cultivation techniques, 25 farmers have been interviewed using a structured questionnaire prepared by the PROTVEG2 team. Information collected through the interviews gives a good overview about "the state of art" about constraints on IPM, estimation of crop losses, etc.

*Figure 27. Participating farmers of the Workshop visiting the IPM experiments of PROTVEG2.*

## 7.2. Training, technology transfer and knowledge exchange

During a two-day workshop organised by the PROTVEG2 team several aspects of integrated crop production and protection were discussed using a broad variety of participatory methods. Dr Widjaya Hadisoeganda presided the workshop. Fifty participants including farmers of indoor crops, farmers of outdoor crops, traders, representatives of the pesticide industry, PT Joro, and Saung Mirwan discussed the problems on actual pest management. Important outcomes have been summarised and discussed by the farmers at the end of day 2. Presentations at day 1 by: Dr. Sudarwohadi (on IPM in vegetables in Indonesia), E. den Belder (on factors affecting Integrated Pest Management), and A. Ellings (Interaction between crops, IPM and environment) formed the kick-off for discussions. Presentations at day 2 by Dr. Laksminiwati Prabaningrum (results of the technical survey on chemical inputs at the farm) and an invited speaker from the Ministry of Agriculture, Ir. Dewi Novia (on Agro Implementation of Prima-2 and Prima-3 certificates certification system in Indonesia) formed the base for discussions at day 2. Lively discussions

took place on IPM certification, market approach, low consumer awareness, advantages and disadvantages of IPM, yields with IPM compared with conventional products, and research topics.
Dr. N. Gunadi had the lead in the problem-solution discussions during day 2. The farmers (divided in five groups) discussed the critical factors that influence pesticide use versus IPM.
At day 2 all participants visited the two greenhouse experiments at IVEGRI on the determination of control thresholds of *Thrips parvispinus* on sweet pepper and the evaluation of the potency of *Verticillium* sp. and *Menochilus sexmaculatus* for controlling *Thrips parvispinus* on sweet pepper.

### 7.3. Involvement of companies

The Indonesian private sector was present during the workshop, including pesticide companies, agricultural supply companies, producers of planting materials and many growers. They showed great interest in the experiments.

### 7.4. Reports and publications

- Belder, E. den and A. Elings, 2005. Mission report PROTVEG2. Visit to Indonesia December 10-17, 2005. HORTIN mission report 29. 24 pp.


*Figure 28. The workshop had very good attendance.*

### 7.5. Presentations

- On IPM in vegetables in Indonesia, presentation by Dr. Sudarwohadi at IVEGRI PROTVEG2 workshop. December 14-15, 2005. Lembang
- Factors affecting Integrated Pest Management in vegetables, presentation by Eefje den Belder at IVEGRI PROTVEG2 workshop. December 14-15, 2005. Lembang
- Interaction between crops, IPM and environment, presentation by Anne Ellings at IVEGRI PROTVEG2 workshop. December 14-15, 2005. Lembang
- Results of the technical survey on chemical inputs at the farm, presentation by Dr. Laksminiwati Prabaningrum (Nita) at IVEGRI PROTVEG2 workshop. December 14-15, 2005. Lembang

## 8. Available information

- Belder, E. den and A. Elings, 2005. Mission report PROTVEG2. Visit to Indonesia December 10-17, 2005. HORTIN mission report 29. 24 pp.

# Horticultural research cooperation between Indonesia and the Netherlands (HORTIN)

## 1. Project title

: Product safety and quality management in vegetable production systems
**QUALITY**

## 2. Project number

: APR 530085

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## 5. Participating organisations

- Applied Plant Research, Lelystad, the Netherlands.
- Indonesia Vegetable Research Institute, Lembang, Indonesia.
- Centre for Standardisation and Accreditation, Jakarta, Indonesia.

## 6. Objectives

The production and marketing of vegetables of high quality standard has become an important issue in Indonesia. At the same time production of safe food is of major concern to consumers. The control of product quality and food safety have become basic trade conditions in for example the European Union but also in the emerging economies of south East Asia. With a systematic approach vegetable growers and supply chains can meet the required standards for product quality and safe food production.

The aim of the project is the development and testing of a certifiable protocol for safe food production and product quality, in co-operation with stakeholders. The project is restricted to the vegetable production region of West-Java.

The approach contains four steps:

1. Identification of hazards for consumers and bottlenecks for product quality, with on the one hand a Hazard Analysis and Critical Control Points analysis (HACCP), and on the other hand an analysis of the perception and awareness of stakeholders in the production chain.

2. Development of a protocol to control the bottlenecks and to stimulate transparency. For this, a participative approach with growers and advisers will be organised to guarantee that the protocol is realistic and embedded in the local practical possibilities.
3. Test of the protocol in a pilot project with farmers and other participants in the supply chain.
4. Exploratory research on the possibilities of certification and institutional embedding.

# 7. Results

## 7.1. Output and impact

In 2004 a GAP was developed based on a HACCP-analysis, interviews and discussions with chain partners. Goal in 2005 was to test this GAP in practice. The main activities focused at this goal were:

- Preparation of the test of HORTIN-GAP.
- Kick-off meeting with all participants.
- The test at farm level.
- Evaluation meeting with all participants.

For the first activity the checklist and registration forms were finalised. Several aspects were worked out like a plan for the test, recruitment of participants, an audit scheme and a monitoring and evaluation plan to evaluate the test systematically.
Central activity in May 2005 was the kick-off meeting. Before this meeting CSA was visited to discuss the state of the art of the national certification programme and the perspectives of integration of the HORTIN-GAP in this programme. It was clear HORTIN-GAP fits quite well into the plans of the Indonesian government.
The kick-off meeting took place at May 12 in Lembang. Processing and trade companies Bimandiri and Edik participated with 10 cabbage growers and 4 tomato growers respectively. Also two representatives of supermarkets participated during this meeting.


*Figure 29. Two extension workers in a carrot field of the Muslim school at Ciwidey.*

The test took place during the summer period. During six months farmers worked with checklist and registration forms. The IVEGRI project members were assigned to act as auditors. They audited the farmers three times and they learned a lot on the bottlenecks and opportunities the HORTIN-GAP checklist and forms gave to the farmers. Besides the HORTIN-GAP, an analysis of pesticide residues on the crop was organised.

Evaluation took place in November 2005 based on discussions with the project team, group discussions with the participants and two representatives of supermarkets. The discussion was focused on questions worked out in the monitoring & evaluation plan. A short summary of the results:

- General impression is positive.
- Checklist and forms are well suited for their purpose, except a few remarks.
- Participants were proud and enthusiastic to participate, all completed the test.
- Positive market response (Edik).

During the discussion recommendations were made for the Indonesian government:

- Speed up the implementation of the national certification programme (SI SAKTI system).
- Improve regulation and communication on pesticide registration and labeling.
- Make analysis of soil, irrigation water and residues available and affordable to farmers.

A message for growers and chain organisations was: development of Good Agricultural Practices must go hand in hand with improvement of product quality to get access to markets with higher price level.

## 7.2. Training, technology transfer and knowledge exchange

1. APR provided a short audit training for project participants of IVEGRI. Result was they were able to supervise the test, use the checklists and support the farmers.
2. During the evaluation meeting in Lembang in November a presentation and discussion was held with the title: 'Why good agricultural practices in the horticultural sector in Indonesia'. In this presentation results of visits to Indonesian supermarkets were integrated.
3. The same presentation was held for 63 farmers in Ciwidey. APR was invited by the Islamic boarding school of Al-Itifaq (Pondok Pesantren) at Ciwidey (West Java). The school provides education to growers. Al-Itifaq is involved in a HPSP-project together with IVEGRI.

## 7.3. Involvement of companies

APR visited the Indonesian Centre for Standardisation and Accreditation (CSA) in May. CSA was involved as a result of cooperation with IAC project partners of the PBSI-project Strengthening Food Safety Indonesia. CSA was involved during the kick-off meeting and in the evaluation. The HORTIN-GAP fits quite well into their certification programme. June 21, the company meeting at APR in Lelystad (Doing business in Indonesia) was visited and a poster presented.

*Figure 30. Meeting with fruit and vegetable manager of HERO supermarket.*

Two Indonesian trade and processing companies were involved in the test: PT Bimandiri and PT Edik. The companies deliver vegetables to supermarkets. The companies were important for the recruitment of farmers for the test and to discuss the results.

Two supermarkets in Bandung were visited (Carrefour and Hero) to discuss GAP, tracking and tracing, product quality and Indonesian versus international standards. The vegetable managers were involved during the evaluation meeting in Lembang.
APR supported IVEGRI in working out a project proposal for the Horticultural Partnership Programme (HPSP). During a meeting in Ciwidey of partners of this project (farmers, Al-Itifaq, Hero, IVEGRI), APR provided a lecture. The project is about delivering vegetables (carrots) of good quality to Hero. Al-Itifaq is very interested in HORTIN-GAP and can be a partner in future.

### 7.4. Reports and publications

- Voort, M.J.P. van der, 2005. HORTIN-Quality mission report. Visit to Indonesia from May 7 to 15, 2005. HORTIN mission report 22. 14 pp.
- Schoorlemmer, H.B and M.J.P. van der Voort, 2005. HORTIN-Quality mission report. Visit to Indonesia from November 20 to 27, 2005. HORTIN mission report 27.

### 7.5. Presentations

- Introduction to the monitoring & evaluation plan and audit training. Presentation by M.J.P. van der Voort at IVEGRI for project members. May 11, 2005. Lembang.
- Kick off meeting HORTIN-GAP. Workshop at IVEGRI. May 12, 2005. Lembang (20 participants).
- Why good agricultural practices in the horticultural sector in Indonesia. Presentation by H.B. Schoorlemmer and M.J.P van der Voort during evaluation meeting. November 2005. Lembang.
- Why good agricultural practices in the horticultural sector in Indonesia. Presentation by H.B. Schoorlemmer and M.J.P. van der Voort during visit to HPSP project of Al Itifaq and IVEGRI. November 25, 2005. Ciwidey. (63 participants).

## 8. Available information

- Voort, M.J.P. van der, 2005. HORTIN-Quality mission report. Visit to Indonesia from May 7 to 15, 2005. HORTIN mission report 22. 14 pp.
- Schoorlemmer, H.B and M.J.P. van der Voort, 2005. HORTIN-Quality mission report. Visit to Indonesia from November 20 to 27, 2005. HORTIN mission report 27.
- Introduction to the monitoring & evaluation plan and audit training. Presentation by M.J.P. van der Voort at IVEGRI for project members. May 11, 2005. Lembang.
- Kick off meeting HORTIN-GAP. Workshop at IVEGRI. May 12, 2005. Lembang (20 participants).
- Why good agricultural practices in the horticultural sector in Indonesia. Presentation by H.B. Schoorlemmer and M.J.P van der Voort during evaluation meeting November 2005. Lembang, and during visit to HPSP project of Al Itifaq and IVEGRI. November 25, 2005. Ciwidey.
- Monitoring & Evaluation plan for HORTIN-Quality, Test of protocol on food-safety and product quality in 2005, Marcel van der Voort & Herman Schoorlemmer, Applied Plant Research, April 25, 2005, Lelystad, the Netherlands.
- Video fragment of evaluation meeting. November 24, Lembang.
- HORTIN-GAP checklist 2004
- Field Registration Form
- Purchase list
- Inventory list Pesticides
- Inventory list Fertiliser
- Sales list

# Horticultural research Co-operation between Indonesia and the Netherlands (HORTIN)

## 1. Project title

: Managing the most important seed-borne diseases of vegetables in Indonesia
**SEEDS**

## 2. Project number

: PRI 7700004100

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## 5. Participating organisations

- Plant Research International, Wageningen, the Netherlands.
- Indonesian Vegetable Research Institute, Lembang, Indonesia.
- East West Seed, Purwakarta, Indonesia.

## 6. Objectives

- To survey important seed-borne vegetable diseases in Indonesia.
- To determine useful and reliable procedures for detection and identification of seed-borne pathogens in Indonesia.
- To produce a leaflet on seed-borne diseases useful for seed producers and seed inspectors.
- To describe strategies for seed health management.
- To improve skills and knowledge on international standard procedures for seed health management of the Indonesian partners.
- To disseminate information on the survey and the other project activities to the Indonesian seed growers, seed companies, seed inspectors and research organisations.

These project activities will create information on the needs for disease health management and other aspects of seed production in Indonesia. It will create goodwill with counterparts in Indonesia, in particular with quarantine officers and the seed industry. It will improve seed health management at an important seed company (EWINDO) in Indonesia with a Dutch seed company (ENZA) as an important shareholder. It stimulates the use of diagnostics

(antibodies) produced in the Netherlands (at PRI). Indonesian seed growers will profit from Dutch expertise, know-how and innovations.

# 7. Results

## 7.1. Output and impact

*1. Survey of seed-borne diseases of tomato, pepper and shallot*

The presence of diseases of tomato, hot pepper and shallot were surveyed by observation of field crops at 15 locations in Central and East Java. Major bacterial and fungal diseases in hot pepper were *Ralstonia solanacearum, Rhizoctonia solani, Cercospora capsici, Gloeosporium* spp. and *Alternaria solani*, from which the last two can be seed-borne. Virus diseases were Chili Puckery Stunt Virus, Curly Yellow Gemini virus and virus diseases causing mosaic symptoms. In addition, mites and trips were dominantly present, whereas aphids and white flies were found with lower incidence.

In tomato, the major bacterial and fungal diseases were *Ralstonia solanacerarum, Alternaria solani, Phytophthora infestans* and *Sclerotium rolfsii*, from which only *A. solani* is really seed-borne. Virus diseases were Yellowing Mosaic Gemini Virus as well as other virus diseases causing mosaic symptoms. White flies were abundantly present in tomato, whereas incidentally mites, trips and aphids were found.

In shallot, no bacterial diseases were found. The major fungal diseases were *Sclerotium rolfsii, Alternaria porri, Stemphyllium sp., Fusarium oxysporum* and *Fusarium nivale*. In addition, mosaic and curly symptoms caused by viruses were found. *Spodoptora exigua* was the major pest in shallot.

Incidentally symptoms were found in hot pepper and tomato typical for Xanthomonas campestris pv. vesicatoria and in tomato for *Clavibacter michiganensis* subsp. *michiganensis*.

In total, 29 seed lots of hot pepper, 20 tomato seed lots and various shallot bulbs lots, all grown on Java, were analysed for the presence of plant pathogens either directly or after growing plants from seed.. Bacterial pathogens were detected by isolation and a pathogenicity assay. Fungal pathogens were characterised by a blotter assay and by growth on PDA. In hot pepper and tomato seed lots, *X. c. pv. vesicatoria, Aspergillus, Colletotrichum* and *Fusarium oxysporum*, TMV, ToMV and CMV were found. In tomato seed lots, also *Alternaria solani* was detected. In shallot, *Fusarium oxysporum*, *Alternaria porri*, OYDV and SYSV were found.

A germination test for tomato seed showed that germination percentages varied largely per seed lot, from 0-95%. Seed grown by farmers in general had lower germination percentages and a lower purity.

The results of the survey will be published on internet (webpage HORTIN-programme).

*2. Information leaflets on major seed-borne diseases*

Drafts were prepared of information leaflets on *Fusarium oxysporum* (basal rot), *Alternaria porri* (purple blotch), *Erwinia* soft rot, *Botrytis* neck rot in allium, *Xanthomonas campestris* pv. *vesicatoria* and Colletotrichum (anthracnose) in pepper. They will be used for the preparation of information books on diseases in tomato, hot pepper and shallot.

*3. Eradication strategies for seed-borne pathogens*

Different seed treatments were evaluated to reduce seed-borne bacteria, fungi and viruses. Tomato and pepper seeds were treated with different biopesticides (antagonists), antibiotics, chemical antimicrobials (chlorine and phosphate, fungicides), hot water and dry heat. The effect on the reduction of pathogens and on seed germination was analysed. Samples were treated with the most effective treatments (see Table 1) were planted in the fields, but no clear differences in plant health were found compared with the untreated samples. Infections with an unknown virus disease causing yellowing of leaves, probably insect transmitted, could not be avoided.

Although the significance of the seed-borne inoculum in the epidemiology has not been established, it is obvious that management of the seed-borne diseases in these crops can be important to avoid introduction and dissemination of these pathogens by seed.

Shallot bulbs were three times treated with dry heat (2 days, 30 °C or 37 °C). The treatment at 37 °C reduced the development of fungi on bulbs. It also reduced the inoculum of Onion Yellow Dwarf Virus.

*Table 1. Suitable seed treatments to eradicate bacteria, fungi and viruses in tomato and pepper seed.*

| Pathogens | Treatment |
|---|---|
| <u>In tomato seed</u> | |
| *Xanthomonas campestris* pv. *vesicatoria* | Soak in 1% Agrept (streptomycin) for 10 min |
| *Alternaria solani* | Soak in 5000 ppm $Ca(ClO)_2$ for 15 min |
| TMV | Soak in 10% $Na_3PO_4$ for 1.5 h. Wash 4 times with water. Soak in 0.8% HCl for 20 min. Wash 3 times with water |
| <u>In hot pepper seed</u> | |
| *Cercospora* sp. | Soak in 0.1% Previcur (Bayer, systemic fungicide) for 20 min |
| CMV | Soak in 10% $Na_3PO_4$ for 1.5 h. Wash 4 times with water. Soak in 0.8% HCl for 20 min. Wash 3 times with water |


*Figure 31. Participants of the 2nd Workshop on Seed Health Management for Vegetable Crops.*

*4. Development and evaluation of detection methods.*

ELISA was compared with a bioassay on the indicator plant *Nicotiana glutinosa* for detection of TMV on hot pepper seed. Different numbers of seeds (1-50) were used with a different percentage of TMV infection (0 – 100%). A good correlation was found between both assays, from 150 samples, from which 72 negative in both assays, two samples were only positive in the bioassay and one in the ELISA. Further it was found that an infection rate of 0.5% or less can not be reliably detected with a sample size of 50 seeds or less. At an infection rate of 2.5% to 5% , at least 25 seeds should be sampled. At infection rates between 5 and 100% a minimum of 10 seeds is required. This information is important to reduce the sample size of costly hybrid pepper seeds.

For *Alternaria solani* on tomato seed and *Colletotrichum gloeosporoides* on pepper, the blotter and water agar tests were both able to detect low levels of seed infections. The test could be further improved by preventing seed germination with 2.4 D or by freeze drying. *Alternaria solani* was easier to recognise on leaves than on the seed coat.

## 7.2. Training, technology transfer and knowledge exchange

The 2nd HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia was held in Lembang from 5-9 September 2005. The first day was used for seminars on national and international phytosanitary regulation, on the seed health status of vegetable seeds in Indonesia and on managing strategies for seed –borne diseases on vegetables. The seminars were attended by 46 participants. The second and third day 11 participants from different seed testing laboratories in international accepted standard procedures for seed health testing including

- Testing of viruses using ELISA, pathogenicity tests and visual observation of symptoms.
- Testing of bacteria (in particular *Xanthomonas campestris* vesicatoria) using dilution plating, immunofluorescence cell staining (IF) and a pathogenicity test.
- Testing of the fungus Alternaria solani using a blotter method and plating

The participants considered the workshop as very interesting and valuable for their work. The pfd file of the workshop manual is available on request.

Ir. N. Vajrina, responsible for seed health testing in EWINDO, received a STUNED scholarship for a two month training period from March 16 to May 15 2005 at PRI in The Netherlands. During her stay she was trained in different detection methods for isolation and characterisation of bacterial pathogens. Several isolates from the EWINDO collection suspected to be *Xanthomonas campestris* pv. *vesicatoria* were analysed with a serological assay (immunofluorescence cell-staining (IF)) and PCR. Two out of seven strains were positive in IF, but negative in PCR. Four commercial tomato seed lots were tested for the presence *Clavibacter michiganensis* subsp. *michiganensis* using IF and three different primer sets in PCR. Samples contained IF positive cells, but none of the suspected colonies tested in PCR was positive. The presence of bacterial pathogens in the EWINDO collection or in seed samples could therefore not be confirmed. A report is available on request.

*Figure 32. Impression of the workshop: IVEGRI project leader participating in a bioassay for the detection of seed-borne viruses.*

## 7.3. Involvement of companies

During the workshop, seed specialists from PT Selektani and EWINDO were trained. EWINDO will support the publication of 3 booklets of diseases on pepper, tomato and cucumber. The descriptions will be written by PRI and IVEGRI. EWINDO will collect high quality pictures of symptoms on the most important diseases. Ir. N. Vajrina from EWINDO was trained at PRI in isolation and characterisation of plant pathogenic bacteria.

### 7.4. Reports and publications

- Vajrina, N. 2005. Tomato and pepper seed, produced in Indonesia, analyzed for the presence of the bacterial pathogens *Clavibacter michiganensis* subsp. *michiganensis* and *Xanthomonas vesicatoria*. Internal report EWINDO. 14 pp.
- Van der Zouwen, P.S., Van der Wolf, J.M. Duriat, A.S. 2005. Manual of the 2nd HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices. IVEGRI, Lembang, Indonesia, 5-9 September 2005.
- Duriat, A.S., Gunaeni, N, Widjaja, E.S., Gunawan, O.S., Kirana, R., Gaswanto, R., Wulandari, A.W., Sulastrini, I., Ratnawati, M.L., Van der Zouwen, P.S. and Van der Wolf, J.M. Managing the most important seed-borne diseases of vegetables in Indonesia (HORTIN-SEEDS). A survey on seed-borne diseases in tomato, pepper and shallot in 2004. Internal report IVEGRI. 15 pp.
- Information leaflets on *Fusarium oxysporum* (basal rot), *Alternaria porri* (purple blotch), *Erwinia* soft rot, *Botrytis* neck rot in allium, *Xanthomonas campestris* pv. *vesicatoria* and *Colletotrichum* (anthracnose) in pepper.

### 7.5. Presentations

- WTO regulation for phytosanitary certification, a case of Indonesia in the world seeds trading. Presentation by A. Hamzah at the 2nd HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices. September 5, 2005. Lembang.
- Seed health testing in an accredited laboratory. Presentation by A.R. Wastra at 2nd HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices. September 5, 2005. Lembang.
- Health certification on potato seed, a case for vegetative planting material. Presentation by M. Pradjadinata at 2nd HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices. September 5, 2005. Lembang.
- Quality control and seed certification in Indonesia: certification, monitoring/ controlling and quality guaranty system. Presentation by U. Nugraha at 2nd HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices. September 5, 2005. Lembang.
- Standardized ISTA and ISHI seed health testing protocols. Presentation by J.M. van der Wolf at 2nd HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices. September 5, 2005. Lembang.
- Strategies for seed health management. Presentation by J.M. van der Wolf at 2nd HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices, September 5, Lembang, by A. Hamzah.
- A survey on vegetable diseases in Indonesia. Presentation by A.S. Duriat at 2nd HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices. September 5, 2005. Lembang.
- Seed health management in practice. Presentation by N. Vajrina at 2nd HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices. September 5, 2005. Lembang.

## 8. Available information

- Vajrina, N. 2005. Tomato and pepper seed, produced in Indonesia, analyzed for the presence of the bacterial pathogens *Clavibacter michiganensis* subsp. *michiganensis* and *Xanthomonas vesicatoria*. Internal report EWINDO. 14 pages
- Duriat, A.S., Gunaeni, N, Widjaja, E.S., Gunawan, O.S., Kirana, R., Gaswanto, R., Wulandari, A.W., Sulastrini, I., Ratnawati, M.L., Van der Zouwen, P.S. and Van der Wolf, J.M. Managing the most important seed-borne diseases of vegetables in Indonesia (HORTIN-SEEDS). A survey on seed-borne diseases in tomato, pepper and shallot in 2004. Internal report IVEGRI. 15 pages
- Information leaflets *on Fusarium oxysporum* (basal rot), *Alternaria porri* (purple blotch), *Erwinia* soft rot, *Botrytis* neck rot in *allium*, *Xanthomonas campestris* pv*. vesicatoria* and *Colletotrichum* (anthracnose) in pepper.