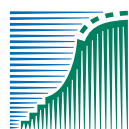


# HORTIN Annual report 2004

Horticultural Research Cooperation between Indonesia and the Netherlands



HORTIN



agriculture, nature and food quality



IAARD - ICHORD





WAGENINGEN **UR**  
*For quality of life*

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# HORTIN Annual report 2004

Horticultural Research Cooperation between Indonesia and the Netherlands

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

Wageningen  
May 2005

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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: APR Lelystad, APR Naaldwijk, APR Horst, Agrotechnology & Food Innovations (A&F), Plant Research International (PRI), Centre for Genetic Resources (CGN), DLV-Agriconsult Horst
  - Participating companies: PT East West Seed Indonesia, Agriom BV, Plasthill BV, Rovero Systems BV, CNC/Exotics BV, Koppert BV, Asian Perlite Industries, Tirta Agri Kencana
6. Duration: 1 January 2003 - 31 December 2006
7. Budget 2004 (k€):

Institute	LNV	Matching andere LNV programma's	Matching SenterNovem	EU
APR	280.6			
RPI	251.9	72.0 <sup>1</sup>	76.3 <sup>2</sup>	44.25 <sup>3</sup>
WUR communication	2.2			
Cluster management	3.4			
Non allocated	10.0			
Total	548.1	72.0	76.3	44.25

The A&F-led PROCULT project has received a subsidy of k€ 50 from the NAP funds in 2003 which have been transferred to 2004. The activities are reported in this annual report.

The above budget is composed of the k€ 480 annual budget plus k€ 10 training budget (by letter trcdwk/2004/1896) plus funds transferred from 2003 (mainly for greenhouse construction activities in PROTFLOW and PROTVEG1).

<sup>1</sup> Composed of Kennisbasis (k€ 25 Garlic), DWK 397 (k€ 20 Protveg2), and DWK 388 (k€ 27 Seeds)

<sup>2</sup> Composed of k€ 48 (Haplin) and k€ 19.3 (Seeds)

<sup>3</sup> EU matching (Garlic)

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 2004

### Introduction

HORTIN is a collaborative programme with Indonesia of strategic and applied research in horticulture for the years 2003-2006. It is financed by the respective Ministries of Agriculture. Executing agencies are the Indonesian Center for Horticultural Research and Development (ICHORD), Indonesia, and Plant Research International (PRI) and Applied Plant Research (APR), the Netherlands.

HORTIN aims at stimulating development through research in public-private partnerships. It is a genuine partnership, which matches the research and agribusiness priorities of both countries. By doing so, it stimulates private-private partnerships, attracts donors, and so assures the transfer of knowledge to practice.

Formal partners are the Indonesian Agency for Agricultural Research and Development (IAARD) of the Ministry of Agriculture, Indonesia and the Directorate of Knowledge Dissemination (DWK) of the Ministry of Agriculture Nature and Food Quality the Netherlands. The programme is covered by an Administrative Arrangement.

On the Indonesian side, the programme is carried out by the three horticultural institutes under ICHORD: 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. The Citrus & Subtropical Horticultural Crops Research Station (CISTROPHRES) has joined the collaboration.

Emphasis of the project is on generating knowledge and transfer of knowledge to facilitate the establishment of business-to-business relationships. The projects are mostly of quite practical nature.

### General issues

#### High visitor

On 26 August 2004, Dr Memed Gunawan, Secretary General of the Indonesian Ministry of Agriculture visited Wageningen. He was accompanied by several high officials from Indonesia and Malaysia, amongst which the DDG of MARDI, Dr Shukor Abd, Rahman, as well as the Dutch Agricultural Counsellor, Mr Frans Claassen. The company was received at Plant Research International by Dr Aalt Dijkhuizen, President of the Executive Board of Wageningen University and Research Centre. Staff of Wageningen UR presented some highlights of research with Indonesia and Malaysia, including a presentation of HORTIN by Mr Joost van der Burg. The programme ended with a get-together with Indonesian students that presently study at Wageningen.

At this occasion, Dr Gunawan offered a plaque of IAARD to Plant Research International as token of appreciation for the long-standing research cooperation.

In the early afternoon, the party moved on to one of the locations of Applied Plant Research in Aalsmeer, where the PROTFLOW project leader, Mr Ruud Maaswinkel, and Dr Arij Everaarts, HORTIN secretary and PROTVEG1 project leader, offered a short programme which centred around protected cultivation.



*Figure 1. Handing over of the IAARD plaque by Secretary General Dr Memed Gunawan to Dr Aalt Dijkhuizen, President of the Executive Board of Wageningen University and Research Centre.*

## 9th Working Group on Agriculture between Indonesia and the Netherlands

The above mentioned visit was partly in the framework of the annual meeting of the joint Working Group on Agricultural (WGA), partly because of the trilateral partnership meetings which include Malaysia.

The following is quoted from the agreed minutes, and regards issues related to HORTIN:

'Training, an important part of HORTIN is seriously hampered due to limited financial support for travelling abroad by Indonesian researchers. The Netherlands Ministry of Agriculture, Nature and Food Quality announced that it has decided to grant an additional fund of Euro 10.000 to facilitate partly in the travelling. The Indonesian counterparts welcomed the additional travelling fund and committed themselves to increase the Indonesian budget for travelling;

The Dutch side informed Indonesia about the importance of upgrading the labs of IOCRI (Indonesian Ornamental Crops Research Institute) and IVEGRI (Indonesian Vegetables Research Institute) with special equipment for the haploid technology application, crucial for the development of modern varieties. At the same time the lab at IVEGRI needs some elementary equipment for the MUSHROOM project. Indonesia fully understand the need to upgrade facilities and informed the Dutch side that additional funds are at the moment being proposed in close cooperation with the private sector, especially for MUSHROOM project.

The Indonesian side proposed to start a mid-term evaluation of the HORTIN program. The Dutch side welcomed this proposal and it was decided that in the first months of 2005 the evaluation should take place.' (Unquote).

## Ekspose 2004

From 8 to 10 December the Indonesian partner institutes united under ICHORD organised their annual horticultural expo (Ekspose Inovasi Teknologi Hortikultura). This time, the hosting institute was IFRURI at Solok, West Sumatra. The programme consisted of field demonstrations, exhibitions, lectures and a business counter. From the Dutch side the HORTIN programme leader presented the current highlights of the programme for a varied and interested Indonesian audience. A number of HORTIN project leaders also took part and they jointly received candidate partners at the Business Meeting.



Figure 2. Overview of part of the Ekspose.

The Indonesian project leaders arranged an informative HORTIN booth, which was wallpapered with the new HORTIN posters.



Figure 3. Waiting for the business partners to come.



Figure 4. The HORTIN stand with Dr Kusumah.

All posters were produced in duplicate, so that a copy of each is now put up in all institutes concerned, both in Indonesia and the Netherlands.

The HORTIN team was provided with a separate table during the business counter meeting, during which several new contacts were made.

The Dutch Agricultural counsellor also visited the Ekspose and hosted a lunch on behalf of the Dutch Ministry of Agriculture, Nature and Food Quality.

## Visit of Mr Diyanto Imam to the Netherlands

In November Mr Diyanto, Agricultural Assistant, Agricultural Bureau, Netherlands Embassy, Jakarta, visited the Netherlands for an orientation visit. On 9 November he made an extensive visit to Wageningen University and Research Centre. Several HORTIN project leaders received him and showed him around at APR, A&F, and PRI. On 10 November Mr Diyanto visited the APR location in Naaldwijk. Mr Ruud Maaswinkel, project leader of PROTFLOW showed him around at the institute. After that a visit was made to one of the world's largest chrysanthemum breeders, Fides BV. Here visits were made to the breeding programme, the variety trials, and the plant production facilities. The possible collaboration between Fides and PROTFLOW was discussed, and resulted in the engagement of Mr Fokko Prins to visit Indonesia in 2005. In the afternoon a large chrysanthemum nursery in the Westland area was visited.

## Other activities

The Programme management was in constant discussion with colleagues of Wageningen UR to form 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. In order not to encumber the projects with more overhead, it was agreed that effectuation of this task would be done low profile with a minimum of financial input from the programmes. Also it was acknowledged that HORTIN had a special position being a programme under a bilateral agreement and would retain its management structure with its own Programme Board until 2005. A new structure, including a new 'nucleus' management team supported by thematic support groups will start in 2006. The present two members of the HORTIN programme management will be part of this new structure and will continue to promote the interests of HORTIN.

Recently Horticultural Partnership Support Programme (HPSP) came to being. This is an initiative of the development organisations Agriterro and Cordaid together with the Royal Netherlands Embassy in Jakarta. It aims to promote partnerships between small farmers and entrepreneurs in the horticultural sector of Indonesia and will support small and innovative projects that are aimed at improving production, processing and marketing of horticultural products in Indonesia through partnership agreements. The HPSP secretariat is managed by the Indonesia-Netherlands Association (INA), based in Jakarta (ina@ina.or.id).

During July the programme leader provided a consultancy service to the Cluster Internationaal to support its efforts to engage into a process of demand-driven priority setting. An internal discussion document was prepared that describes the current national and international priority setting mechanisms in Indonesia. This document, together with a similar study for East Africa, provided a basis for discussions at the Ministry of Agriculture, Nature and Food Quality in the Hague.

## Policy issues

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

### Promotion of trade

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

Some projects started in HORTIN with good business contacts and contracts, but most projects are 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. The programme management supports them with advice and action.

On 26 May 2004, the manager of the Indonesia desk of SenterNovem, an agency of the Dutch Ministry of Economic Affairs, Mr Taake Manning, gave a presentation at PRI of the various 'instruments' (subsidy regulations) that SenterNovem and the EU have. Several project leaders also had an individual talk with him to endeavour their possibilities.

At this stage, most projects have established good relations with business partners. These contacts however, are usually still limited to getting to know each other, contributions from the business partner to workshops and excursions, joint exploratory travels, etc. No new B2B projects have materialised so far. Much of it depends on the outcome of the research, which in most cases is just starting up.

Apart from that the excursions and workshop activities have already resulted in many business encounters and matching of institutes with companies. We intend to develop this function as broker in the coming years.

## Knowledge dissemination

Now that results are becoming more and more available, many projects laid emphasis on reaching out of the findings. This is done with 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.



*Figure 5. Participants of the PROTFLOW workshop are discussing the questions.*

GENEBANK, PROCULT, PROTFLOW, PROTVEG1, PROTVEG2, QUALITY, SEEDS, all organised workshops, nine in total, and training courses with participation of private companies and farmers. GARLIC, FRUITFLY, MUSHROOM, and several other projects gave presentations at seminars in Indonesia. Also much on-the-job training was done, *e.g.* by GENE BANK, MUSHROOM, PROTVEG2. In most cases the results of surveys and experimental research were discussed. Attendance of these events is very good and in some cases in which farmers are involved (PROTFLOW, PROTVEG1) the presentations were given in or translated into Bahasa. The SEEDS project produced its first draft seed leaflets, which were commented upon and will be improved and translated as well.





Figure 6. PT East West Seed Indonesia made large contributions to the PROCULT and PROTVEG2 workshops.

Special mention merits the paper presented by the PROCULT staff: S. Hemming, D. Waaijenberg, J.B. Campen, Impron & G.P.A. Bot, 2004. 'Development of a greenhouse system for tropical lowland of Indonesia', at the ISHS International symposium on greenhouses Environmental Controls and in-house mechanisation for crop production in tropics and sub-tropics in Malaysia.

## Institution building

### *Scientific exchange*

All Dutch project leaders visited Indonesia at least once this year, mostly to organise workshops or to take part in survey activities. In addition, five of them went to the Ekspose (see above). During these visits experiences were exchanged and valuable research initiatives were started. Emphasis is always laid on the quality of the research and its focus on possible utilisation.

Thanks to great efforts of all concerned, we could welcome many Indonesian researchers in the Netherlands:

- Ir Muryati, IFRURI, visited PRI and followed an IAC-course on integrated pest management at the International Agricultural Centre (IAC). [FRUITFLY project]
- Mr Anto Hardiyanto, CISTROPHRES, came for an individual training from September-November 2004 to PRI. During this period he was trained to carry out genetic fingerprinting using AFLP for garlic germplasm characterisation. Furthermore he was updated on Dutch agriculture with special reference to Allium breeding and cultivation. In this context he visited breeding companies, extension services and farmers. [GARLIC project]
- Ir Suskandari Kartikaningrum, IOCRI, visited the Dutch Genebank (CGN) for an individual training and followed two IAC courses: Management of Diversity in Genebanks and On-farm and PGR policies and the course on Plant Breeding. [GENEBANK project]
- Dr Etty Sumiati, IVEGRI, visited APR Horst in April 2004 and followed a training in culture collections (maintenance, isolating single spore cultures, etc.) and preparation of spawn. Dr Sumiati also has visited a number of farms in the Netherlands and a spawn producer in Belgium. [MUSHROOM project]
- Dr Witono Adiyoga, IVEGRI, visited APR Lelystad from 11 till 19 of June 2004. To get insight in the Dutch approach of food safety and product quality in the vegetable supply chain he visited different companies representing the different levels in the supply chain: Dutch farmers, NAK AGRO, supermarket, day market and the Food centre. His visit was also used to work out the hazard-analysis and GAP for the Indonesian vegetable supply chain. [QUALITY project]
- Dr Atie S. Duriat received an IAC fellowship for a training course from 22 May to 20 June in the Netherlands. She participated in the IAC Seed Certification Course (10 days), and was trained in seed testing procedures at PRI. [SEEDS project]

- Finally, Ir Adriyanita Adin (Irin) of PT Ewindo was given a personal four days in-house insect scouting training by Wim van den Brink, PRI. [PROTVEG2 project]

The extra subsidy for training provided by DWK greatly helped making our ends meet.

### *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. See also Constraints.

## **Results**

Much progress has been made, which is presented in the individual project reports in the annex. Despite a number of limitations encountered during the year, most projects are running well. Below a short summary per project is given with the projects in alphabetical order.

### **FRUITFLY**

Main activity this year were the experiments with different traps and lures selected. Several traps were tried out and it appeared that a trap made of empty water bottles were as efficient as the best commercial trap. The optimal trap height was determined as well.

The experiment on different amounts of lure is still running and results are expected in February 2005. The determination of different fruit fly species that are caught with different types of lures in a number of crops is still on-going. With both types of lures that are used in the experiments now, more than 20 species of fruit flies were captured. However, only a few species appear to be dominant. It is also shown that the species composition is different among crops.



*Figure 7. Fruitfly trap made of a water bottle.*

A major contact was made with the ACIAR project on fruit fly, which will start next year. The HORTIN project leaders are invited to join the kick-off meeting. Collaboration with ACIAR will facilitate the fruit fly identification and training and also open the possibility for a wider dissemination of our project results.

Involvement of the private sector: Until now no real good contacts exist. Production of one type of lure is done in Indonesia; traps can be made locally as well. Options that are still open are superior lures (we have to await the experimental results) and possibly also poisonous protein baits. These can be made from waste material from breweries, as is done in Vietnam, and contacts will be sought with subsidiaries to Dutch brewers in Indonesia if opportune.

**Highlight: Results of the first trials are promising; many species could be identified.**

## GARLIC

A consumer preference study was completed successfully in cooperation with Brawijaya University, Malang (Dr Ratya Anindita, Faculty of Agriculture). 67% Percent of the consumers from five widespread Indonesian regions said to consume imported (Chinese) garlic, while the remaining consumers (33%) consumed local garlic. The study showed that the price of garlic was not the major limiting factor for consumers to buy. Taste, easy to find, aroma, size, and easy peeling proved to be major factors (31%) affecting consumers in their purchase decision, whereas the influence of price, colour, storage longevity, and usefulness for health was 22%. Indonesian consumers preferred garlic with a strong taste and aroma (pungent), bigger size, and easy peeling.

We conclude that Indonesian garlic agribusiness still has an opportunity on the local market, when they focus on these desired traits. The agronomical part of the project is focusing on the improvement of these characteristics, as pungency is strongly related to the organo-S metabolism and bigger size to the use of *in vitro* culture (for virus elimination and therefore yield improvement) and mycorrhiza (for yield improvement).

Involvement of the private sector: Discussions are ongoing with a Dutch mycorrhiza-producing company. Contacts with potential producers of garlic sets have started and will be intensified in 2005. The prospects for collaboration with companies producing nature-based medicines, either Dutch or Indonesian, will be further investigated.

**Highlight: Gained insight into consumer preferences and promising accessions selected.**

## GENEBANK

Aim of this project is to assist IOCRI with the development of a management system for the genetic resources collection of tropical ornamentals. After establishing protocols for collecting and describing plant materials, much work has been done to enrich the collections. Especially the orchid collection grew, the whole collection was reorganised and brought together in one central place, and the existing material was duly described and registered.



Figure 8. Part of the Zingiberaceae collection at IOCRI.



Much effort was put into the development of the database and discussions on a national level regarding plant genetic resources documentation. Knowledge transfer was intensive, through a 2-week working visit of the Dutch project leader, training of a staff member of IOCRI in the Netherlands for an extended period, and a workshop in Segunung.

Involvement of the private sector: Not applicable for this project.

Highlight: **Improved database structure and exposure of this project through many visits to growers**

## HAPLIN

Aim of the project is to implement haploid technologies at IOCRI and IVEGRI. The technology for cabbage and pepper is available and can be transferred immediately, the technology for haploid *Anthurium* still has to be developed and this is done in conjunction with the SenterNovem-financed InDuAnthurium project.

Once a batch of Indonesian cabbages was grown to flower and embryos could be produced, but the success rate still is rather low. For hot pepper, parameters were studied that are important for implementation under less sophisticated conditions in Indonesia. To that end, the donor-plants were grown in pots instead of the rock wool slap culture with a closed water system used so far, and the results were equally good.

Both PRI and IOCRI continued research on protocol development for microspore embryogenesis in *Anthurium*.

However, both experienced the problem of endogenous bacteria in the plants, which leads to culture contamination. Still this problem has not been solved

IVEGRI has been continuing to fit up the laboratory for microspore culture and to buy equipment. However, progress in this is slow (very crucial is the lack of a low temperature growth room for the cabbage donor-plants), which was concluded during the project mission to IVEGRI in April. Therefore, it was recommended to organise a try-out of the haploid production procedures for pepper and cabbage in the Research Institute for Agricultural Biotechnology and Genetic Resources (Balitbio), Bogor, where most necessary equipment is available, and which is an IAARD institute as well.

Involvement of the private sector: InDuAnthurium contra-financing in 2005 amount to k€ 27.

Based on our results within HORTIN and BIORIN, two Dutch private companies are considering starting commercial partnerships with Indonesia and will request for ISOM and PSOM subsidy from SenterNovem. Activities involved will concern haploid technology in *Phalaenopsis* and hot pepper, respectively.

Highlight: **The protocol for hot pepper was successfully amended for application under tropical conditions.**

## 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, introduce methods of collecting, characterisation and storage of cultures, and by performing collaborate research on spawn production, development of growing media, etc.

Several strains of commercially produced mushrooms were sent to IVEGRI. Different tests with substrate formulates failed due to lack of the appropriate equipment. Money has been transferred again last year from the Dutch part of the project to IVEGRI in order to purchase an autoclave and a laminar flow cabinet as soon as possible.

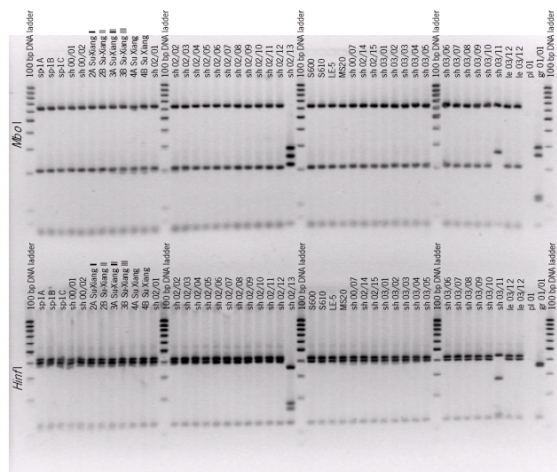


Figure 9. Screening shiitake lines for species identity.

Based on the genotyping 60 strains of shiitake last year, 18 strains complemented with 3 European commercial strains were tested. It appeared that at least 3 and possibly 5 strains do produce well at 24 °C and are thus suitable for cultivation under Indonesian conditions. The trial has been co-financed by CNC Exotics. The results were also useful for this Dutch company because a number of parameters were evaluated that are important for Dutch cultivation systems.

The Indonesian project leader visited APR in April 2004 and followed a training in culture collections (maintenance, isolating single spore cultures, etc.) and preparation of spawn. She also visited a number of farms in the Netherlands and a spawn producer in Belgium.

Involvement of the private sector: So far, only CNC Exotics has invested in testing shiitake strains. Pt. Tata Agro Nusantara Indah prepared a business plan for *Volvariella* production in the Karawang region. Unfortunately, the director had a fatal car accident and the successor now tries to save the company.

CNC Oesterzwammen indicated at the end of 2003 that it would like to invest in research on *Pleurotus* substrate as co-financer in HORTIN. In 2004, however, CNC Oesterzwammen stopped the production of *Pleurotus* substrate. The Dutch project leader will further try to find partners in developing a new technology using bagasse as a substrate for mushroom production. SenterNovem has indicated that this technology can in principle be financed as a TI project.

**Highlight: A number of promising shiitake strains could be selected for growing under Indonesian conditions.**

## PROCVLT

Aim of this project is to develop possibilities for protected cultivation in the lowland. Two sets of three greenhouses have been built each with another type of plastic foil. The design of the greenhouse is such that it should enable protected cultivation in the lowland, avoiding temperature stress and enabling integrated pest management. The design proved successful: the temperature was similar to the surroundings. Simulation models show that larger greenhouses of similar design will also be possible without negative influence on greenhouse climate and crop production (less ventilation, but better crop/greenhouse ratio). Tomato production was about 50% higher compared to open field production. Thanks to the closed nature of the greenhouses and careful insect monitoring, the reduction in pesticide use amounted to 80%. A&F's CFD model to simulate greenhouse climate proved very useful and has shown to speed up research by saving on expensive empirical experiments.

The scientific results were presented during the ISHS symposium in Malaysia in June and during Greensys 2004 in Belgium. Knowledge transfer to Indonesian growers and other interested parties takes place continuously through visits and workshops at PT Ewindo. Many farmers visit the Procvlt greenhouses every month, where they learn about the advantages of the system.

Involvement of the private sector: Both Indonesian and Dutch companies were actively participating in this project, investing with respect to the content and on financial basis. During a period of three years, PT East West Seed Indonesia, Rovero Systems B.V., Plasthill B.V. and Oerlemans Packaging B.V. invested more than € 200.000 in this project.

**Highlight: The PROCULT greenhouse is suitable for lowland vegetable production, giving substantially higher yields.**

## PROTFLOW

The project aims at developing an improved low-cost greenhouse for commercial flower production at mid- and high elevation. This project is run in close collaboration with PROTVEG1. In cooperation with Asian Perlite Ltd two greenhouses were built at the research station located in Segunung. The traditional bamboo greenhouse was built by a local contractor while Asian Perlite Ltd. built the prototype of the Malaysian style greenhouse. The irrigation and fertigation unit was constructed by Asian Perlite Ltd as well. The first experimental chrysanthemum crop has been grown in the greenhouses and the results indicate that both type are suitable for chrysanthemum growing, the wooden house having higher maximum temperatures and lower minimum temperatures, a significantly higher light yield (78% compared to 47% for the bamboo house), and opposing results as to the number of leaves with two different cultivars. The yield figures are still inconclusive due to errors in water dosage. A new test crop will be managed with adapted water management.

Another experiment, run at PT Alam Indah Bunga Nusantara, was designed to find the best rooting medium and to evaluate the usefulness of added fertiliser during that stage. It appeared that the traditional burned rice husk performed best and that additional NPK was favourable for the rooting result. More tests are needed to be able to be conclusive, because also here the amount of water seemed suboptimal for some of the media, especially those with which one did not have experience.



*Figure 10. Substrate experiment conducted at PT Alam Indah Bunga Nusantara.*

The reception of this project by Indonesian flower growers is very enthusiastic. Two workshops have been organised this year, which had a large attendance and were translated from English into Bahasa Indonesia, which resulted in animated discussions. The greenhouses, under construction at first, were visited and discussed during these workshops.

Involvement of the private sector: In 2004 there were different contacts with a large Dutch chrysanthemum breeder. It was agreed to organise a joint mission in 2005 and to present oneself during the HORTIN workshops. It is the intention to deliver the stems to Indonesian growers and to guide and support them with the chrysanthemum cultivation.

Asian Perlite Industries completed the construction of the two plastic houses at IVEGRI in June and contributed extra to the project in time. With this company discussions are on-going to build a cheap plastic house with ventilation in the roof in 2005.

The first experiments in the plastic houses started in June 2004. An Indonesian chrysanthemum producing company is very interested in the experiments. The manager regularly visited the experiments and gave advice. The company hosted the substrates experiment.

Highlight: **Very successful workshops and an interesting first experiment.**

## PROTVEG1

The project aims at developing an improved low-cost greenhouse for commercial vegetable production at mid- and high elevation. This project is run in close collaboration with PROTFLOW. The same two types of greenhouses were built at IVEGRI in Lembang: a bamboo and a wooden house of the 'Malaysian type'.

During the first experiment problems arose with the water supply. The water proved contaminated with bacteria and fungal spores and this resulted in the loss of a lot of plants caused by bacterial wilt. Before starting new experiments in 2005 first this problem has to be solved. In order to ensure a steady supply of clean fresh water a spring is being drilled at the moment. However, because of the presence of rocks in the soil the drilling is not going fast and still unsure is whether the drilling will be completed. If ultimately not successful, methods shall be developed for disinfection of the water.



*Figure 11. Excellent crop management in one of the experimental greenhouses at IVEGRI.*

The first preliminary results show a higher production of the sweet pepper plants in the Malaysian style plastic house. Compared to the bamboo greenhouse more light is available, but also higher temperatures were measured and a higher degree of thrips infestation was observed.

The main preliminary conclusion from the first experiment is that, with adjustments, it is possible to obtain higher production levels by growing sweet pepper plants in a Malaysian style greenhouse.

A workshop was held at IVEGRI on 14 December to present and discuss the results of the experiments and to disseminate information on sweet pepper cultivation in the Netherlands and in Indonesia and information on marketing of sweet pepper under the local conditions. This workshop was attended by about forty persons, amongst which more than 20 Indonesian growers. The project was visited by the Dutch ambassador to Indonesia.

Involvement of the private sector: Asian Perlite Industries completed the construction of the two plastic houses at IVEGRI in June and contributed extra to the project in time and by a moderate discount on the construction costs. In June contacts were established with Oerlemans Plastics, Genderen, to explore the idea of cooperation. At the end of the year the agreement to discuss cooperation was still open, but no opportunity has been found to formulate a definite proposal.

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. Furthermore EWINDO supported the experiments with the donation of 5000 sweet pepper seeds.

Highlight: **The newly introduced Malaysian type greenhouse gave promising results with respect to higher yields.**

## PROTVEG2

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.

In 2003 and 2004 it focused on the greenhouse experiments of PROCULT.

After an initial crop failure due to bacterial wilt, now a successful evaluation of three crops (at the end of the rainy season, during the dry season, and at the beginning of the rainy season) could be made. Experiments showed that it is possible to produce high quality vegetables with an increase in yield of 50% (see PROCULT above) over open field production. Further improvement of cultivation techniques should enable greater yield gains.



*Figure 12. Insect scouting course at PT Ewindo.*

In order to improve Indonesian experience in scouting of tomato pests and diseases, a second scouting course was given at EWINDO, in which two scientists from IVEGRI participated. Later on, a four days-in-house training was organised at EWINDO, after which IVEGRI started the comparison of pest pressure in the greenhouses with the outdoor situation. Preliminary data show a clear reduction in pest pressure in comparison with outdoor production and a major reduction in pesticides. Now that PROCULT has ended, discussions on how to proceed are on-going. Together with IVEGRI a new work plan was established.

Involvement of the private sector: In a meeting last year (December 2004) with Dutch and Indonesian partners from the private sector, their satisfaction with the results of the project was expressed and it was suggested to formulate a follow-up. In January 2005 the partners from the Dutch private sector met together with a representative from SenterNovem (T. Manning), and discussed several options for continuation.

Highlight: **Protected cultivation in lowland makes dramatic reductions in the use of pesticides possible while it increases yields.**

## QUALITY

The project aims at the developing and testing a certifiable protocol for the safe production and product quality of vegetables in Indonesia. For hazard-analysis for food safety and product quality in the Indonesian vegetable supply chain, a brainstorm session was organised conform the HACCP-approach. A HACCP team was formed with several expertises (HACCP, farm management, Indonesian cropping techniques, product quality). The team listed potential risks and made estimations of frequency and severity of these risks. Results were worked out in a concept report and discussed with the Indonesian partners. Scientific foundation of the hazard-analysis by literature research is still under preparation.

During and after the visit of one of the Indonesian project partners to the Netherlands, a concept Good Agricultural Practice (GAP) was worked out. This concept is based at the HACCP-analysis, the Eurep GAP protocol and the inventory made in Indonesia in 2003. The concept contains a checklist and registration forms.

A workshop was organised at IVEGRI, to discuss the results of the project, especially the concept Good Agricultural Practice. Participants were 18 persons (growers, packers Bimandiri and Pandu Tani, supermarket Carrefour, research and Indonesian Centre of Standardisation and Accreditation). To improve the discussion and the awareness of the chain partners about food safety aspects a test was developed about the attitude to food safety and quality in the vegetable supply chain. The discussion during, and after the workshop resulted in an improved GAP. This will be tested in 2005 in practice.

Involvement of the private sector: As a result of contacts with the PBSI-project Strengthening Food Safety Indonesia, contact was made with Mr Ir Syukur Iwantoro, Director of the Centre for Standardisation and Accreditation in Indonesia (CSA). He was invited to give a presentation at our workshop at IVEGRI October 11, 2004. During the workshop arrangements were for further cooperation with CSA. The project seems to fit quit well into the certification strategy of CSA and CSA will be involved in improving and testing the GAP.



Figure 13. Visit to PT Bimandiri.

During the workshop the manager of PT Bimandiri expressed his willingness to participate in the 2005 test of the GAP-documents. Bimandiri is a packer who processes vegetables which are bought from growers and sold to Carrefour. A group of growers who supplies Bimandiri was also willing to participate in the 2005 test of the GAP-documents.

Contacts were made with Mr Winaryo of Skal International in Indonesia focused about Eurep-GAP certification. Contacts were established with Elmar Bouma of INA and secretary of a new Partnership Programme focused at partnerships between growers and the private sector in Indonesia. This programme is funded by the Dutch government, Agriterra and Cordaid.

Highlight: **A well-discussed GAP protocol was established.**



## 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. The first new detection techniques for seed-borne fungi, bacteria and viruses have now been introduced into Indonesia. Facilities still have to be developed to be able to carry out some of the tests in a good way.

The presence of seed-borne diseases of tomato, hot pepper and shallot on Java were surveyed by observation of field crops on 12 locations and by analysing 20 seed samples per crop, either directly or after growing plants from seed. Characterization was done on the basis of symptoms (for all pathogens), on microscopic structures (for fungi), ELISA (for viruses), whereas some seed samples were also analysed for bacteria by dilution plating. The results of the survey will be published on internet (webpage HORTIN-programme).

Drafts were prepared of information leaflets on *Alternaria solani* in tomato and *Clavibacter michiganensis* subsp. *michiganensis* in tomato. A draft on tobamoviruses in tomato (TMV and ToMV) is in preparation. The drafts were evaluated by staff of EWINDO and from the MoA seed inspection department and considered as useful.

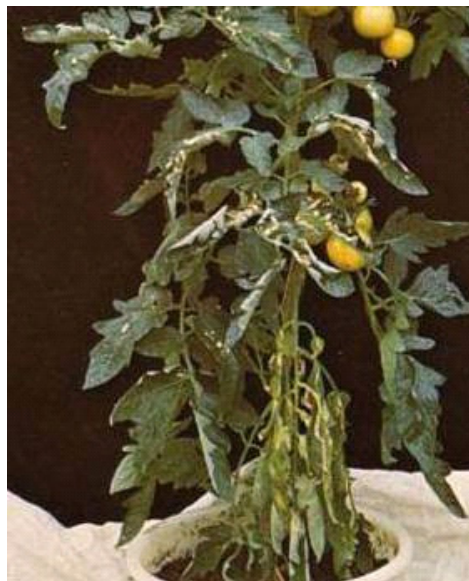


Figure 14. Illustration taken from the draft information leaflet on bacterial canker in tomato.

The 1<sup>st</sup> HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia was held in Lembang from 19 to 21 January 2004. The first day was used for seminars on phytosanitary regulation in Indonesia, on the status of vegetable seed production in Indonesia and managing strategies for seed-borne diseases on vegetables. The seminars were attended by 50 participants. The second and third day 12 participants from IVEGRI, the seed inspection, IPB, IOCRI, PT Selektani, and PT San Hyang Seri were trained in international standard procedures for seed health testing.

Dr A.S. Duriat received an IAC fellowship for a short training period from May 22 to June 20 in the Netherlands. She participated in the IAC Seed Certification Course (10 days), and was trained in seed testing procedures at PRI. During her stay several seed samples, produced in Indonesia, were analysed for the presence of fungi, using a blotter test, and bacteria, using dilution plating methods.

Due to a surgery of Dr A.S. Duriat, the second workshop had to be postponed to 2005

Involvement of the private sector: During the workshop, seed specialists from PT Selektani and PT San Hyang Seri were trained. PT Ewindo has provided strains and information on the occurrence of seed-borne diseases. In 2005, Mrs Nur Vajrina of PT Ewindo, who has been provided a StuNed fellowship, will visit PRI for 2 months to further develop her skills and expertise in seed testing.

Highlight: **The first survey on seed-borne diseases in Indonesia has been published.**

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 were initiated to increase the 'visibility' of the programme.

As has been mentioned, we developed a duplicate set of posters for all to use to present the programme and to start discussions with interested persons. All project posters were bilingual. A small brochure was made, which is being used as handouts during meetings and workshops.

All project results will be published in scientific journals, both in Indonesia and internationally. Next to that, the project leaders have been encouraged also to present their (preliminary) results in professional journals in both countries, especially to generate interest in the business community.

In order to reach the policy makers and our paying client, the Ministry of Agriculture, Nature and Food Quality, HORTIN was asked to join the 'Kennisonline' (Knowledge Online) website of WUR.

Since mid 2004 this webpage is now available ([www.kennisonline.wur.nl](http://www.kennisonline.wur.nl)). The site gives a brief on the programme goals and provides the reader with links to partners and downloadable reports and other files. Unfortunately the language is Dutch until HORTIN is reached, when we present our results in English, but even then the (fixed) headings are in Dutch. Nevertheless, much information can be viewed and downloaded through that site. You are invited to have a look.

Finally, an article was devoted to HORTIN in a printed version of Kennisonline, which is distributed within the Ministry.

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.

## Remarks

### GARLIC

At present the Programme Board questions the possibilities of this project to engage into good business arrangements. It wishes to see an economic analysis of the business opportunities. This project has had a hesitant start due to internal discussions within Indonesia about the relevance of renewed research on garlic. A mandate problem also slowed progress in the beginning. Despite these problems, the researchers made considerable progress and the project is now active on several fronts: creation of a tropical garlic gene pool, genetic characterisation and mapping, seed production, tissue culture to reduce virus contamination, and mycorrhiza work to increase production. A consumer preference study was carried out and a socio-economic study is planned for 2005. Both these studies will be carried out in collaboration with Brawijaya University.

### PROCULT

Thanks to an extra grant from the Ministry of Agriculture, Nature and Food Quality the input of A&F in PROCULT could be supported financially. This ensured the continuation of the programme, of which several protected cultivation projects are dependent, most notably PROTVEG2. A&F, PRI and their industrial partners are presently formulating a follow-up on this project.



## Constraints

The main constraints, *viz.* mobility and equipment, have been brought under the attention of the Working Party on Agriculture (see above). We are glad that these issues have been taken up seriously and the first results are promising.

Fortunately the mobility of Indonesian researchers could be increased due to serious efforts on both sides. We hope to acquire the same (financial) support in 2005.

Some essential equipment is 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 a lot of effort has been made to free funds from the Dutch budget. Hopefully this will, in combination with the extra efforts intended by the Indonesians, 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.

*Acronyms and abbreviations.*

English acronym	Indonesian acronym	Full English name
A&F		Agrotechnology & Food Innovations
ACIAR		Australian Centre for International Agricultural Research
AIAT	BPTP	Assessment Institute for Agricultural Technology
	Balitbio	Research Institute for Agricultural Biotechnology and Genetic Resources
APR		Applied Plant Research
B2B		Business-to-Business
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
DWK		Directorate for Science and Knowledge Dissemination
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

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

- 1. Project title** : Fruit fly control in Indonesia (FRUITFLY)
- 2. Project number** : PRI 7400020500
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### 5. Participating organisations

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

## 7. Results

### 7.1. Output and impact

Three activities were planned for 2004:

1. Completion of literature survey on bioactive compounds for fruit flies and possibilities for post-harvest control.
2. Development of trapping devices.
3. During the year field experiments will be performed to test the efficiency of different trap types and amounts of lures.

A 4<sup>th</sup> activity that came up during the year was a visit to Brisbane, Australia during the International Conference on Entomology to meet Dr Drew and colleagues. They will start in 2005 collaboration on fruit flies in Indonesia.

Activity 1 has been completed. A CD with an overview of literature on fruit fly control is available and was transferred to IFRURI. Conclusion based on discussions with importers of tropical fruits indicated that the project should focus on reduction of damage in the primary production.

Activity 2 has been completed. Different trapping devices have been tested in the field and their efficiency was compared. It appeared that self-made traps from water bottles were more efficient than several other trap types and almost as efficient as the best commercial trap tested. The optimal trap height was determined in field experiments. For further tests and proof of concept, traps made from water bottles can be used.



Figure 15. Commercially available trap in citrus.

Activity 3, testing of different amounts of lures, is still running and results are expected in February 2005. The determination of different fruit fly species that are caught with different types of lures in different crops is still going on. With both types of lures that are used in the experiments more than 20 species of fruit flies were captured. However, only a few species are dominant. It is also shown that the species composition is different among crops.

Activity 4: Dr Drew and colleagues from Griffith University in Brisbane will start a research cooperation with Indonesian partners in 2005. We discussed the two projects and agreed to cooperate. Drew, who is also an expert fruit fly taxonomist, is willing to assist the researchers of IFRURI in identification of fruit flies and IFRURI researchers are welcome to join taxonomy workshops in Jakarta. Ahsol and De Kogel plan to participate in the kick-off meeting of the Australian-Indonesian project in order to optimize cooperation.

## 7.2. Training, technology transfer and knowledge exchange

Three activities were carried out in 2004:

1. Ir Muryati visited the Netherlands, participated in the IAC IPM-course, and discussed the progress in the fruit fly project at PRI.
2. Discussion with Dr Drew in Australia on possibilities for taxonomy training courses.
3. Visit of De Kogel to Indonesia for evaluating 2004 and planning 2005 and participation in Expose Inovasi Teknologi Hortikultura Indonesia 2004.

Activity 1: Muryati came to the Netherlands to participate in the Integrated Pest Management course from IAC. During here visit she took the results from the fruitfully project with her to discuss the progress. She also visited the labs at Plant Research International.

Activity 2: It was agreed with our Australian colleagues that researchers from IFRURI can participate in taxonomy workshops organized by Drew and colleagues.

Activity 3: De Kogel visited Solok in December 2004. The progress and planning for 2005 were discussed and an experimental site was visited. De Kogel and Ahsol also participated in the Expose Inovasi Teknologi Hortikultura Indonesia 2004. There was a special HORTIN stand with a bilingual poster and demonstration material (including copies of a special prepared fruitfully brochure). De Kogel and Ahsol participated in a business meeting and a workshop.



Figure 16. Hortin booth at the Ekspose, Solok 8-10 December.

## 7.3. Involvement of companies

In Australia I discussed with Dr Drew the development of protein baits: these protein-based baits are attractive for females. The baits contain 0.01% of Fipronil (an insecticide from BASF). Drew was very successful using this in experiments in Vietnam in peach. The raw material for these baits is waste from beer breweries. We will discuss further if we can involve breweries in the Netherlands that have breweries in Indonesia in the research project. This could be an interesting matching opportunity for the fruit fly project.

**7.4. Reports and publications**

- Ahsol Hasyim & Muryati, 2004. Lalat Buah: A brochure on fruit fly pest status and control options.
- Kogel, W.J. de, 2004. CD with literature survey on bioactive compounds for fruit flies and possibilities for post-harvest control.

**7.5. Presentations**

- Fruit fly control in Indonesia. Presentation at meeting with Diyanto Imam (Assistant Counsellor - Agriculture, Nature and Food Quality The Royal Netherlands Embassy at Jakarta), November 9, Wageningen by W.J. de Kogel.
- Informasi hasil penelitian hama lalat buah. Presentation at fruit fly workshop, December 2004, Jakarta, by Ahsol Hasyim.
- Project FRUITFLY: Fruit fly control in Indonesia. Poster presentation at Ekspose Inovasi Teknologi Hortikultura, December 8-10, Solok.

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

- 1. Project title** : Revitalising Indonesian garlic agriculture (GARLIC)
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### 5. Participating organisations

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- 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-term objectives 2004*

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

#### Socio-economics

- Analyzing consumer preferences with respect to indigenous and foreign garlic.
- Updating and maintenance of garlic economic database.

#### Agronomy/breeding

- Collection and evaluation of garlic accessions and development of an INDO core collection.
- Application of meristem culture and mycorrhizas to improve garlic quality.



### *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. The socio-economical part of this study will consist of a consumer preference study and the updating and maintenance of a large garlic agro-economic data base. The agronomy/breeding part will encompass collection & evaluation of garlic strains and quality increase.

## **7. Results**

### **7.1. Output and impact**

The following activities were planned to be carried out in 2004:

1. Execution of a consumer preference test by CISTROPHRES.
2. Updating and maintenance of a garlic economic data base by IVEGRI.
3. Finishing of collection and evaluation activities of garlic germplasm by CISTROPHRES and PRI.
4. Initiation of meristem culture by CISTROPHRES.
5. Initiation of mycorrhiza research by CISTROPHRES and PRI.



*Figure 17. The cultivation of garlic on Java.*

In 2004 we realised the following:

#### *1. Execution of a consumer preference test*

There is limited information available about the garlic consumption behaviour or consumer preferences on garlic in Indonesia. However detailed information on this issue is important given the flooding of the Indonesian market during the last decade with garlic imported from PR China and its consequences for local garlic production. Therefore, together with Brawijaya University - Malang (Dr Ratya Anindita, Faculty of Agriculture), CISTROPHRES and PRI carried out a study on current Indonesian consumer trends in garlic. The objective of this research was to provide an overview of characteristics, attitude, behaviour, and preferences of garlic and to indicate which market possibilities are open for local garlic production (for a more detailed description of the research see: Hardiyanto, 2004). More than 70% of consumers were able to differentiate between garlic types (local and imported garlic) in the market. Sixty-seven percent of the consumers from five widespread Indonesian regions consumed imported garlic, while the remaining consumers (33%) also consumed local garlic. Only in Mataram (NTB) a high percentage of consumers (70%) said to consume local garlic. The study showed that the price of garlic was not the major limiting factor for consumers. Taste, easy to find, aroma, size, and easy peeling proved to be major factors (31%) affecting

consumers in their purchase decision, whereas the influence of price, colour, storage longevity, and usefulness for health was 22%. Indonesian consumers preferred garlic with a strong taste and aroma (pungent), bigger size, and easy peeling.

Based on this research, we conclude that Indonesian garlic agribusiness still has an opportunity on the local market, when they focus on garlic which has a strong taste and aroma (pungent), bigger size, and easy peeling which are desired by consumers. The agronomical part of the GARLIC HORTIN project is focusing on the improvement of these characteristics, as pungency is strongly related to the organo-S metabolism and bigger size to the use of *in vitro* culture (for virus elimination and therefore yield improvement) and mycorrhiza (for yield improvement).

### *2. Updating and maintenance of garlic agro-economic data base*

An in-depth discussion took place between Dr Witono Adiyoga from IVEGRI Lembang and Dr Chris Kik (PRI) on this aspect of the GARLIC project when Dr Witono was visiting the Netherlands in June 2004. It appeared that Dr Witono certainly would like to cooperate personally in this project but that he is not allowed to do so because his institute (IVEGRI) has no the mandate for this crop anymore: the mandate is now with CISTROPHRES. So this means that this part of the project will be terminated.

### *3. Collection and evaluation of garlic accessions and development of an INDO core collection*

#### Collection of garlic accessions

The garlic collection activities started immediately after the start of the project. The collection in the Netherlands at the start of the project consisted of approximately 90 garlic accessions from non-tropical origin. During 2003 and 2004 a number of tropical accessions from Indonesia (3) and Nigeria (17) were added to this collection. So in total the Dutch collection consisted of 110 garlic accessions. It is important to have such collections because the accessions may differ genetically and possess various traits that are important in order to improve varieties. The cultivation of the tropical material in Dutch conditions proved to be poor. This is most probably due to day length dependency. On the Indonesian side, the garlic collection consisted at the start of the project of 8 different garlic clones. In 2003, 19 accessions from the Dutch garlic core collection and 17 accessions from Nigerian origin obtained via PRI Wageningen were added to the collection. In 2004, 12 Indonesian garlic clones were collected from several centres of production in Indonesia and added to the collection. The introduced garlic accessions from the Netherlands showed poor growth and all of them died. The accessions from Nigeria, on the other hand, were able to produce bulbs although they had generally small sizes (1.2 - 3.5 cm in diameter) and low bulb weight (2 - 25 g). Harvesting time for the Nigerian accessions ranged from 90 - 125 days after planting. Four Nigerian garlic accessions were identified as promising and perhaps they can be developed into new garlic varieties for the Indonesian application.

Currently at PRI we are busy to genetically fingerprint both collections using AFLP technology in order to obtain an overview of the genetic relatedness of the material.

#### Evaluation of garlic accessions

On the Dutch side the garlic accessions were first characterized according to the garlic group they belonged to according to the Maass & Klaas classification. We managed to obtain a well balanced collection as it now contains also tropical accessions (group V). Garlic accessions were evaluated for three characteristics: (1) the absence of the most important *Allium* viruses, (2) the amount of organo-S compounds and (3) the sexual fertility.

The most important *Allium* viruses are onion yellow dwarf virus (OYDV) and leek yellow stripe virus (LYSV). These viruses can reduce the yield separately up to 60%. Virus analyses took place using a double antibody sandwich ELISA technique, a technique well known for its ability to detect viruses. We found that 7 garlic accessions were free of OYDV and 12 were free of LYSV. In only 3 accessions neither OYDV nor LYSV virus was detected. We also observed that we could not always completely rely on the DAS-ELISA bioassays for the identification of virus resistant accessions, as we found virus symptoms in the field on an accession that was scored as virus free. In some cases the opposite proved to be true as well. In general, a positive correlation was observed between field and bio-assays.

Organo-S compounds have health-beneficial effects. These compounds were analysed in the garlic collection using IP-HPLC. It was shown that there was substantial variation present in specific organo-S compounds like alliin, iso-alliin and their peptide precursors. For alliin there was a threefold difference between the lowest and the highest producing accession, for iso-alliin this proved to be 15 fold, for the glutamyl precursor of alliin it was 10 fold and for

the glutamyl precursor of iso-alliin this was 2 fold. Therefore this collection is very interesting for the selection of those garlic clones which can accumulate these compounds.

The next trait that was analysed was sexual fertility. Multiplication of plant material through seed will reduce the problems with viruses. It was found that 26 of the clones could produce true seeds. The number of seeds per flowering plant was in the order of 50. Germination was not good as less than 5% of the seeds produced plants. Most probably this is due to the Dutch climatic and day length conditions during seed set. Under Mediterranean conditions we found that germination can be considerably higher. Furthermore we analysed pollen fertility of the garlic accessions and found that some accessions produced no fertile pollen, but since there was seed set, this suggests that these plants are male sterile.

On the Indonesian side, garlic clones have been characterized in 2004 based on morphological characteristics, biochemical traits using isozyme analysis, and molecular markers using RAPDs. Based on these analyses, Indonesian garlic clones could be divided into two main groups with levels of genetic similarities within the groups of 0.73 - 0.94; and 0.69 - 0.91. These results were mainly based on RAPD and isozyme analyses. An activity which is still to be done is organo S compound analysis for all Indonesian garlic clones.



Figure 18. Indonesian garlic.

#### 4. Application of meristem culture to improve garlic quality

In order to develop virus-free Indonesian garlic clones, *in vitro* shoot proliferation was applied on clones derived from meristem-tip culture. This work has been carried out in the Tissue Culture Lab, CISTROPHRES, Batu. Before meristem tips were cultured for virus elimination, studies were made to select the best medium for shoot proliferation as well as bulb formation. Preliminary experiments indicated that the range of newly formed shoots per explant was only 1 - 9 shoots. The Sanggah cultivar was able to produce 9 completely new plants treated with LS + 52.5 mM KNO<sub>3</sub> + 3.5 mM NH<sub>4</sub>CL + 22.5 ppm BA + 9.3 ppm NAA, then followed by cultivar Saigon (8 plants/explant) treated with LS + 48 mM KNO<sub>3</sub> + 12 mM NH<sub>4</sub>Cl + 22.5 ppm BA + 9.3 ppm NAA. The bulb producing garlic ranged of 1 to 5 cloves per explant with LS + 30 % Sucrose or ½ MS + 10 ppm IBA + 0.1 ppm BA. Currently this research is still ongoing. Detection whether virus can be transmitted via meristem tips will be carried out in 2005.

#### 5. Application of Mycorrhiza to improve garlic quality

The research on mycorrhiza was conducted in the greenhouse using 3 garlic clones and 2 types of mycorrhiza (*Glomus etunicatum* and *Gigaspora margarita*, added to the soil in tablet form). For one pot 2 tablets (40 spores) were added to soil which was sterilized using formalin. The results showed that significant differences of vegetative growth, yield, and yield components were due to clones instead of mycorrhiza treatments. Moreover, the infection percentage was very low; it was about 22 % for both *Glomus etunicatum* and *Gigaspora margarita*. Most probably the results obtained can be explained by assuming that the mycorrhiza treatment was not effective due to the presence of formalin. Based on this result, this study will be repeated in normal non-sterilized soil in the field.

## 7.2. Training, technology transfer and knowledge exchange

A. Hardiyanto has studied in the Netherlands from September-November 2004. During this period he was trained to carry out genetic fingerprinting using AFLP for garlic germplasm characterization. Furthermore he was updated on Dutch agriculture with special reference to *Allium* breeding and cultivation. In this context breeding companies, extension services and farmers were visited.



*Figure 19. Visit to Advanta Breeding Company (Rilland, Zeeland, the Netherlands). From left to right: Ir Reinout de Heer (onion breeder Advanta), Dr Anto Hardiyanto, Ir Sjaan Hopmans (onion breeder Advanta), Dr Chris Kik (Allium coordinator, PRI, the Netherlands).*

## 7.3. Involvement of companies

- Based on the results of the consumer preference study that has been carried out in 2004, we have enough reasons to visit both EWINDO and the farmer's cooperative on Lombok again in 2005 to discuss further possibilities for a multilateral project.
- In 2004 a discussion was started with a Dutch company, which is involved in the application of mycorrhiza for commercial purposes. We have plans for further contacts with this company in 2005 because also from other research projects we are able to show them very interesting results regarding improved yield of crops and special components.
- CITROPHRES has contacts with a phytopharma company in Surabaya: they already use garlic extracts for the production of a traditional medicine. We think that they could be potentially interested in garlic with higher concentrations of active compounds.
- In order to improve the quality of Indonesian garlic with respect to the production of virus-free materials, we plan to visit in 2005 the Association Asbenindo (tissue culture producers) and the company Stekindo.

## 7.4. Reports and publications

- Hardiyanto, A., 2004. Consumer preferences on garlic in Indonesia. Report of CISTROPHRES-BATU and PRI.

## 7.5. Presentations

- Project GARLIC: Revitalising Indonesian garlic agriculture. Poster presentation at Ekspose Inovasi Teknologi Hortikultura, December 8-10, Solok.
- Poster by CISTROPHRES on garlic research. Poster presentation at Ekspose Inovasi Teknologi Hortikultura, December 8-10, Solok.

## 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, Pacet, 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).



Figure 20. *Phalaenopsis* orchid collection.

## 7. Results

### 7.1. Output and impact

#### *Output*

In the second year of the project substantial progress has been made and the following highlights can be mentioned:

- New material of several families, including *Orchidaceae* (several orchid genera such as *Dendrobium*, *Phalaenopsis*, *Vanda*, *Spathoglottis*, etc.), *Araceae*, *Zingiberaceae*, *Agavaceae*, *Bromeliaceae*, *Palmae*, *Euphorbiaceae*, etc. was introduced. Emphasis was given on the broadening of the orchid collection and 151 new accessions were collected from different sources in Indonesia including East and West Java and Bali. 20 accessions were obtained from Thailand.
- The organisation of the collections was highly improved and collections were brought together in greenhouses and in the field
- The collections of Calla Lily, orchids, *Anthurium* and *Palmae* were partly characterised and descriptor lists for orchids and *Anthurium* were published (Kartikaningrum *et al.*, 2004; Solvia *et al.*, 2004).
- Inventory, documentation and updating for passport data of the orchid, *Anthurium* and *Zingiberaceae* collection was further conducted. The standardisation of data and subsequent documentation is an ongoing activity of IOCRI.
- During the visit to IOCRI early December 2004, the structure of the IOCRI database was intensively discussed. Weaknesses in the passport tables and their relationships and important gaps in the structure of the characterisation / evaluation data tables were identified. As the IOCRI database is under development and only contains data for testing purposes, the proposals for improvements were in-time. A draft version including the structure of the IOCRI database has been recently published by the database manager of IOCRI (Pramurjadi, 2004)
- The training facilities provided through the HORTIN project has improved the quality of the PGR management of IOCRI effectively (see 7.2)
- During a one day workshop on 'Collection Management of Genebanks and GENIS, the Documentation system of CGN', held on 6 December 2004 at IOCRI's headquarters at Segunung, four papers were presented by the staff of IOCRI and CGN (see 7.5). The structure of the IOCRI database as well as GENIS, the database of CGN, were presented and discussed during the workshop.

#### *Impact*

Discussions with the members of the Germplasm Working Team of IOCRI and the training of Mrs Suskandari Kartikaningrum in the Netherlands have highly improved the knowledge of Genetic Resources management at IOCRI.



A reorganisation of the conservation of the different collections, grouping the same families together in greenhouses and the field genebank has resulted in a better overview and easier management of the collections.

The IOCRI collections of ornamental crops have been substantially increased with new material. Particularly the orchid collection was broadened with material collected by different growers all over Indonesia (see Mission Report 2004). The visit to these growers is not only important for the extension of the IOCRI collections but delivers information and provides insight in the operation of the growers and the potential markets for ornamental crops. Furthermore, the growers get acquaintance with the existence of the genebank of ornamental crops of IOCRI.



Figure 21. Collection of pot plants at IOCRI.

The collections are now much better accessible and can be easier characterised. Development of descriptor lists for a number of families increased the knowledge of the collection and will contribute to a better utilisation.

The documentation of the collections has received much attention in 2004. The structure of the database is further developed and can be finalised in the very near future. The database manager of IOCRI is in close contact with the national coordinator for documentation of all PGR collections hold by institutes in Indonesia. Therefore the discussions may have an impact on the national system for PGR documentation. The national coordinator for documentation participated in the discussions on the documentation system of IOCRI and indicated interest in further cooperation in this field with CGN.

The workshop on PGR management on 6 December 2004 was visited by more than 50 interested researchers from different institutes and universities and the discussions were very animated.

## 7.2. Training, technology transfer and knowledge exchange

Mrs Suskandari Kartikaningrum, member of the IOCRI Germplasm Working Team, curator and of the orchid collection and also involved in breeding research in some economical important orchid genera (*Dendrobium*, *Vanda* and *Phalaenopsis*) visited Wageningen from April 26 to June 18, 2004 for further training. The training was divided in the following three modules:

### A. Course 'Agrobiodiversity Management of Diversity in Genebanks and On-farm PGR policies (April 26 - May 7)

- Context of genebank management, objectives and responsibilities.
- Genebank Management procedures and practical training.
- Documentation and methodology of PGR.
- Economics of genebanks.
- Agro-ecosystems.
- In-situ conservation.
- Conservation and development.
- Project planning.

#### B. Individual training in PGR management (May 10 - June 3)

- Practical training in Plant Genetic Resources Management, including regeneration, characterisation, documentation and utilisation of PGR.
- Plant variety research, including description of DUS factors.
- Discussions with PRI researchers on breeding, in vitro culture and molecular markers of ornamental crops.
- Excursions to the Phytosanitary Service, Aalsmeer auction and three companies working on ornamental crops (orchids, *Anthurium*).

#### C. Course on design of Plant Breeding programmes (7-18 June)

- Theoretical concepts.
- Practical decisions.
- Size breeding programme and budgets.
- Decision making targeted to development of new cultivars.

The two courses were organised by IAC, whereas the individual training was conducted at CGN. Mrs Suskandari Kartikaningrum was very satisfied with the training opportunities and wrote a report about her training in the Netherlands (Kartikaningrum, 2004). The project leader and director of IOCRI, Dr Kusumah Effendie requested to organise a similar training in 2005 for another member of IOCRI's Germplasm team Mrs Nina Solvia in 2005.

A workshop was organised at IOCRI's headquarters on 6 December 2004 (Collection Management of Genebanks and GENIS, the Documentation system of CGN). Papers were presented by staff members of IOCRI and CGN (see 7.4). General PGR management and documentation aspects were discussed.

More than 50 researchers of IOCRI and different other institutes and universities of West Java participated in this workshop.



*Figure 22. Good storage of seeds is essential for maintaining a Genebank.*

### **7.3. Conclusions**

During the second year of the project substantial progress was made in acquisition of new collection material and the PGR management of the ornamental crops of IOCRI. Parts of the collections are now much better accessible and characterisation and evaluation activities can be conducted. The structure of the database has been further developed and can be finalised in the very near future. The knowledge transfer facilitated by CGN contributed to improvement of the PGR management of IOCRI's collections of ornamental crops.



#### 7.4. Reports and publications

- Kartikaningrum, S., 2004. Training report on Agro-biodiversity and Plant Breeding and Individual training in plant genetic resources management and plant variety research (April 26 –June 18, 2004). HORTIN/IOCRI/CGN/IAC.
- Kartikaningrum, S., D. Widiastoety and K. Effendie, 2004. Panduan Karakterisasi Tanaman Anggrek (Descriptor list for Orchid species). IOCRI, Segunung/Cipanas, Indonesia.
- Pramurjadi, A., 2004. Progress report of Ornamental Germplasm MIS IOCRI. IOCRI, Segunung/Cipanas, Indonesia (Draft version).
- Soest van, L. J. M., 2004. Report of a mission (October 12-27, 2003) to IOCRI-Genebank, Segunung, Indonesia. Mission report HORTIN programme, Wageningen.
- Soest van, L. J. M. and H.T. Hoekstra. 2005. Report of a mission (November 30 to December 15, 2004) to Indonesia. Mission report 20, HORTIN programme.
- Solvia, N., Y. Sulyo and K. Effendie, 2004. Panduan Karakterisasi Tanaman *Anthurium*. (Descriptor list *Anthurium* species). IOCRI, Segunung/Cipanas, Indonesia (Draft version).

#### 7.5. Presentations

- Laporan perjalanan ke Belanda (Training report in Netherlands), Presentation at IOCRI, November 5, Segunung/Cipanas, by S. Kartikaningrum.
- GENIS, the documentation system of CGN. Presentation at IOCRI Workshop 'Collection Management of Genebanks and GENIS, the Documentation system of CGN. December 6, Segunung/Cipanas, by H.T. Hoekstra, J. L. van Hintum and F. B. J. Menting.
- Sistem informasi Manajemen Plasma Nutfah Tanaman Hias (Database Management System for Germplasm) of IOCRI. Presentation at IOCRI Workshop 'Collection Management of Genebanks and GENIS, the Documentation system of CGN. December 6, Segunung/Cipanas, by A. Pramurjadi.
- Collection management of Genebanks. Presentation at IOCRI Workshop 'Collection Management of Genebanks and GENIS, the Documentation system of CGN. December 6, Segunung/Cipanas, by L.J.M. van Soest.
- Data base Tanaman Hias.(Databases of IOCRI). Presentation at IOCRI Workshop 'Collection Management of Genebanks and GENIS, the Documentation system of CGN. December 6, Segunung/Cipanas, by N. Solvia.
- Project GENE BANK: Management of field collection of tropical ornamentals. Poster presentation at Ekspose Inovasi Teknologi Hortikultura, December 8-10, Solok.

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

**1. Project title** : Introduction of haploid technology in breeding programmes in Indonesia; hot pepper, cabbage, and *Anthurium* (HAPLIN)

**2. Project number** : PRI 7700017100

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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, Bogor, Indonesia
- Senter International, 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 in 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 future facilitating breeding and production of F1 hybrid varieties, allowing to replace 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 Ir Ence Darmono 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 on 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 to be carried out in 2004:

1. Transfer of hot pepper and cabbage microspore culture technology to the local institute IVEGRI.
2. Development of a microspore culture protocol for *Anthurium*.
3. Training and knowledge transfer.

For the first activity, we continued microspore experiments in both crops at PRI. Once a batch of Indonesian cabbages was grown to flower, the microspores were responsive, and embryos were produced, but the success rate still had to be improved. As for the hot pepper procedure, we mainly studied parameters important for the technology implementation under less sophisticated conditions in Indonesia. The donor-plants were grown in pots instead of the rock wool slat culture in a closed water system used so far, and microspore embryogenesis results were the same as earlier. A combined antibiotic treatment was found that was very promising in controlling bacteria that frequently contaminated our hot pepper cultures in Indonesia. Most important, this antibiotic mixture did not hamper the embryo production from the microspores.



Figure 23. Haploid and diploid pepper plants.

IVEGRI is continuing to fit up the laboratory for microspore culture and to buy equipment. However, progress with this is slow (very crucial is the lack of a low temperature growth room for the cabbage donor-plants), which was concluded during the project mission to IVEGRI in April. Therefore, it was recommended better to have a try-out of the haploid production procedures for pepper and cabbage in the Research Institute for Agricultural Biotechnology and Genetic Resources (Balitbio), Bogor, where most necessary equipment is available, and which is an IAARD institute as well. Dr Suyanto, director ICHORD, and also responsible researchers at IVEGRI agreed with the proposal to choose Balitbio for an immediate demonstration of the available protocols and they expressed their willingness to assist in necessary actions to get formal agreements, etc.



Figure 24. Mr Budi Winarto (IOCRI) with microspore cultures.

For the second activity, both PRI and IOCRI continued research on protocol development for microspore embryogenesis in *Anthurium*. However, both experienced the problem of endogenous bacteria in the plants, which leads to culture contamination. Still this problem has not been solved. For a while we had the idea that inflorescences grown in Indonesia would suffer less from the problem. But after a couple of shipments of *Anthurium* material from Segunung to Wageningen (brought along by colleagues), we had to conclude that the expected advantage did not exist. Further approaches to overcome the bacterium contamination, and results obtained, are mentioned in more detail in reports to SenterNovem, which is contra-financing the research on *Anthurium* in a collaboration with Agriom, Aalsmeer.

In the framework of the third activity we visited the partner institutes in Indonesia from April 12 to 17. Two seminars were organised, in which various microspore culture systems were presented and mutual experiments were discussed (see papers below). Local bottle-necks hampering implementation of the haploid technology in the local labs became evident, but we found the possibility for performing the cultures first at Balitbio (planned for 2005), so that the haploid technologies can now finally be transferred to Indonesia.

## 7.2. Training, technology transfer and knowledge exchange

Our visit to IVEGRI and IOCRI, April 12-17, has substantially contributed to training, technology transfer, and knowledge exchange. Further training items were the following:

- Unfortunately, Mr Djoko Pinilih, IVEGRI, who was awarded a six months IAC-fellowship for training in microspore culture, could not come for this training in 2004, as he did not finish his MSc on time.
- After consultation with IAC staff, Ir Budi Winarto, IOCRI, was given the possibility to take over Pinilih's IAC fellowship. He will start his training in Wageningen as of February 2005.
- Mr Djoko Pinilih applied again for an IAC fellowship in 2005, but we didn't hear the decision yet.

### 7.3. Involvement of companies

InDuAnthurium contra-financing in 2005 will amount k€ 27.

Based on our results within Hortin and Biorin, two Dutch private companies are considering starting commercial partnerships with Indonesia and will request for ISOM and PSOM subsidy from SenterNovem. Activities involved will concern haploid technology in *Phalaenopsis* and hot pepper, respectively.

### 7.4. Reports and publications

- Custers, J.B.M., 2004. HAPLIN project mission; visit to Indonesia, April 12-17, 2004. Mission Report 13. HORTIN programme.
- Supena, E.D.J, 2004. Innovations in microspore embryogenesis in Indonesian hot pepper (*Capsicum annuum* L.) and *Brassica napus* L. Thesis Wageningen University, Wageningen.
- Supena, E.D.J, S. Suharsono, E. Jacobsen and J.B.M. Custers, 2005. Successful development of a shed-microspore culture protocol for doubled haploid production in Indonesian hot pepper (*Capsicum annuum* L.). Plant Cell Reports (accepted for publication).

### 7.5. Presentations

- Microspore embryogenesis; fundamental aspects and opportunities to develop protocols for new species. Lecture at IOCRI seminar, April 14, Cianjur, by J.B.M. Custers.
- Results in InDuAnthurium, a co-operative project between Agriom and PRI, the Netherlands, and IOCRI, Indonesia. Lecture at IOCRI seminar, April 14, Cianjur, by J.B.M. Custers.
- First results with microspore culture in Anthurium at IOCRI. Lecture at IOCRI seminar, April 14, Cianjur, by Budi Winarto.
- Introduction of haploid technology in the Indonesian breeding programmes of cabbages and Chilli pepper. Lecture at IVEGRI seminar, April 15, Lembang, by Mrs Iteu Hidayat.
- Microspore embryogenesis; fundamental and practical aspects, and applications for breeding. Lecture at IVEGRI seminar, April 15, Lembang, by J.B.M. Custers.
- Putting *Brassica* microspore culture to work in tropical countries. Lecture at IVEGRI seminar, April 15, Lembang, by J.B.M. Custers.
- An efficient shed-microspore culture procedure for Indonesian hot pepper accessions developed at PRI. Lecture at IVEGRI seminar, 15 April, Lembang, by J.B.M. Custers.
- Shed-microspore culture in Indonesian hot pepper accessions. Poster presentation at Ekspose Inovasi Teknologi Hortikultura, December 8-10, Solok.
- Development of anther and/or microspore culture technique in Anthurium. Poster presentation at Ekspose Inovasi Teknologi Hortikultura, December 8-10, Solok.

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

- 1. Project title** : Improving mushroom production (MUSHROOM)
- 2. Project number** : APR 620154
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### 5. Participating organisations

- Applied Plant Research, Horst, the Netherlands
- Indonesian Vegetable Research Institute, Lembang, Indonesia
- Fungi 2000, Horst, the Netherlands

### 6. Objectives

The objectives of the Hortin Mushroom programme are:

- Exploration, isolation, collection, and conservation of germplasms of edible mushrooms both for indigenous and cultivated/exotic species/strains, as germ sources for research activities.
- To find out superior edible mushrooms 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 best selected strains of a limited number of cultivated species.
- Improvement of preservation of edible mushrooms.

The project aims for the objectives by 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*

- 12 Strains collected from nature are being tested/cultivated at IVEGRI. Testing is still in progress.
- Six strains of ear mushroom (*Auricularia*) were inoculated on substrate with the intention to relocate the colonized substrate at growers on different altitudes (Karawang, Bogor and Lembang). Unfortunately, due to infections and the lack of a proper temperature during spawn run the experiment failed. This points again to the main problem in this project, *i.e.* the lack of good equipment such as a laminar flow cabinet and an autoclave. The experiment is set up again, starting from new mother cultures and using lamps to increase temperature during spawn run.
- Test on different substrate formulatates had also no success due to the same problems as mentioned before. Money has been transferred again from the Dutch part of the project to IVEGRI in order to purchase an autoclave and a laminar flow cabinet as soon as possible.

#### *The Netherlands*

- Last year a large shiitake strain testing has been performed at APR. After a genetic finger printing of 60 strains, 18 strains were selected and supplemented with 3 European commercial strains. From the trial it appeared that at least 3 and possibly 5 strains did produce well at 24 °C and are thus suitable for cultivation under Indonesian conditions. The trial has been co-financed by CNC Exotics. The results were also useful for this Dutch company because a number of parameters were evaluated that are important for Dutch cultivation systems.
- Forty strains for edible mushroom collected from different sources in Indonesia (farms, institutes, etc.), were taken up in the collection of APR, and were genotyped using an ITS-RFLP method.
- Twenty strains collected in different parts of Java were also put into the APR collection and genotyped. Five strains were identified as *Auricularia* species, thus edible. Others did not resemble enough to database sequences to be identified with certainty. It appears that most were either non-edible or not cultivatable (mycorrhizal fungi).

Several strains of commercially produced mushrooms were sent to IVEGRI via a Dutch contact person who travels often between the Netherlands and Indonesia.



Figure 25. Production of Shiitake mushroom: left growing chamber with bags filled with inoculated substrate, right growth of the Shi take mushroom itself.

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

Dr Etty Sumiati has visited APR in April 2004 and followed a training in culture collections (maintenance, isolating single spore cultures, etc.) and preparation of spawn. Dr Sumiati also has visited a number of farms in the Netherlands and a spawn producer in Belgium.

### 7.3. Involvement of companies

Dr George Surya Adinata (Company name: Pt. Tata Agro Nusantara Indah, Karawang) has written a business plan for *Volvariella* production in the Karawang region. Unfortunately, he had a fatal car accident. His wife likes to take over, but so far she seems to have no success (close to bankruptcy).

CNC Oesterzwammen indicated at the end of 2003 that it would like to invest in research on *Pleurotus* substrate as co-financer in Hortin. In 2004, however, CNC Oesterzwammen stopped the production of *Pleurotus* substrate. Only CNC Exotics has invested in testing shiitake strains.

The Dutch project leader will visit a number of champignon producers in East Java to see if one of these companies is interested in the use of bagasse as a substrate for champignon production in a new technology. Senter has indicated that this technology can in principle be financed as a TI project.

### 7.4. Reports and publications

- Sonnenberg, A.S.M. and J.G.M. Amsing, 2004. Evaluation of shiitake (*Lentinula edodes*) strains of the culture collection of Applied Plant Research. Hortin/APR report APR no 2005-1.
- Sonnenberg, A.S.M., 2005. Genotyping commercial and wild collected mushrooms from Indonesia. Draft APR report.

### 7.5. Presentations

- Project MUSHROOM: Improving mushroom production. Poster presentation at Ekspose Inovasi Teknologi Hortikultura, December 8-10, Solok.



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

- 1. Project title** : Protected cultivation in tropical lowland (PROCULT)
- 2. Project number** : A&F 5378001
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### 5. Participating organisations

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- Plant Research International, Wageningen, the Netherlands
- East West Seed Indonesia, Purwakarta, Indonesia
- University of Bogor, Bogor, Indonesia
- Rovero Systems, Raamsdonksveer, the Netherlands
- Plasthill, Hillegom, the Netherlands
- Oerlemans Packaging, Genderen, the Netherlands

### 6. Objectives

In tropical lowland of Indonesia crops are conventionally grown in the open field. However, heavy rainfall, wind and various plant pests and diseases often damage the open field grown vegetables. The use of pesticides, which leads to unacceptably high levels of residues in the products, heavy pollution of the environment, and high levels of resistance of insects to these pesticides, needs to be restricted. In Indonesia the farmers use simple protected structures for the production of vegetables. In these protected structures they often have problems with the greenhouse inside temperature and humidity and with plant pests and diseases, especially thrips and caterpillars, because the structures are not particularly developed for this climate. A new greenhouse design with an advanced covering material is developed during this project including an integrated pest management system, also considering economically aspects. Besides an optimally-adapted design of a greenhouse construction with natural ventilation, the covering material has to contribute to an improvement of greenhouse inside climatic conditions and must lead to a cooling effect making plant production with better quality and quantity possible. The new greenhouse has also to be tight for several insects using special nets. On the other hand these nets must not limit the natural ventilation of the greenhouse. Protected cultivation provides the conditions in which integrated pest management can be employed. The introduction of natural enemies or biologicals against thrips has to be investigated for the Indonesian conditions and insect types.

Due to participation of several industrial partners the project results are practically oriented. By involving local research partners such as the Indonesian Vegetable Research Institute in Lembang it is guaranteed that the project results are valuable for the Indonesian farmers.

The objectives can be summarized as:

Design of a protective cultivation system for tropical lowland of Indonesia.

- Higher yield and better quality of the products and so higher social prosperity of the growers and their families.
- Lower risk of quality losses and yield reductions compared with the open field production.
- Longer production period.
- Lower water consumption.
- Less plant pests and diseases.
- Reduction of pesticide use.
- Introduction of an 'Integrated Pest Management' system possible.

Please notice that this reporting only covers the work done due to the greenhouse construction and greenhouse climate. This is an multidisciplinary project covering the above mentioned project objectives. The crop management and integrated pest management aspects are covered by the PROTVEG2 project. For the results of these aspects see the report of PROTVEG2 below.



*Figure 26. The Greenhouse construction at Purwakarta.*

## 7. Results

### 7.1. Output and impact

After the design of the new Procult greenhouse construction and the development of several new plastic film coverings, the greenhouse prototypes were installed on the site of Ewindo in Purwakarta. Greenhouse climate, crop growth and plant pests and diseases were monitored and investigated during more than a year. The results of the crop aspects and integrated pest management aspects will be reported in the project PROTVEG2. The results of the greenhouse climate investigations can be summarized as follows:

- We were able to develop a greenhouse construction, which makes protected cultivation in tropical lowland possible.
- Small greenhouse areas have a large ventilation capacity. In this case the inside greenhouse temperature is on the same level as the outside temperature.
- With climate simulation we showed that also larger greenhouse areas can be realised with this greenhouse type without a negative influence on greenhouse climate and crop production.
- In tropical countries the use of high-quality plastic film coverings has to be advised. Plastic films have to be highly stabilised against UV radiation to increase the lifetime of the film. Plastic films that make incoming light diffuse increase crop production. Diffuse films lead to a lower greenhouse temperature and a lower plant temperature.

- It is not necessary to additionally use NIR-reflecting pigments in the plastic film, since their influence on greenhouse climate is only marginal. Greenhouses with a high ventilation capacity provide a satisfactory greenhouse inside climate. In the future better NIR-reflecting plastic films have to be developed to get a better effect on greenhouse climate and crop production. This is not possible with today's pigments.
- The light transmission of the Procult greenhouses is about 70%. While it is <50% in bamboo greenhouses, which are commonly used in many tropical countries.
- The greenhouse covering has to be cleaned regularly for maximum light use.
- Before building the greenhouses climate simulations were carried out using the CFD modelling tool. With this model greenhouse ventilation capacity, maximum temperatures and temperature distribution were simulated. The model was validated with real climate measurements. A comparison of simulated and measured values shows that CFD is a good tool to model greenhouse climate. This tool can reduce expensive and long-lasting practical experiments. However, the right boundary conditions have to be estimated, special attention has to be paid to the crop transpiration, which was underestimated in our first simulations.

The Procult project has finished in December 2004. The overall conclusions of the project are:

- The Procult team managed to develop a greenhouse system especially adapted to the local requirements for tropical lowland in Indonesia, in which an environmentally-friendly production of healthy vegetables with high quality can take place. The Procult greenhouse is very suitable for the tropics.
- Always use diffuse plastic films for greenhouse production in the tropics.
- The yield of tomato is minimally 50% higher than outside and 30% higher than in bamboo greenhouses.
- There are many possibilities to further improve yield.
- Continuous production is possible, resulting in safety of income and higher prosperity of growers, continuous offer and delivery of high quality products; the market is asking for that.
- The water use is 75% lower than in open field production, while the water is always available.
- Less plant pests and diseases, with enormous reduction in pesticide use, resulting in production of healthier food.
- Prevention of plant pests and diseases is necessary by the use of healthy nursery plants and hygienic working methods. Procult makes biological control possible.
- Production of high-quality products in Procult greenhouses is economically better than production in bamboo greenhouses.

The target group are the Indonesian farmers. Since the greenhouse construction seems to fulfil the requirements of a new system for protected cultivation in tropical lowland, the system can be introduced into the Indonesian horticultural practice after finishing the project.

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

The scientific results were presented during the ISHS symposium in Malaysia in June and during Greensys2004 in Belgium. Knowledge transfer to Indonesian growers and other interested parties takes place continuously through visits and workshops taking place at Ewindo. Many farmers visit the Procult greenhouses every month, where they learn about the advantages of the system.

## **7.3. Involvement of companies**

Both Indonesian and Dutch companies were actively participating in this project. They invested in this project with respect to the content and on financial basis. PT East West Seed Indonesia, Rovero Systems B.V., Plasthill B.V. and Oerlemans Packaging B.V. invested three years long in total for more than €200,000.- in this project.

#### **7.4. Reports and publications**

- Belder, E. den, S. Hemming, L. Marcelis and D. Waaijenberg, 2004. Mission Report - PROCULT Protected Cultivation in Tropical Lowland of Indonesia. A&F Report 071, 50 pages - confidential.
- Campen, J.B., 2004. Greenhouse design applying CFD for Indonesian conditions. Paper and presentation for International Symposium Greensys 2004 in Belgium, to be published in Acta Horticulturae.
- Hemming, S., D. Waaijenberg, J.B. Campen, Impron, G.P.A. Bot, 2004. Development of a greenhouse system for tropical lowland of Indonesia. Paper and presentation for ISHS 'International Symposium on Greenhouses Environmental Controls and In-house Mechanisation for Crop Production in Tropics and Sub-tropics' in Malaysia, to be published in Acta Horticulturae.

#### **7.5. Presentations**

- Greenhouse development for protected cultivation in the tropics. Poster Presentation at Hortifair 2004, Amsterdam, by S. Hemming, D. Waaijenberg and G.P.A. Bot.
- Ontwikkeling van een kassysteem voor tropisch laagland in Indonesië. (Development of a Greenhouse construction for tropical lowland in Indonesia).
- Procult-greenhouse climate, 2004. Presentation by S. Hemming.
- Procult: Gewasgroei, 2004. Presentation by A. Elings and Impron. (Procult: crop growth)

## 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, Indonesia
- Asian Perlite Industries, Tanah Rata, Malaysia

### 6. Objectives

#### *Long-term objectives:*

The project will contribute to:

- The development of plastic house structures and growing techniques for protected flower production under plastic 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 flowers growing in plastic houses in Indonesia.

#### *Short-term objectives:*

In order to achieve the long-term objectives the project will initially 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 2004:

#### 1. Building a bamboo and a wooden house in Segunung

In May the bamboo and the wooden house in Segunung were constructed. The bamboo house was constructed by a local contractor. The wooden house, cyclic lighting and irrigation installation, was constructed by Asian Perlite Industries from Malaysia.



Figure 27. Bamboo plastic house under construction.

#### 2. Consultancy for building a bamboo and a wooden house in Lembang

The bamboo house in Lembang was constructed in April by local constructors. In May the wooden house was constructed. The wooden house and irrigation were also constructed by Asian Perlite Industries. During part of the construction period R. Maaswinkel was present and gave advice on how to organise the work and on the best way to construct the plastic houses at both sites.

#### 3. Participation in an international symposium about tropical cultivation

With two Indonesian colleagues (Yoyo Sulyo and Nikardi Gunadi) and a Dutch colleague (Arij Everaarts) the Dutch project leader participated in the ISHS 'International symposium on Greenhouses Environmental Controls and In-house Mechanisation for Crop Production in Tropics and Sub-tropics' in Malaysia. The symposium started on June 15 with a scientific tour to the Cameron Highlands. On June 16 and 17 a programme with twelve technical sessions was given. Besides that 30 poster sessions were presented.

#### 4. First research activities

##### 4.1 Comparison of the bamboo and the wooden house in terms of differences in production and product-quality of *Chrysanthemum*

Main goal of the experiment was to observe differences between cultivating *Chrysanthemum* in a bamboo house and a wooden house. When differences were present, the second goal was to quantify these differences in terms of growth, production and product quality.

The most important conclusions of the first trial are:

- There is a large difference in radiation between the bamboo and the wooden house. In the bamboo house only 47% of the radiation reached the plants, in the wooden house this was 78%.
- The amount of water which was given during the cultivation was about 24 litre/m<sup>2</sup>/week. During the cultivation the amount of water was probably enough for the plants in the bamboo house but not enough for the plants in the wooden house.

- The mean maximum temperature per month during the period July - October in the wooden house is 0.2 - 0.7 °C higher than in the bamboo house.
- The mean minimum temperature per month during the period July - October in the wooden house is 2.0 - 3.4 °C lower than in the bamboo house.
- The stem length of the plants in the wooden house was shorter than the length of the plants in the bamboo house.
- The number of leaves of the plants cv. White Reagan in the wooden house was higher than in the bamboo house. With the variety White Fiji these results were the opposite.
- Before a reliable advice can be formulated a second adjusted trial will be necessary.

From the first results a report will be made and this will be finished in the first quarter of 2005.

#### 4.2 Research into the optimum rooting media and the effect of fertilisers during the rooting period of *Chrysanthemum*

In Indonesia in most nurseries burned rice husk is used as rooting media for *Chrysanthemum*. In other countries there are very good results with other rooting media like coco peat, perlite and vermiculite. For growers in Indonesia it is still a question if it is advisable to give fertilisers during the rooting period.

The target of this research with the rooting media burned rice husk, coco peat, perlite and vermiculite is to examine which of these media is to be preferred under Indonesian circumstances and the effect of giving fertilisers during the rooting period.

The most important conclusions of the first trial are:

- Burned rice husk was the best substrate in this experiment.
- By using fertilisers, the results with the different substrates are better.
- Probably the frequency of watering with fertilizers was optimal for the burned rice husk, but not for the other substrates.

The results of the first trial are given in the report: Media Dan Pemupukan NPK Untuk Stek Krisan. E.D.S. Nugroho, Y. Sulyo, R.H. Maaswinkel. With abstract in English. The report is also published in Mission Report nr. 19



Figure 28. Building the wooden house and explaining its advantages to the course participants, May 2004.

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

In 2004 courses on cultivation of *Chrysanthemum* and PROTFLOW workshops were given in May and in December at IOCRI, Segunung.

At both meetings about 50 participants were present (*Chrysanthemum* growers and advisers).



#### Yoyo Sulyo gave lectures about

- Differences between a bamboo and a wooden house.
- Important factors to make allowance for cultivation in plastic houses.

#### R. Maaswinkel gave at the course in December lectures about

- Plant physiology of *Chrysanthemum*.
- Using plant growth regulators.
- Cultivation of mother plants.
- Rooting of cuttings.
- Water and fertilizers.
- Pests and diseases.
- Information on horticulture in the Netherlands.
- Figures of cultivation of *Chrysanthemum* in the Netherlands.
- Harvesting *Chrysanthemum* and put for auction.

The lectures were translated from English into Bahasa Indonesia. During the course different nurseries of the participants were visited. At the end of the course there was a discussion with the participants about the different subjects of the course.

### **7.3. Involvement of companies**

In 2004 there were some contacts with Fides. An agreement with Fides has been made that in 2005 Ruud Maaswinkel will introduce Fides to the Indonesian growers. A couple of growers will be visited then. That introduction will be combined with a workshop. At that workshop Fides will give a lecture about the possibilities of *Chrysanthemum* in Asia and Indonesia. Fides will deliver the stems and guide the growers on *Chrysanthemum* cultivation.

The two plastic houses were completed by Asian Perlite Industries in June 2004. Two workshops were given during the construction of the houses and in December 2004. The participants (50) got a good impression about the differences between the traditional bamboo house and the wooden house. With the Asian Perlite Industries a contact is made for building a cheap plastic house with ventilation in the roof in 2005.

The first experiments in the plastic houses started in June 2004. The Indonesian company Alam Indah Bunga Nusantara (AIBN) is very interested in the experiments. The manager of AIBN (Sarked Saleh) regularly visited the experiments and gave advises. One experiment (with substrates) took place at the nursery of AIBN.

Contacts with PEVAL did not yet develop further.

### **7.4. Reports and publications**

- Maaswinkel, R.H.M. and Y. Sulyo, 2004. Sustainable tropical plastic house flower production systems. Mission report 14, HORTIN programme.
- Maaswinkel, R.H.M. and Y. Sulyo, 2004. Sustainable tropical plastic house flower production systems. Mission report 15, HORTIN programme.
- Maaswinkel, R.H.M. and Y. Sulyo, 2004. Sustainable tropical plastic house flower production systems. Mission report 19, HORTIN programme.
- Nugroho, E.D.S., Y. Sulyo and R.H.M. Maaswinkel, 2004. Report of research to the optimum rooting media and the effect of fertilizers during the rooting period of *Chrysanthemum* (in Bahasa, with English abstract). Media Dan Pemupukan NPK Untuk stek Krisan, IOCRI 2004. In: Mission report 19, HORTIN programme.

### **7.5. Presentations**

- Plant physiology of *Chrysanthemum*. Lecture at IOCRI seminar, December 1-2, Cianjur, Indonesia, by R.H.M. Maaswinkel.
- Using plant growth regulators. Lecture at IOCRI seminar, December 1-2, Cianjur, Indonesia, by R.H.M. Maaswinkel.

- Cultivation of mother plants. Lecture at IOCRI seminar, December 1-2, Cianjur, by R.H.M. Maaswinkel.
- Rooting of cuttings. Lecture at IOCRI seminar, December 1-2, Cianjur, by R.H.M. Maaswinkel.
- Water and fertilizers. Lecture at IOCRI seminar, December 1-2, Cianjur, by R.H.M. Maaswinkel.
- Pests and diseases. Lecture at IOCRI seminar, December 1-2, Cianjur, by R.H.M. Maaswinkel.
- Information on horticulture in the Netherlands. Lecture at IOCRI seminar, December 1-2, Cianjur, by R.H.M. Maaswinkel.
- Figures of cultivation of *Chrysanthemum* in the Netherlands. Lecture at IOCRI seminar, December 1-2, Cianjur, by R.H.M. Maaswinkel.
- Harvesting *Chrysanthemum* and put for auction. Lecture at IOCRI seminar, December 1-2, Cianjur, by R.H.M. Maaswinkel.
- Project PROTFLOW: Sustainable tropical plastic house flower production systems. Poster presentation at Ekspose Inovasi Teknologi Hortikultura, December 8-10, Solok.
- Differences between a bamboo and a wooden house. Lecture at IOCRI seminar, December 1-2, Cianjur, by Y. Sulyo. In: Mission report 19, HORTIN programme.
- Important factors to make allowance for cultivation in plastic houses. Lecture at IOCRI seminar, December 1-2, Cianjur, by Y. Sulyo. In: Mission report 19, HORTIN programme.

## 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
- Asian Perlite Industries, Tanah Rata, Malaysia
- DLV-Agriconsult, Horst, the Netherlands

### 6. Objectives

#### *Long-term objectives*

The project will contribute to:

- The development of plastic house structures and growing techniques for protected vegetable production under plastic 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 initially 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 climatologically 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 under the tropical climate conditions 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 and seeks complementary financing to realise this goal.

## 7. Results

### 7.1. Output and impact

Two activities were carried out in 2004:

- Two plastic house prototypes were built, One being a prototype of the traditional bamboo greenhouse, which is the standard greenhouse in Indonesia, and the other one a prototype of a greenhouse structure widely used in Malaysia.
- An experiment was started in the plastic houses with sweet peppers, comparing the two plastic house types and two substrates.

The original idea was to build three greenhouses. Due to technical problems with designing a greenhouse based on construction with plastic pipes and for budget reasons, for the moment only two plastic houses were built.



Figure 29. Sweet pepper cultivation in a bamboo house (left) and a Malaysian style house (right).

In cooperation with Asian Perlite Ltd two greenhouses were built at the research station located in Lembang. The traditional bamboo greenhouse was built by a local contractor while Asian Perlite Ltd. built the prototype of the Malaysian style greenhouse. The irrigation and fertigation unit was constructed by Asian Perlite Ltd. At the end of June both greenhouses were completed and could be taken into operation.

In close cooperation similar greenhouses were constructed at the research station Segunung of the Indonesian Ornamental Crops Research Institute, for the Proflow project.

For the sweet pepper experiments seeds were donated to the project Mr R. Rodenburg of East West Seeds Indonesia. Mr Rodenburg and Mr A. Pabekka, director of CV Tirta Agri Kencana, an agricultural supply and trading company, and a sweet pepper grower himself, offered to visit the experiments on a regular base and to share their expertise with the researchers in charge of the sweet pepper experiments.

During the first experiments problems arose with the water supply. The water that is available for irrigation is contaminated with bacteria and fungal spores and this resulted in the loss of a lot of plants caused by bacterial wilt. Before starting new experiments in 2005 first this problem has to be solved. In order to ensure a steady supply of clean fresh water at the moment a spring is drilled. However, because of the presence of rocks in the soil the drilling is not going fast and still unsure is whether the drilling will be completed. If ultimately not successful, methods have to be developed for disinfection of the water.

The first preliminary results are showing a higher production of the sweet pepper plants in the Malaysian style plastic house. Compared to the bamboo greenhouse more light is available in this plastic house and this results in a higher production. However, also higher temperatures were present in the Malaysian plastic house and a higher degree of thrips infestation was observed. At the same time production and cultivation of sweet pepper on perlite substrate was compared with production and cultivation on the traditional burned rice husk. Preliminary results showed that amount and timing of water should be different per substrate.

From the results it was concluded that a higher plant density is desired in the Malaysian style greenhouse and that separate fertigation lines for timing and amount of fertigation should be constructed for further experiments. The main preliminary conclusion from the first experiment is that with adjustments to cultivation practices based on experiences with sweet pepper production in a traditional bamboo greenhouse, it is possible to obtain higher production levels by growing sweet pepper plants in a Malaysian style greenhouse. Further technical details are reported in Mission Reports 15 and 18.

## 7.2. Training, technology transfer and knowledge exchange

Two activities were carried out in 2004:

1. A symposium of the International Society for Horticultural Science on greenhouses, environmental controls and in-house mechanization for crop production in the tropics and sub-tropics at Pahang, Malaysia, was attended by N. Gunadi and A.P. Everaarts from 15 - 17 June 2004.
2. A participatory workshop on sweet pepper production in plastic houses in Indonesia was organised in December at IVEGRI, Lembang.

The symposium in Malaysia served as the study tour for training and knowledge transfer in the project for the project leaders of PROTVEG1. Rapport of attendance is made in Mission Report 15.



Figure 30. Sweet pepper workshop on December 14<sup>th</sup> at IVEGRI, Lembang.

The workshop for the Indonesian growers and companies met the goal for exchange of knowledge in the PROTVeg1 project. The workshop was held at IVEGRI on December 14<sup>th</sup>, to present and discuss the results of the experiments and to disseminate information on sweet pepper cultivation in the Netherlands and Indonesia and marketing of sweet pepper under the local conditions. This workshop was attended by about forty persons, among which more than 20 Indonesian growers. Details of the workshop are reported in Mission Report 18. A separate report on the Workshop presentations and discussions is in preparation.



Figure 31. Workshop attendants are inspecting the sweet pepper trial in the Malaysian type plastic house.

### 7.3. Involvement of companies

Asian Perlite Industries completed the construction of the two plastic houses at IVEGRI in June, contributed extra to the project in time and provided a moderate discount on production costs.

In June contacts were established with Oerlemans Plastics, Genderen, to explore the idea of cooperation. At the end of the year the agreement to discuss cooperation was still open, but no opportunity has been found to formulate a definite proposal.

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. Furthermore EWINDO supported the experiments with the donation of 5000 sweet pepper seeds.

### 7.4. Reports and publications

- Everaarts, A.P. and H. de Putter, 2004. Sustainable tropical plastic house vegetable production systems. Mission Report 16, HORTIN Programme.
- Everaarts, A.P. and H. de Putter, 2004. Sustainable tropical plastic house vegetable production systems. Mission Report 18, HORTIN Programme.
- Gunadi, N., A.P. Everaarts, Witono Adiyoga, Tony K. Moekasan, Subhan, Rini Rosliani, Rachman Suherman, 2003. Sustainable vegetable production systems under tropical plastic house conditions. Research Report 1. HORTIN Programme.

### 7.5. Presentations

- Sustainable tropical plastic house vegetable production systems. Presentation at HORTIN Programme meeting, October 25, Wageningen, by A.P. Everaarts
- Protveg1: sustainable tropical plastic house vegetable production system. Poster presentation at Ekspose Inovasi Teknologi Hortikultura, December 8-10, Solok.
- Sweet pepper cultivation in the Netherlands. Presentation at Participatory workshop on Sweet pepper production in plastic houses, December 14, Lembang, by H. de Putter
- The growth of sweet pepper in two growing media under two types of plastic house. Presentation at Participatory workshop on Sweet pepper production in plastic houses, December 14, Lembang, by N. Gunadi, T. Moekasan, Subhan, W. Adiyoga, A. Everaarts and H. de Putter

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

**1. Project title** : Protected cultivation of vegetables and Integrated Pest Management in tropical condition (PROTVEG 2)

**2. Project number** : PRI 730002440

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### 5. Participating organisations

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- Indonesian Vegetables Research Institute, Lembang, Indonesia
- Agrotechnology and Food Innovations, Wageningen, the Netherlands
- Rovero Systems, Raamsdonksveer, the Netherlands
- Plasthill, Hillegom, the Netherlands
- East West Seed, Purwakarta, Indonesia
- South East Asian Regional Centre for Tropical Biology, Bogor, 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 unacceptable high levels of residues in the products, pollution of the environment (air, water, and soil) and danger for employees. 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 6 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 work together to face the technological challenges. Anne Elings evaluated the tomato production. After the failure of the first crop due to bacterial wilt infection, a different lowland variety of Ewindo was selected. This resulted in the successful evaluation of three tomato crops (at the end of the rainy season, during the dry season, and at the beginning of the rainy season). Experiments showed that it is possible to produce high quality vegetables with an increase in yield of 50% (Table 1). Further improvement of cultivation techniques should enable greater yield gains.

*Table 1. Fresh fruit production in kilogramme per square meter at different locations.*

Location	Number of seasons per year	Fresh fruit production (kg/m <sup>2</sup> )	
		Per season	Per year
Indonesian highland, indoor	2	2	4
Indonesian lowland, indoor	2-3	4.3	10.8
Indonesian lowland, outdoor	2-3	2.8	7
Columbian highland, indoor	1	25	25
Netherlands, indoor	1	55-60	55-60



*Figure 32. PhD student Impron explains his observations at PT Ewindo.*

Up to now very little experience has been built up in Indonesia in scouting of tomato pests and diseases. Therefore a second scouting course was given in 2004 at EWINDO by Wim van den Brink in March-April 2004. Also two scientists from IVEGRI participated. After the visit of Eefje den Belder a start was made with continuous scouting activities by Adriyanita Adin (Irin) in February. After a four days-in-house training by Wim van den Brink at EWINDO Irin

started the comparison of pest pressure in the greenhouses with the outdoor tomato production. Preliminary data show a clear reduction in pest pressure in comparison with outdoor production and therefore a major reduction in pesticides (Table 2).

*Table 2. Overview of the pest pressure in indoor tomatoes and outdoor tomatoes.*

Pests	PROBLEM Inside	PROBLEM Outside
Spider mites	++++	++++
Caterpillars	(0)	++++
White flies	+	++++
Mealy bugs (secondary pest)	+	+
Aphids	(+)	+++
Leaf miners	(0)	++
Thrips resistant tomato	Not applicable	Not applicable

## 7.2. Training, technology transfer and knowledge exchange

A second scouting/monitoring course given by PRI for farm managers of East West Seed Indonesia (EWINDO) and the company Saung Mirwan.

An individual in-house scouting and monitoring training at EWINDO (see 7.1).



*Figure 33. Dr Sudarwohadi, IPM specialist, and Nita, PhD-student on IPM, visited PT Ewindo to discuss further cooperation within PROTVEG2.*

## 7.3. Involvement of companies

In a meeting (December 2004) with Dutch and Indonesian partners from the private sector, the partners have expressed their satisfaction with the project results and they suggested to formulate a following up. In January 2005 the partners from the Dutch private sector together with a representative from Senter (T. Manning) have discussed several possibilities for continuation.

#### **7.4. Reports and publications**

- Belder, E. den, A. Elings and S. Hemming, 2004. Mission Report Protveg 2. Indonesia January 25 - February 2, 2004. Mission report 5. HORTIN programme.
- Belder, E. den and W. van den Brink, 2004. Mission Report Protveg 2: Progress workshop. Mission Report 12. HORTIN programme.
- (See also under Procult.)

#### **7.5. Presentations**

- Integrated Pest Management. Presentation for Industrial Partners, November 2004, by E. den Belder, W. van den Brink and Adriyanita Adin.
- Project PROTVEG 2: Protected cultivation of vegetables and Integrated Pest Management in tropical condition. Poster presentation at Ekspose Inovasi Teknologi Hortikultura, December 8-10, Solok.

## Horticultural research Co-operation 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 Vegetables Research Institute, Lembang, Indonesia
- Centre for Standardisation and Accreditation, Jakarta, Indonesia

### 6. Objectives

The production and marketing of vegetables of high quality standards 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 has 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 and focused at cabbage, tomatoes and potatoes.

The approach contains four steps:

1. Identification of hazards for consumers and bottlenecks for product quality, with on the one hand an Hazard Analysis and Critical Control Points analysis (HACCP), and at 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: how to organise independent audits and the needed organisational infrastructure.

## 7. Results

### 7.1. Output and impact

The main activities focused at the projects goals were:

- Realisation of a hazard-analysis for food safety and product quality in the Indonesian vegetable supply chain.
- Development of a concept Good Agricultural Practice focused at food safety and product quality.
- Workshop in Indonesia with Indonesian vegetable supply chain participants and the project team to discuss the situation in the Indonesian supply chain, latest developments on food safety and the concept Hortin-GAP-protocol.

For the first activity a brainstorm session was organised conform the HACCP-approach. A HACCP team was formed with several expertises (HACCP, farm management, Indonesian cropping techniques, product quality). The team listed potential risks and made estimations of frequency and severity of these risks. Results were worked out in a concept report and discussed with the Indonesian partners. Scientific foundation of the hazard-analysis by literature research is still under construction.

During and after the visit of Dr Witono to the Netherlands a concept Good Agricultural Practice was worked out. This concept is based at the HACCP-analysis, the Eurep GAP protocol and the inventory made in Indonesia in 2003. The concept contains a checklist and registration forms.

A workshop was organised at IVEGRI. Main goal was to discuss results of the project Hortin-Quality, especially the concept Good Agricultural Practice. Participants were 18 persons (growers, packers Bimandiri and Pandu Tani, supermarket Carrefour, research and Indonesian Centre of Standardisation and Accreditation). To improve the discussion and the awareness of the chain partners about food safety aspects a test was developed about the attitude to food safety and quality in the vegetable supply chain. The discussion during, and after the workshop resulted in an improved GAP. This will be tested in 2005 in practice.



Figure 34. APR presentation during workshop supply chain management, IAARD Jakarta October 9, 2004.

## 7.2. Training, technology transfer and knowledge exchange

From 11 till 19 of June 2004 Dr Witono Adiyoga of IVEGRI visited the Netherlands. To get insight in the Dutch approach of food safety and product quality in the vegetable supply chain he visited different companies representing the different levels in the supply chain. A brief schedule of his visit is:

1. Visits to Dutch farmers, NAK AGRO, supermarket, day market and the Food centre.
2. Together working on the hazard-analysis and GAP for the Indonesian vegetable supply chain.
3. Visit different projects in relation to the Hortin-Quality project in Wageningen.
4. Make arrangements on the visit to Indonesia of APR and the hazard-analysis.

APR went to Indonesia from 6 till 15 October 2004. During this visit APR carried out the following exchange activities about knowledge transfer:

1. APR provided a refresher course about quality assurance at IVEGRI, Lembang. This course was a follow up of a training organised in 2003. Twelve researchers of IVEGRI participated in the course. For this course some exercises about Good Agricultural Practices were developed focused at record keeping, traceability and hazard analysis.
2. On invitation of Dr Suyanto, director of ICHORD (Indonesian Centre for Horticulture Research and Development) APR provided a presentation about international developments in the vegetable supply chain on a workshop in Jakarta. This workshop was organized by IAARD (the Indonesian Agency for Agricultural Research and Development). After the presentation, there was time for discussion about supply chain management but also topics like integration of economics and ecology in research and the privatisation of research in the Netherlands.



Figure 35. Group discussion at the workshop at IVEGRI, Lembang October 11.

## 7.3. Involvement of companies

As a result of a meeting with IAC project partners of the PBSI-project Strengthening Food Safety Indonesia, contact was made with Mr Ir Syukur Iwantoro, Director of the Centre for Standardisation and Accreditation in Indonesia (CSA). He was invited to give a presentation at our workshop at IVEGRI October 11, 2004. During the workshop arrangements were made about cooperation with CSA, because the project seems to fit quite well into the certification strategy of CSA. In 2005 CSA will be involved in improving and testing the GAP.

During the workshop Mr Sandredo, manager at Bimandiri, expressed to be willing to participate in the 2005 test of the GAP-documents. Bimandiri is a packer who processes vegetables which were bought from growers and sold to Carrefour. A group of growers who supplies Bimandiri was also willing to participate in the 2005 test of the GAP-documents. After the workshop Bimandiri and the growers association were visited and preliminary appointments were made for the test in 2005.

Contacts were made with Mr Winaryo of Skal International in Indonesia focussed on Eurep-GAP certification. On invitation of the Dutch Ambassador a business party was visited in Bandung. The party gave the opportunity to have informal meetings with among others: the ambassador Ruud Treffers, Diyanto Imam, the Indonesian assistant of the Dutch agricultural counsellor and Elmar Bouma of INA, the Indonesia Netherlands Association (Indonesian Netherlands Chamber of Commerce) and secretary of a new Partnership Programme focused at partnerships between growers and the private sector in Indonesia. This programme is funded by the Dutch government, Agriterra and Cordaid.

#### **7.4. Reports and publications**

- Anonymous, 2004. Hortin-GAP, checklist vegetable production, version 1. IVEGRI and APR report, Lelystad.
- Anonymous, 2004. Hortin-GAP, Field registration form 2004, APR report, Lelystad.
- Schoorlemmer, H.B. and M.P.J. van der Voort, 2004a. Mission Report nr 17, HORTIN programme.
- Schoorlemmer, H.B. and M.P.J. van der Voort, 2004b. Quick scan about attitude to food safety and quality in the vegetable supply chain, HORTIN programme (in English and Indonesian).
- Schoorlemmer, H.B., M.P.J. van der Voort and W. Adiyoga, 2004. A work document: Food safety and product quality in Indonesia (concept), Lelystad.

#### **7.5. Presentations**

- Hortin-QUALITY. Presentation at IVEGRI Refresher Course, October 8, Lembang by H.B. Schoorlemmer and M.P.J. van der Voort.
- International developments in the vegetable supply chains, Quality assurance and food safety. Presentation at ICORD, October 9, Jakarta, by H.B. Schoorlemmer and M.P.J. van der Voort.
- International developments in the vegetable supply chains, Quality assurance and food safety. Presentation at IVEGRI October 11, Lembang, 2004. by H.B. Schoorlemmer and M.P.J. van der Voort.
- Project QUALITY: product safety and quality management in vegetable production systems. Poster presentation at Ekspose Inovasi Teknologi Hortikultura, December 8-10, Solok.



## Horticultural research cooperation 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
- Institut Pertanian Bogor, Bogor, 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 skill and knowledge on international standard procedures for seed health management to 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 insight information on the needs for disease health management and other aspects of seed production in Indonesia. It will create goodwill at counterparts in Indonesia, in particular at quarantine officers and 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 seed-borne diseases of tomato, hot pepper and shallot on Java were surveyed by observation of field crops on 12 locations and by analysing 20 seed samples per crop, either directly or after growing plants from seed. Characterization was done on the basis of symptoms (for all pathogens), on microscopic structures (for fungi), ELISA (for viruses), whereas some seed samples were also analysed for bacteria by dilution plating.

In tomato, the seed borne pathogens *Alternaria solani*, TMV and ToMV were frequently, and of *Fusarium* and CMV occasionally found in seed and in the field. In the field, *Phytophthora* and *Cladosporium* were other major diseases, but these are not considered as seed borne.

In hot pepper, *Colletotrichum*, ToMV, TMV and CMV were frequently found in seed, but no symptoms of *Colletotrichum* were observed in the field. *Cercospora* and *Choanephora* caused major diseases in the field, but these are not seed borne. In tomato and hot pepper seed samples no bacterial diseases could be detected.

In shallot, three seed borne fungal diseases were found in the different surveys: *Alternaria porri*, *Stemphylium* sp. and *Fusarium* sp. The seed borne fungus *Alternaria porri* was detected in a high incidence in the field in seed bulbs and also in plants and bulbs grown from seed bulbs, indicating the importance of a proper control. *Stemphylium* was not found in the field, but was observed frequently in plants and progeny bulbs grown from seed bulbs. Under favourable conditions for the pathogen, it may cause damage. *Fusarium* was only incidentally found. Soft rot *Erwinias* play also an important role in shallot. They were found in 40% of the seed bulbs. Up to 17% of bulbs grown from seed bulbs also showed rot symptoms. Incidentally *Erwinia* infected bulbs were also found in fields. The viruses OYDV and SYDV as well as other none characterized viruses were detected by ELISA in a high incidence in plants grown from seed bulbs. Mosaic symptoms were also found in field crops.

Although the significance of the seed borne inoculums in the epidemiology is not completely established, it is obvious that management of the seed-borne diseases *Alternaria solani* in tomato, *Colletotrichum* in pepper, *Alternaria porri*, *Stemphylium* and soft rot *Erwinias* needs special attention. In addition there is a strong need for virus-free plant propagation material.

EWINDO has provided a collection of 18 *Xanthomonas vesicatoria* strains from hot pepper and 2 *Clavibacter michiganensis* subsp. *michiganensis* strains from tomato with information on the locations where infected seed lots were produced. Unfortunately, probably during transport all strains became contaminated and from none of the strains the identity was confirmed by serological methods, dilution plating on semi-selective agar medium and PCR. The characterisation will be repeated with fresh strains by Mrs Nur Vajrina from EWINDO during her training at PRI. 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 *Alternaria solani* in tomato and *Clavibacter michiganensis* subsp. *michiganensis* in tomato. A draft on tobamoviruses in tomato (TMV and ToMV) is in preparation. The drafts were evaluated by people from EWINDO and from the seed inspection department and considered as useful.

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

The 1<sup>st</sup> HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia was held in Lembang from 19 to 21 January 2004. The first day was used for seminars on phytosanitary regulation in Indonesia, on the status of vegetable seed production in Indonesia and managing strategies for seed-borne diseases on vegetables. The seminars were attended by 50 participants. The second and third day 12 participants from IVEGRI, the seed inspection, IPB, IOCRI, PT Selektani, and PT San Hyang Seri were trained in international standard procedures for seed health testing including:

- Testing of viruses (CMV, TMV, ToMV, OYDV and SYSV) using ELISA, pathogenicity tests and observation of symptoms (prepared by IVEGRI).
- Testing of bacteria (*Xanthomonas campestris vesicatoria*, *Clavibacter michiganensis michiganensis*) using immunofluorescence cell staining (IF) and a pathogenicity test (prepared by PRI).
- Testing of bacteria *Ralstonia solanacearum* using immunofluorescence colony staining (IFC) (prepared by PRI).
- Testing of the fungi *Botrytis aclada* using an agar plate method and *Colletotrichum spp* using a blotter method (prepared by PRI).

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

Dr A.S. Duriat has received an IAC fellowship for a short training period from May 22 to June 20 in the Netherlands. She participated in the IAC Seed Certification Course (10 days), and was trained in seed testing procedures at PRI. During her stay several seed samples, produced in Indonesia, were analysed for the presence of fungi, using a blotter test, and bacteria, using dilution plating methods.

Due to a surgery of Dr A.S. Duriat, the second workshop had to be postponed to 2005.



Figure 36. Survey to seed-borne diseases in a shallot production field on Java.



Figure 37. Impression of the first HORTIN-Seeds workshop.  
Training of participants in a bioassay for detection of seed-borne viruses.

### 7.3. Involvement of companies

During the workshop, seed specialists from PT Selektani and PT San Hyang Seri were trained. Ewindo has provided strains and information on the occurrence of seed-borne diseases. They are also involved In 2005, Nur Vajrina, who has been provided a Stuned fellowship, will visit PRI for 2 months to further develop her skills and expertise in seed testing.

### 7.4. Reports and publications

- Anwar, A., P.S. van der Zouwen, S. Ilyas & J.M. van der Wolf, 2004. Bacterial canker (*Clavibacter michiganensis* subsp. *michiganensis*) of tomato in commercial seed produced in Indonesia. Plant Disease 88, 680.
- Duriat, A.S., N. Guanaeni, E.S. Widjaja, O.S. Gunawan, I. Sulastrini, A.W. Wulandari, P.S. van der Zouwen & J.M. van der Wolf, 2004. Report 2004. Managing the most important seed-borne diseases of vegetables in Indonesia (Hortin-Seeds). Internal report IVEGRI.
- Wolf, J.M. van der & P.S. van der Zouwen, 2004. 1<sup>st</sup> HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices. Lembang, January 19-21, 2004.

### 7.5. Presentations

- Phytosanitary regulations of imported plants and planting materials into the territory of the Republic of Indonesia. Presentation at the 1<sup>st</sup> HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices, January 19, Lembang, by A. Hamzah.
- Strategies for seed health management in vegetable production. Presentation at the 1<sup>st</sup> HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices, January 19, Lembang, by J.M. van der Wolf.
- Strategies and supply system of vegetable seed in Indonesia. Presentation at the 1<sup>st</sup> HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices, January 19, Lembang, by S.H. Hastiti.
- Managing the most important seed-borne diseases of vegetables in Indonesia. Presentation at the 1<sup>st</sup> HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices, January 19, Lembang, by A. Duriat.
- Target pathogens in the HORTIN project. Presentation at the 1<sup>st</sup> HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices, January 19, Lembang, by J.M. van der Wolf.
- Methods for viruses carrying seed. Presentation at the 1<sup>st</sup> HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices, January 19, Lembang, by A. Muharam.
- Methods for testing fungi and bacteria in seed. Presentation at the 1<sup>st</sup> HORTIN SEEDS Workshop on seed-borne diseases of vegetable crops in Indonesia: towards improved management practices, January 19, Lembang, by J.M. van der Wolf.
- Project SEEDS: Managing the most important seed-borne diseases of vegetables in Indonesia. Poster presentation at Ekspose Inovasi Teknologi Hortikultura, December 8-10, Solok.

