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Trip Report August 2010

Report on 'Workshop on the achievements and future direction of Integrated Pest Management in horticulture under the auspices of the Ethiopia-Netherlands Partnership Programme'

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1. Acknowledgements

We would like to express our gratitude to all growers, scientists and ministerial representatives who took the time, effort and enthousiasm to meet with us during the workshop at the headquarter of EIAR.

We also would like to thank Dr. Melaku Alemu for the organization of this very successful workshop, in which he was supported by Dr. Dereje Gorfu.
The papers presented during the morning session were very informative and inspiring and gave a good overview what is going on. Very important issues have been discussed in a very open and constructive way in which everyone was given the change to contribute in the small groups. During the wrap-up the discussions were very lively about
1) the set up of the verification trials
2) the shift to organizing research in which users are centrally and from a linear (one component) research to a wider set of activities that go considerably in the direction of IPM system approach.
Many useful suggestions have been given how to rearrange the procedures/paperwork around the verification trials and the import of the BCA's
The importance of the partnerships and coalitions have been highlighted and very concrete suggestions have been given.

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Wageningen,
September 2010

2. Summary

The mission's Terms of Reference were to participate in, and contribute to the discussion of the '1st Workshop on the achievements and the future direction of IPM in horticulture under the auspices of the Ethiopia-Netherlands Horticulture Partnership Programme', especially with regards to the procedures and set-up of IPM trials, import permits, and communication/partnerships.

Recent discussions on IPM in Ethiopia recently concern two questions:

- Should a biological control agent (bca) be evaluated in a setting in which other essential circumstances are not changed (the single component approach), or should a bca be evaluated as part of a flexible system (the system approach)?
- Should a very strict experimental protocol be maintained, or can growers' practices be accepted?

As the system approach acknowledges that a farming system is complex, and that the effect of one particular action is always influenced by the situation and other management actions, we (den Belder and Elings) are in favour af a systems approach to on-farm IPM research.
Obtaining reliable answers for on-farm application is in our view also possible with a flexible attitude to experimental protocols.

At the workshop, a presentation 'Status and future approaches of IPM in the Ethiopia Netherlands Horticulture Partnership Programme' was given.

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Wageningen, August 2010

2. Introduction

2.1 Project rationale

Ethiopian export horticulture is developing at high speed. In 2000, 9 ha were under flowers, which had increased to around 1000 hectares in 2009. In 2005/2006 the export value was $26 million, and in 2009 the export value was around $ 130 million.

With the rapid development of the sector public concerns within and outside Ethiopia are growing regarding labour conditions at the farm, the environmental impact (over-exploiting water resources), and human health due to the misuse or overuse of pesticides and fertilizers. The Ethiopian government is introducing a series of measures designed both to promote a long-term shift away from chemical controls where this is practicable and thus moving towards more sustainable forms of pest management. Research programmes are also looking at ways to reduce pesticide use while maintaining agricultural productivity. In response to above mentioned concerns the Ethiopian Horticulture Producers and Exporters Organization has taken the initiative to develop a code of conduct. The development of this code of conduct (including a plan for implementation) is supported by the Royal Netherlands Embassy in Addis Ababa. The Ethiopian Institute for Agricltural Research (EIAR) has taken the initiative to organize a multistakeholder workshop at their HQ.

The way integrated pest management (IPM) will be adopted and communicated will be affected by the level of ecological and socio-technological knowledge among the actors in the innovation system therefore not only depend on farmer's ecological knowledge, but also on the mindsets of those involved in the process, and the establishments of partnerships between the institutions (Van Mele, 2008).

Traditional R&D providers are required to become more client-oriented which calls for demand-driven modes of working and establishing linkages with the private sector and society as a whole.

2.2 Approach

The best approach to IPM research has been discussed over the last months in Ethiopia. Actually, it was the trigger to organize the workshop (see elsewhere in the report). The discussion concern two questions:

- Should a biological control agent (bca) be evaluated in a setting in which other essential circumstances are not changed (the single component approach), or should a bca be evaluated as part of a flexible system (the system approach)?
- Should a very strict experimental protocol be maintained, or can growers' practices be accepted?

The single component approach
The bca is the only pest management method applied, and its isolated effectiveness can be determined. A positive outcome would be that the bca, under a certain release schedule, is capable of suppressing the pest population. A negative outcome would be that the bca is not capable of suppressing the pest population. In any case, no supporting pest management methods are applied.
A problem is that real quantification is very difficult. Should for example the number of pest individuals predated by the bca be determined, or the surviving number of pest individuals per plant? As a way out, it is often simply evaluated whether the pest population is sufficiently suppressed.

The systems approach

The system approach acknowledges that a farming system is complex, and that the effect of one particular action is always influenced by the situation and other management actions. The purpose is to evaluate the pest management system as a whole, placing focus on the bca. If necessary, other pest management practices are applied, and crop management can be adjusted. The duration of the on-farm trial can be lengthened (this is especially true if results during the first months were relatively disappointing because the IPM technology was not yet fully optimized, which could be corrected in a later phase), etc.

A positive outcome would for example be that the bca is capable of suppressing the pest population if combined with a second bca, the use of soft chemicals or sticky plates/strips if the pest population peaks. A negative outcome would be that the bca is not capable of surviving under the ambient environmental conditions, and does therefore not contribute to the pest management system.

A strict experimental protocol

A strict experimental protocol has one or more of the following components: replicates, a control, pre-determined doses, and a clearly defined research goal (hypothesis to be tested). For example: 'The fortnightly application during 6 months of 50 bca's m^{-2} will suppress the pest population', tested in 3 replicates, with the treatment and control randomized over the greenhouse.

Technically, this will work, in the sense that an answer to this very specific question will be found. But if the answer is negative, it may still be possible that the system would work after 7 months, or with an increased release rate of bca.

Following growers' practices

By definition, a on-farm trials is conducted at a far. The farmer's first priority is to realize profit. He/she might be willing to take some risk (which a farmer is doing continuously), but only if this risk is manageable and quantifiable. Farmers participate in on-farm trials because of the expected innovation and profit this can bring to the farming system, which warrants a certain risk and some limitations to regular farm management. However, risk avoidance may require that actions are taken to maintain a sufficiently high production. This implies that in addition to the bca, other pest management methods may have to be used, that the dosing has to be adjusted, etc. Also, growers usually will mostly not allow a fully randomized trial with a number of replicates and controls (the IPM project has experienced this on a number of occasions over the last years). This will interfere too much with the regular farming. Therefore, the starting situation is a normal farming situation, to which a bca or a combination of bca's is introduced. The bca is combined with other pest management methods, and the entire pest management system works within an equally flexible crop management system. The farmer will judge the effectiveness of the entire system, not of the bca on its own.

What is important?

In our view (den Belder & Elings), most important is that the Ethiopian horticultural sector has access to state-of-the-art pest and disease management technology. Probably all parties will agree to this. Only technology that has been successfully applied elsewhere is introduced in the IPM project. For this reason, this established technology can be validated (is the technology 'valid') under on-farm conditions. The research goal in this case is whether the pest (or disease) can be managed adequately under the prevailing conditions and farm management practices at the farm. We therefore call for a system approach, and the following of farmer's practices.

Studying details of the pest management system is actually done in earlier phases of the research process. Is the bca effective if applied as the only pest management method? Is the bca effective at low winter temperatures? Such more detailed questions are brought forward as counter-arguments, but should in our view be answered under more controlled conditions, where commercial interests do not interfere. This can be done at research stations or at farms only if the crop is considered a research crop and the farmer agrees to this.

Therefore, we feel that the single-component approach, in combination with a strict research protocol is suitable for on-station research in early/earlier phases of the pest management research. When validating the efficacy of a bca, this should be done on-farm, under flexible farming conditions.

Reliable answers

How can reliable answers be obtained? The major reasons for concern may be:

1. The on-farm trial has not been replicated.
2. The bca has not been compared with other biological or chemical agents.
3. The on-farm trial has been conducted at one location.
4. The on-farm trial has been conducted during one season or year.

1. The on-farm trial has not been replicated.

This is a statistical consideration that can not be denied. The average grower will not allow replication in independent greenhouse compartments and interference with a large portion of the farm. The consequence is that standard errors of parameters can not be computed. Is this a problem? Perhaps from a scientific point of view. It relates to the research question whether the technique works The answer that can be given at the end of the trial will be 'yes' or 'no', however without a statistical quantification of the reliability of the finding. In on-farm trails, researchers should learn to live with this. However description of the whole process in the greenhouse can contain very valuable information. A grower probably will not care, and is just interested in the simple question whether the technology works or not.

2. The bca has not been compared with other biological or chemical agents.

The consequence is that no assessment can be made of the efficacy of the bca relative to other control agents. Is this a problem? Not if the on-farm research question was to validate whether the bca was effective in pest management. The result is not measured in terms of comparison with another approach, but in terms of levels of pest insects, or yield reduction.
Only if some legislation would demand that any new technology would be better than previous technologies, a comparison would be required.

3. The on-farm trial has been conducted at one location.

4. The on-farm trial has been conducted during one season or year.

Both concerns express the fact that in Ethiopia, there might be circumstances in terms of different climates and farming systems under which the bca does not perform acceptably, because these circumstances differ substantially from the circumstances at the on-farm trial.
In the evaluation of bca's against red spider mite in rose, trials were conducted at a number of rose farms at different altitudes (den Belder et al., 2009). It was concluded that this IPM system could be implemented, if a number of criteria are met.
The climate within Ethiopia varies mostly in terms of temperature and air humidity. If at a certain location the bca is proven effective, one can safely assume that it is also effective in a fairly broad range of temperatures, air humidities and farm management systems. However, under strongly different circumstances, one should be cautious. Actually, a grower should always be cautious and implement an IPM technology with great care.
Still, after a successful on-farm trial, it is in our view safe to state that the bca has good potential for a wide range of conditions within Ethiopia.

Organization of IPM research

Essential characteristics of the system approach to research are shown in box 1.

Box 1 Essential characteristics of a system approach to research

1. Researchers (suppliers) and users (farmers) of research are centrally involved
2. farmers needs are understood
3. Investments are made in the system research
4. Intermediary functions are performed for linking researchers with farmers
5. Learning results from iterative action research
6. Financially sustainable extension system exist (farmers pay for the advices)
7. Institutional arrangements are changed (e.g. IPM office at EIAR)
8. Infrastructure that supports and enables the system research to operate effectively is strengthened.

Communication

The role of intermediate institutions such as applied research institutes is frequently under-estimated or misunderstood. These typically have low status compared with universities and basic science institutes. The alternative system approach is often actively fought by pesticide companies, agricultural research institutions and others who stand to lose if the system approach is becoming in place.

The system approach highlights the importance of networks, coalitions and partnerships and the need for effective communication channels among the organizations and the individuals. Many studies of IPM adoption have shown that improved information/communication facilitates the adoption of IPM practices. The sources of information, as well as their underlying quality, are varied. They include government extension programs; farmer associations; non-governmental organizations, study groups; and field days, electronic information sources, and others.
Increased or improved information does not necessarily lead to adoption, however; it may lead to an initial decision not to adopt or to subsequently abandon previously adopted practices or technologies.
The role of information is a key area in which public policy can play a role.
The mechanisms by which information about these alternatives is developed, transmitted, and diffused are especially critical to these systems.
Networks can be formal or informal, and both are important. Informal links appear to be particularly vital as they help to foster trust between the various parties.
Intermediate organizations (private or public, farmer associations, public extension, horticultural agencies) can provide a bridge between researchers and farmers.

2.3 Terms of Reference

The mission's Terms of Reference were to participate in, and contribute to the discussion of the '1st Workshop on the achievements and the future direction of IPM in horticulture under the auspices of the Ethiopia-Netherlands Horticulture Partnership Programme', especially with regards to the procedures and set-up of IPM trials, import permits, and communication/partnerships.

3. 1st Workshop on the achievements and the future direction of IPM in horticulture under the auspices of the Ethiopia-Netherlands Horticulture Partnership Programme

As a preparation, we visited Dr. Gashawbeza Ayalew and Dr. Mohammed Dawd at their respective EIAR research stations in Nazareth and Ambo, on Tuesday August 3 and Wednesday August 4, respectively.

We discussed the research results and other project achievements, and agreed that issues such as experimental set-up of on-farm verification trials should be thoroughly discussed at the workshop.

Also, we met with Dr. Melaku Alemu and Dr. Dereje Gorfu (senior pathologist at Holeta Experimental Research Station) to prepare the workshop.
Dr. Dereje Gorfu will take over coordination responsibilities of the IPM-Horticulture projects from Dr. Melaku Alemu.

3.1 Welcome and opening

Dr. Adefris Telkewold, Director of Crop Research Process of EIAR, opened the workshop. He explicitly asked the workshop for two outcomes:

1. Develop an IMP management approach with good modalities that satisfies all stakeholders (growers, suppliers, researchers, registration bodies, and facilitators). As a part of this, the methodologies for IPM research must be refined, bearing in mind that the research is more business-oriented than academic.
2. Resolve the current registration challenges.

Fig. 1. Dr. Adefris Telkewold, Director of Crop Research Process of EIAR.

Eefje presented the book "Farmland birds across the World" to Dr. Melaku Alemu, head of the PR department of EIAR for the use at EIAR. The books is aimed at a wide audience: the conservation and farming communities, birdwatchers, the food industry, and also examples from Ethiopia are included.

Fig. 2. Dr. Eefje den Belder offering "Farmland birds across the World" to Dr. Melaku Alemu, head of the PR department EIAR.

3.2 Presentations

Presentation	Presentator	Insitution
Status and prospects of IPM in Ethiopian agriculture	Dr. Ferdu Azerefegn	Hawassa University
Profile of bca's imported and used in IPM	Dr. Melaku Alemu	Ethiopian Institute for Agricultural Research
IPM of two-spotted spider mite in rose	Dr. Mohammed Dawd	Ethiopian Institute for Agricultural Research
IPM of white flies and thrips in herbs	Dr. Gashawbeza Ayalew	Ethiopian Institute for Agricultural Research
IPM of mealy bugs in roses	Dr. Bayeh Mulatu	Ethiopian Institute for Agricultural Research
IPM of crown gall in roses	Dr. Eshetu Derso	Ethiopian Institute for Agricultural Research
IPM of grey mold in roses	Dr. Dereje Gorfu	Ethiopian Institute for Agricultural Research
Three years of successful implementation of IPM. What are the major drawbacks. Perspectives of the producers of bca's.	Dr. Steinberg Shimon	Director of Research, Biobee Ltd., Israel
Status and future approaches of IPM in the Ethiopia Netherlands Horticulture Partnership Programme	Dr. Eefje den Belder & Dr. Anne Elings	Wageningen UR, The Netherlands








Fig. 3. From top left to bottom right:

Dr. Ferdu Azerefegn	*- University of Awassa*
Dr. Melaku Alemu	*- EIAR*
Dr. Mohammed Dawd	*- EIAR*
Dr. Gashawbeza Ayalew	*- EIAR*
Dr. Bayeh Mulatu	*- EIAR*
Dr. Eshetu Derso	*- EIAR*
Dr. Steinberg Shimon	*- BioBee*
Dr. Eefje den Belder	*- WUR*

The presentation by Eefje den Belder & Anne Elings is given in appendix 5.

3.1 Brainstorm

Five discussion points for the brain storm were selected by the participants on the basis of their relevance having heard all the presentations, viz:

1. Fast track: must a product from a certain company go through a verification trial if a product with a similar bca('s) from a different company has already successfully been verified?
2. Guidelines for the import of bca's.
3. Importation and other legal issues.
4. IPM research protocols.
5. Institutional linkeages.

These five points were discussed in three separate groups of approximately 15 persons each, and that each represented the various stakeholders.

Fast track: must a product from a certain company go through a verification trial if a product with a similar bca from a different company has already successfully been verified?

- There are two basic arguments to verify all products:
  - Deal with companies equally. It is not fair if a company that comes in later is given a competitive advantage.
  - Formulations among companies vary.
  - Therefore, verification / efficacy test remain necessary.
- Possibilities to optimize the verification trials:
  - Do not make more time than needed. For example, set minimum evaluation time, e.g., 6 months, but allow for more time if the outcomes of the verification trial are not conclusive as yet.
  - Use secondary data from elsewhere, which, however, may not be fully applicable.
- Evaluate effects on biodiversity.
- Consider level of risk (high risk, medium risk, low risk)

Guidelines for the import of bca's

- There was some confusion as to what guidelines were exactly meant. A formal guideline does not yet exist as yet, but is under development. It was suggested to share the draft version with senior scientists for comments. A decree for biological control is out, which has to be considered in the finalization of the guideline.
- New guidelines should be concise.
- Another relevant document that exists is the supplier's file in which importation is requested, and which is verified by a researcher.
- It should be considered to what level a pest must be specified: genus, species, sub-species? Sometimes, the identity is only known at the genus or species level, even among the specialized taxonomists. Therefore, it is best to be pragmatic and require only a functional identification.
- Bca's are considered as pesticides in terms of regulation. In Europe, the term 'plant protection product' is used to cover chemical substances (including pheromones semiochemicals, products containing micro-organisms or plant extracts, each with its own manual) and beneficial insects .
- Farmers are also interested in the use of plant protection products containing micro-organisms. Thus there is an urgent need for good guidelines for this group of products.

Importation and other legal issues

- The method of documents need to be revisited. The current status is that a supplier request for import, mentioning the farm name at which the on-farm trial will be conducted. The import permit specifies the name of the responsible researcher of EIAR, who has to come in person to the airport. Importation can not be delegated to the supplier or a clearing company. Names do not match in this case. This is not a sustainable situation. A researcher – certainly if the station is far away from the airport or if several experiments fall under his/her responsibility – can not come on a regular basis to the airport.
- Customs does not appreciate sensitivity of bca's. Create awareness with customs.
- Taxation is a problem. Formally, all goods above a certain value are subject to import tax. This, however, requires a considerable amount of paper work, and also, the amount of tax is extremely high.
- These are urgent problems to be resolved by EIAR / MoARD.

IPM research protocols

The discussion focuses on the question whether a single component is evaluated, or the system in which the component has a contribution to the total pest management. For example, is isolated effect of a bca on a certain pest evaluated, or is it permitted to evaluate the joint effect of a bca in combination with soft chemicals or other pest management means?
The overall feeling was that a system approach should be followed, while some support for a component approach was expressed.
Our (Eefje & Anne) belief is that a system approach should be followed (see paragraph 2.2).

System approach:

- Flexibility. It is not possible to define one evaluation method. After all, the term IPM includes the terms 'integrated' and 'management'.
- The researcher designs the evaluation trial in collaboration with the grower and the supplier. The major guideline here is that the evaluation trial deals with a bca-pest-crop combination that has been evaluated positively elsewhere in the world, and that the prime goal is to simply establish whether the bca works against the pest if the proper circumstances are created[1]. The goal is not to determine the relative effects of application rates etc. If this perspective is followed, then a plot with the bca in comparison with some sort of control would be adequate.
- Standarization of the evaluation trials for various bca-pest-crop combinations must be sought in the fundamental simplicity of the prime goal (see above).
- In on-farm trials, grower's money is involved. So, intervention may be required if pest gets out of hand. The researcher has to understand this and accommodate this eventuality in the experimental design.
- Growers stress that 'Research is part of IPM'. What is meant is that basic research goes in terms of timing before implementation of the results, and that on-farm research has to be conducted in a commercial farm management environment.

[1] We would like to remark that in many countries, efficacy trials of new bca's are not required. This aspect is left to the market after the product has been introduced. A dossier, supplied confidentially to a regulatory body, has for instance to prove that a new product is not harmful to human health. For Ethiopia, however, it might be wise to conduct efficacy trials as a safety measure.

Component approach:

- Three treatments were suggested: only the bca product applied (single component approach), bca + other recommended products applied (systems approach), and the conventional farm approach in wich chemicals are applied control. In this way, knowledge on bca should become known.
-

Both approaches:

- Experience in other countries also important.
- Evaluate under suitable conditions.
- Data collection and scouting requires training.
- For the natural enemies tested within the IPM project of the Ethiopia-Netherlands partnership the suppliers can give a technical dossier in which important features of the products are described.

Institutional linkeages

It was suggested that a system for information and activities is established.
For example, an annual meeting in combination with a field day can be organized.
See also the brainstorm results on importation.

Wrap-up and closing remarks

Dr. Adefris Telkewold, Director of Crop Research Process of EIAR, closed the workshop with a number of remarks.
Dr. Adefris was very satisfied with the discussion outcomes, however, had a number of remarks:

- Should there be developed a clear definition of efficacy, avoiding the obscuring effect of interacting factors?
- It should be clearly defined what is evaluated at-station in the laboratory, and what on-farm in field trials. The participants replied that laboratory knowledge is available, as it concerns established technology. If it is known that a bca predates or parasitizes on a pest, then this are a fact. The applicability of this knowledge must be evaluated under local circumstances. The fact that the technique works on-farm in other countries is no guarantee that it also works under Ethiopian conditions. However local circumstances in e.g. Kenia can be comparable and quite similar.
- For chemicals, application rates are recommended in Ethiopia, which requires elaborate field testing. For bca's the situation may be different, enabling simpler validation trials.
- The protection of the environment should be well considered, also if a IPM method is proven to be effective.
- The flexibility of the individual researcher should be clearly defined, as a certain standardization is required.
- It should be considered whether bca's (especially from the non-branded companies) are contaminated. How can this be tested?
- Ambo is responsible for anything in crop protection, and therefore also to institutional linkages.

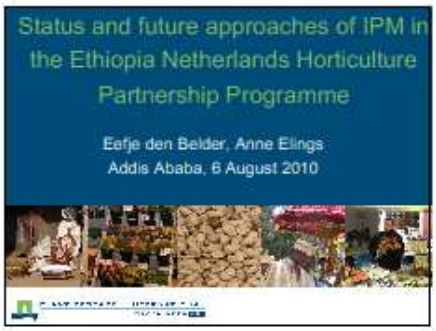
Dr. Adefris is waiting for more specific advices, which can be developed by the IPM community in Ethiopia in the near future. For instance, an IPM workshop by Ethiopian Plant Protection Society (chaired by Dr. Bayeh Mulatu) will be organized in November. The focus will be on mainstreaming IPM. Invited are growers, scientists, others. Funds are searched.

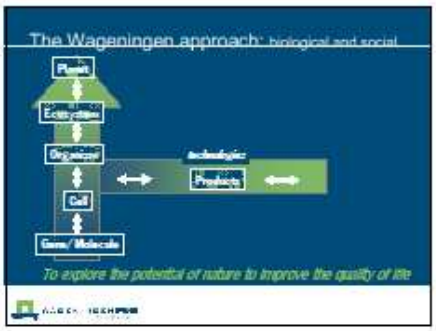
4. Itinerary

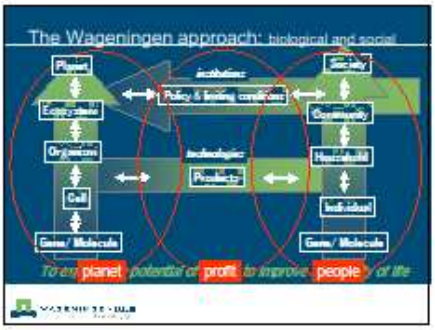
Monday 2 August	Evening	Flight Amsterdam – Nairobi - Addis Abeba
Tuesday 3 August	Morning	Arrival Addis Abeba
		To Nazareth Experimetal Station
	Afternoon	discussion with Dr. Gashawbeza Ayalew
	Evening	To Addis, arrival in Hotel
		Preparation meeting with Director EIAR and Director Plant Protection
Wednesday 4 August	Morning	Visit Dr Mohammed Dawn at AMBO CPRC
		Vist Dr Kamal at AMBO CPRC
	Afternoon	To Addis
		Meeting with Dr Melaku Alemu and Dr Eshetu Ahmed at HQ EIAR
	Evening	Meeting Mr Thomas Assefe local supplier
Thursday 5 August	Morning	Preparation multistakeholder workshop
	Afternoon	Preparation multistakeholder workshop
	Evening	At Hospital
Friday 6 August	Morning	Presentations Workshop at EIAR HQ
	Afternoon	Discussions in groups and plenary wrap-up Workshop at EIAR HQ
	Evening	Free
Sat 7 August	Morning	Shopping in Addis
	Afternoon	Writing report
	Evening	Departure Addis Abeba
Sunday	Morning	Arrival Amsterdam - Wageningen

5 Status and future approaches of IPM in the Ethiopia Netherlands Horticulture Partnership Programme

8/11/2010







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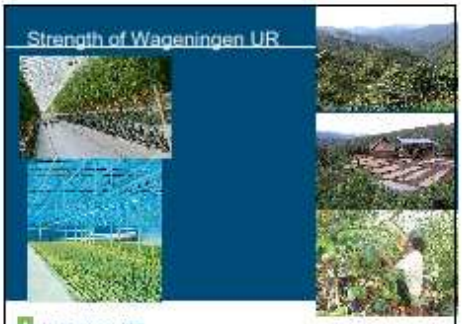
Strength of Wageningen UR



THE NETHERLANDS: REGIONAL IPM

Functional biodiversity: Enhance BCA's?

Management of permanent field margins by farmers, loca and national government, water boards etc.

Study groups - Farmer Field Schools

Cooperation between Public-Private sector

Communication

IPM in Ethiopia: wide perspective

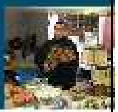
- Stakeholders
  - Growers
  - Suppliers
  - Ethiopian Horticulture Producers and Export Organisation
  - Ethiopia Horticulture Development Agency
  - Ministry of Agriculture and Rural Development - Plant Protection Department
  - Ethiopian Institute for Agricultural Research - Plant Protection Research Centre
  - Jimma University – College of Agriculture and Veterinary
  - Netherlands Embassy
  - Wageningen UR

Baseline study IPM project: situation at 31 farms in 2007

- Medium size rose farm uses about 1000 L/ha
- 23 different chemical compounds
- At a cost of 100,000 ETB/ha, 9000 €

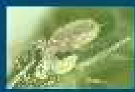
Pesticide use: must go down

- Market — 25% expenditures
  15% yield reduction
  S – longevity plastic cover
  Demand low residues
- Control — Resistance development to chemicals
- Image sector workers' health — Improvement image for consumers/retailers/supermarkets
  Complaints from workers and neighbouring farms



Identification main pest at 10 farms January 2007

- Two spotted spider mite *Tetranychus urticae*
- Yellow flower thrips *Frankliniella schultzei*
- Legume /bean flower thrips *Megalurothrips sjostedti*

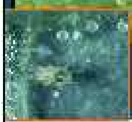


Amblyseius californicus, Amblyseius swirskii, Phytoseiulus persimilis all are predacious mites

www.pestinfo.org/Literature/thripspec.htm

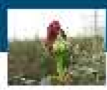
IPM in Ethiopia: starting with one single pest

- Rose: various varieties
- Red spider mite *(Tetranychus urticae)*
- *Phytoseiulus persimilis & Amblyseius californicus*



Approach

- Enabling environment
  - Risk assessment with regards to use of beneficials
  - Permit procedures embedded in rules and legislation
    - Import permit for experimental purposes
  - Institutional linkages and partnerships (IPM association)
- Research
  - On-farm research
  - Applied research
  - Post-graduate research
- Knowledge exchange
  - Study groups
  - Demonstration trials



Enabling environment – risk assessment

RISK	RESPONSIBLE ENTITY	RISK MANAGEMENT
PRODUCT		
Incorrect pest identification	Research	Correct identification
Incorrect organisms in BCA	Supplier	Random identification by Plant Protection Service in country of origin
	Supplier	predators are on the BCA list of the EPPO region, and the USA Evaluation list
Low activity of BCA	Supplier	batch-wise control by producer according IOBC guidelines (for Europe)
	Supplier, grower	advanced transport & storage system
ENVIRONMENT AND WORKERS' HEALTH		
Exotic biodiversity	Ministry	BCA-list (EPPO) and Permit for Interstate Shipment (USA) are based upon broad expert knowledge, resulting in safe usage in 50 countries.
Workers' health	Grower	BCA-list and Permit for Interstate Shipment comprise allergy tests.
FARM		
yield and quality reduction	Grower	Training, technical support, research, study groups
Crop attacked by BCA	supplier	In country of origin, a criterion to select BCA is its inability to attack

IPM ON-FARM TRIAL:

1) Trial lay-out
2) Scouts trained
3) Scout schedule
4) Release schedule
5) Climate data
6) Observations
7) Report on results

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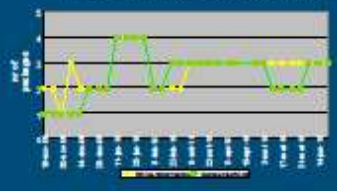
TRIAL-LAYOUT

SCOUTS TRAINED

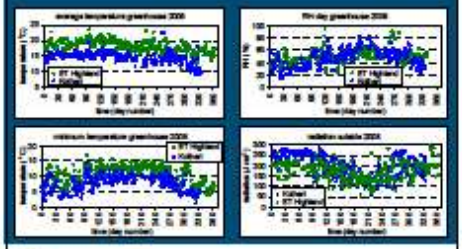
SCOUT SCHEDULES

RELEASE SCHEDULES

RELEASE SCHEDULES



On-farm research: climate



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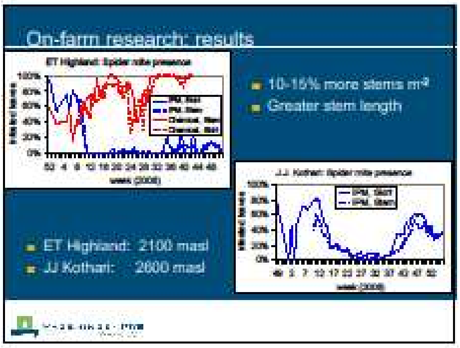
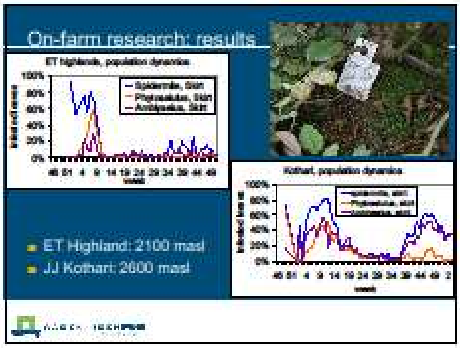
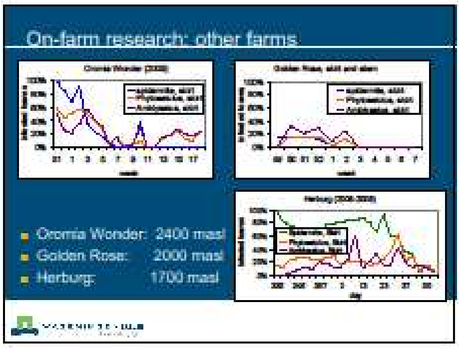
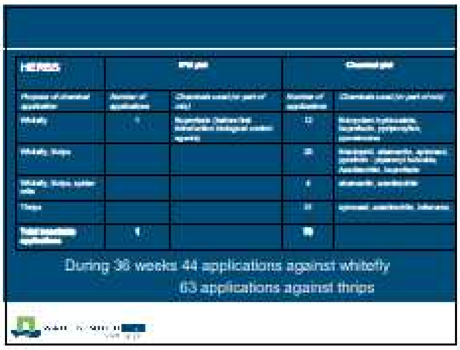

On-farm research: results
ET Highland: Spider mite presence
JJ Kothari: Spider mite presence
10-15% more stems m-2
Greater stem length
ET Highland: 2100 masl
JJ Kothari: 2600 masl


On-farm research: results
ET highlands, population dynamics
Kothari, population dynamics
ET Highland: 2100 masl
JJ Kothari: 2600 masl


On-farm research: other farms
Oromia Wonder (2008)
Golden Rose, skirt and stem
Herburg (2008-2009)
Oromia Wonder: 2400 masl
Golden Rose: 2000 masl
Herburg: 1700 masl


On-farm research: summary
IPM is possible, financially profitable
Increase of production and quality
Not-limiting factors
Rose variety
Humidity
Crop age (although young crop is preferable)
Limiting factors
Training
Low temperatures
Chemical residues


During 36 weeks 44 applications against whitefly
63 applications against thrips

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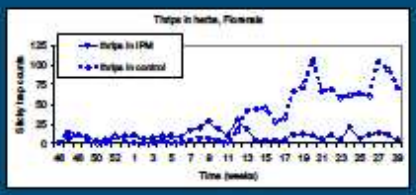
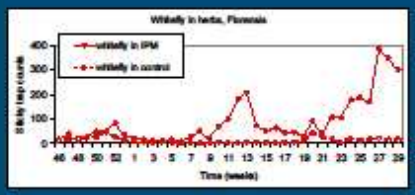
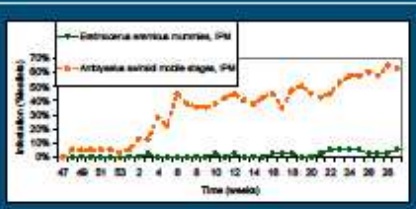
observations so far thrips



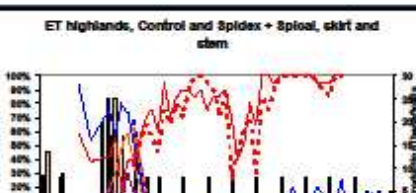
observations so far whitefly





Possible conclusions herb on-farm trial

- Efficacy of *A. Swirskii* is sufficient against thrips in herbs
- Efficacy of the A. swirskii/Ercal system is ok against whitefly if combined with limited number of applications
- Efficacy of Ercal is not sufficient



Questions are:

- How long do we measure?
- Do we measure 1 pest - 1 bca relations ?
- Do we measure 1 pest - 2 bca's relations ?
- Do we measure 2 pests - 1 bca relations ?
- Do we measure 2 pests – 2 bca's relations ?
- Are the applicaton of a soft chemicals acceptable?

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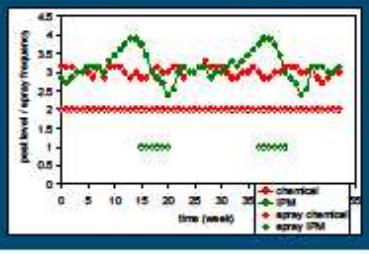
Hypothetical example



On-farm research: lessons learned

- Commitment
- Identification & monitoring
- Intensive communication
- During transition phase:
  - Low pest levels
  - No chemical residues
- Knowledge exchange

IPM

- Further capacity building
- Rose – pest and diseases
  - acreage
  - # farms
  - propagations
- Strawberries – spider mite
- Herbs – thrips - white fly
- Outdoor vegetables- Fusarium Phythophthora (started)
- Tomato -whitefly (started)
- Propagations- Sciaridae-shoreflies
- Fruit vegetables

Future

- Enabling environment
  - Permit procedures embedded in rules and legislation
    - Import permits for experimental purposes/commercialization
    - Adjustment of permit formats
    - Improvement customs at airport
    - Improved logistics
    - Institutional linkages and partnerships
  - Private-public co-operation
- Knowledge exchange
  - Facilitation of study groups
- Research
  - On-farm research
  - Strategic research on local bca's
  - Post-graduate research

Wageningen UR
Agro Systems Research
Greenhouse Horticulture

Thank you

Sustainable crop production in Ethiopia

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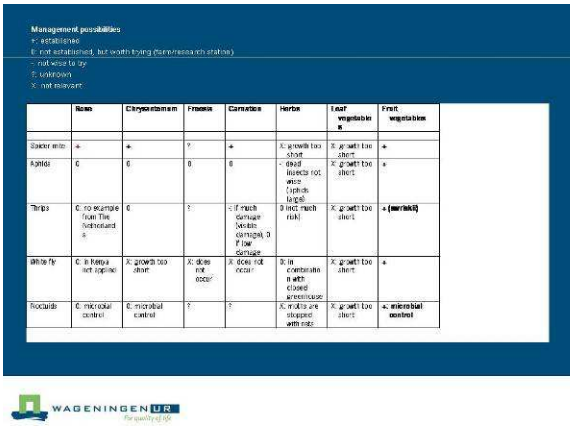
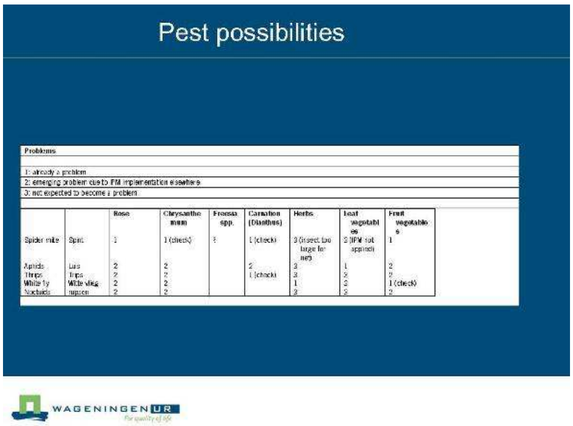
6 ANNEX 2:



Management possibilities
+: established
0: not established, but worth trying (farm/research station)
-: not wise to try
?: unknown
X: not relevant

	Rose	Chrysantemum	Freesia	Carnation	Herbs	Leaf vegetables	Fruit vegetables
Spider mite	+	+	?	+	X: growth too short	X: growth too short	+
Aphids	0	0	0	0	-: dead insects not wise (aphids large)	X: growth too short	+
Thrips	0: no example from The Netherlands	0	?	-: if much damage (visible damage), 0 if low damage	0 (not much risk)	X: growth too short	+ (swirskii)
White fly	0: in Kenya not applied	X: growth too short	X: does not occur	X: does not occur	0: in combination with closed greenhouse	X: growth too short	+
Noctuids	0: microbial control	0: microbial control	?	?	X: moths are stopped with nets	X: growth too short	+: microbial control



Pest possibilities

Problems
1: already a problem
2: emerging problem due to IPM implementation elsewhere
3: not expected to become a problem

		Rose	Chrysanthemum	Freesia spp.	Carnation (Dianthus)	Herbs	Leaf vegetables	Fruit vegetables
Spider mite	Spint	1	1 (check)	?	1 (check)	3 (insect too large for net)	3 (IPM not applied)	1
Aphids	Luis	2	2		2	3	1	2
Thrips	Trips	2	2		1 (check)	3	2	2
White fly	Witte vlieg	2	2			1	2	1 (check)
Noctuids	rupsen	2	2			3	3	2

7 Literature

Belder, E. den & A. Elings, 2007a.
A Research and Development Plan for the Introduction of Integrated Pest Management in the Ethiopian Rose Sector. Trip Report January 2007. Plant Research International, Wageningen.

Belder, E. den & A. Elings, 2007b.
A Research and Development Plan for the Introduction of Integrated Pest Management in the Ethiopian Rose Sector. Trip Report September 2007. Plant Research International, Wageningen.

Belder, E. den & A. Elings, 2008a.
A Research and Development Plan for the Introduction of Integrated Pest Management in the Ethiopian Rose Sector. Trip Report January 2008. Plant Research International, Wageningen.

Belder, E. den & A. Elings, 2008b.
On-farm evaluation of integrated pest management of red spider mite in cut roses in Ethiopia. Report to the Ministry of Agriculture and Rural Development. Plant Research International, Wageningen.

Belder, E. den & A. Elings, 2008c.
On-farm evaluation of integrated pest management of red spider mite in cut roses in Ethiopia. 2nd Report to the Ministry of Agriculture and Rural Development. Plant Research International, Wageningen.

Belder, E. den, A. Elings, Y., Yilma, M. Dawd & F. Lemessa, 2009.
On-farm evaluation of integrated pest management of red spider mite in cut roses in Ethiopia. Final report to the Ministry of Agriculture and Rural Development. Plant Research International, Wageningen.

Elings, A., 2008.
The Introduction of Integrated Pest Management in the Ethiopian Rose Sector. Trip Report June 2008. Plant Research International, Wageningen.

Klerkx, L. & C. Leeuwis, 2008.
Balancing multiple interests: Embedding innovation intermediation in the agricultural knowledge infrastructure. Technovation 28: 364–378.

Mele, van P., 2008.
The importance of ecological and socio-technological literacy in R&D priority setting: the case of a fruit innovation system in Guinea, West Africa. Int. J. Agric. Sustainability 6: 183-194.

World Health Organization, 2005.
WHO Guidelines to Classification.