Report of the International workshop on EIQ
FAO Vegetable IPM Programme in Asia
Do Son, Vietnam
19-21 April 2007

1. INTRODUCTION

The Environmental Impact Quotient, EIQ, is one of numerous pesticide risk indicator models developed to rate potential hazardous impacts on human health and the environment of different pesticide use regimes. The EIQ takes into account toxicity information on the inherent potential of the active ingredient as well as actual application dosage per area to indicate harmful effects of the pesticide products on the producer, the consumer and on eight environmental compartments. In several IPM programmes in Asia, the EIQ model has been applied for different purposes over the past years. Time was ripe to reflect on lessons learned and explore potential contributions as well as limitations of applying EIQ in IPM programme activities. For that purpose, several resource persons and representatives of programme countries were invited to an international workshop on EIQ to provide input to the discussions on the application of EIQ in national programmes based on their knowledge and experience.

Objective; To review experiences so far with the application of EIQ in IPM Programmes; its potential and limitations; adjustments made to the model to adapt to local circumstances; training experiences and available curricula; etc.

The workshop was organized in Do Son in Hai Phong province, Northern Vietnam, in collaboration between FAO staff and the Plant Protection Department of the Ministry of Agriculture and Rural Development.

There were 16 participants who attended the workshop including three professors representing Oregon State University US and Bioforsk/NIAER, seven resource persons from Thailand, Cambodia, China, Lebanon and Vietnam in addition to six FAO staff. The schedule of the meeting is attached in **Annex 1** and the list of participants in **Annex 2**.

2. MAIN ACTIVITIES

2.1 Opening and introduction

Mr. Jan Willem Ketelaar, Chief Technical Advisor of the FAO Regional Vegetable IPM Programme, opened the meeting on behalf of FAO. Following his opening remarks, Mr. Le Van Hung from the Ministry of Agriculture and Rural Development welcomed participants and wished them a fruitful workshop on behalf of the Government of Vietnam. Mr. Harry van der Wulp from the Global IPM Facility continued the opening by introducing the objectives and the background for organizing this workshop.

As part of the introduction, Prof. Ole Martin Eklo from Bioforsk/NIAER gave a brief presentation on the EIQ model, the components in the formula, its use in general and examples of Bioforsks' work on the EIQ in Norway and Vietnam.

Prof. Paul Jepson from Oregon State University continued with a presentation on risk indicator models in general, its intentional use and purpose as well as limitations with the models. He emphasized that the models are designed for risk estimation only and can illustrate potential differences between use regimes. Validation with actual effects in the field is a necessity to prove actual risk reduction.

2.2. Overview of regional experience

Several of the invited participants were asked to give presentations to share their experience on how the EIQ model can be used and for what purposes. A brief summary of the presentations is provided below.

1. Experiences from Vietnam (*presented by Mr. Ngo Tien Dung)*
   Mr. Dung explained how EIQ had been introduced in four provinces in Vietnam as a collaboration between Bioforsk and the Plant Protection Department. EIQ has been introduced as a supplement in IPM farmer education to raise awareness on harmful effects of pesticides to human health and the environment. It has also been used as a decision support tool for farmers to select pesticides that are potentially less hazardous to use if no alternative control methods is known. In addition to farmer education purposes, EIQ has also been used in community based impact assessment and as a tool for PPD specialists in developing lists of recommended pesticides in safe vegetable production. Based on the experiences main advantages and limitations of using the EIQ model for these purposes were presented. (*See summary of discussions in annex.)*

2. Regional experience overview *(presented by Mr. Gerd W. Echols)*
   Mr. Gerd W. Echols has been engaged as a consultant to review the use of EIQ in cotton, rice and vegetable IPM programmes in Asia. He presented examples per country of how the EIQ had been applied and for what purpose. The EIQ model has been used as an additional pesticide reduction measure in case studies that compare IPM and farmer practice plots in Bangladesh, China, India, Pakistan and the Philippines. Only Vietnam has introduced the EIQ for awareness raising and as a decision support tool in selecting less harmful pesticides.

3. Field experience Lam Dong province, Vietnam *(presented by Mr. Lai The Hung)*
   Trainers who had been involved in EIQ-related farmer training activities were invited to present their results of a survey and field studies carried out in Lam Dong province in 2006. The presentation showed field data on natural populations, application of pesticides, fertilizer, EIQ field values and economic analysis of EIQ-trained IPM alumni farmers in comparison with conventional farmers' practices. In general, the results showed that the IPM trained farmers had lower EIQ values resulting from selecting less toxic pesticides and had less

frequent sprays. They also had higher economic gain as a result of reduced pesticide use and higher yields.

4. Experiences from Thailand *(presented by Mr. Pairote Nualnoon)*
   Mr. Nualnoon presented the work from his master thesis on using the EIQ model in an impact assessment study of IPM farmer training in rice. The assessment was designed to measure impacts on farmers' knowledge, income and the environment. EIQ was used to indicate impact on the environment by calculating total EIQ values based on pesticides selected and dosage applied. The results showed a clear reduction in potential environmental risk after IPM training.

5. Experiences from Cambodia *(presented by Mr. Nghin Chhay)*
   Representatives from the National IPM Programme in Cambodia had attended a local EIQ workshop in Vietnam one month before this international workshop. They were invited to learn how the EIQ model could be used as a tool in impact assessment. Mr. Nghin Chhay explained how they had calculated EIQ values on pre-collected impact assessment data. The EIQ value was then split in the three compartments for the producer, the consumer and the environment. By comparing these EIQ values based on farmer records for IPM farmers and a control group, it was clear that the EIQ values were much lower for the IPM farmers. Some of the main sources of errors were also presented. *See summary of discussion in annex.*

6. IPM programme in Near East *(presented by Mr. Imad Nahhal)*
   Mr. Nahhal from the Ministry of Agriculture in Lebanon gave an overall presentation of the activities in the Regional Near East IPM Programme. He also presented results from a health and environment study carried out in Syria. This study compared residue testing of pesticides on tomato and in soil and ground water with number of reported cases of pesticide poisoning. The results showed that the poisoning cases had declined after IPM programme had been implemented.

7. Project in West Africa; "patterns of exposure" *(presented by Prof. Paul Jepson)*
   Prof. Paul Jepson gave a brief presentation on a FAO supported project in West Africa that is designed to determine pesticide risk exposure patterns with focus on water. The findings will be part of a pesticide risk assessment. The purpose is to determine what the risks are and what can be done to reduce exposure risk. He explained about their data collection strategies in the project.

2.3 Discussions

The questions and comments that followed each presentation were taken up for discussions structured into three parts; 1) technical issues, 2) operational issues and 3) if and how to best apply the EIQ model for IPM programme purposes. A summary of each discussion topic is enclosed in **Annex 3**.

2.4 Review of EIQ guidelines.

Mr. Gerd W. Echols had prior to this workshop prepared Draft of Guidelines on the Use of EIQ in IPM Programmes. The conclusions and recommendations from the discussions were taken into account when providing feedback and comments to improve this document. Overall and detailed feedback on the structure, content as well as edit suggestions were provided in a plenary discussion. A summary table of potential uses by target group is enclosed in **Annex 4**.

2.4 Wrap up and closing

To wrap up, Mr. van der Wulp summarized the main outputs of the three days workshop. Closing remarks were given by Mr. Ketelaar followed by Mr. Dung. The guidelines for the use of EIQ in IPM programmes will be finalized based on suggested recommendations of the meeting attendees, and made available on FAOs webpage.

Annex 1: Meeting Programme

International Workshop on the application of Environmental Impact Quotient (EIQ) in IPM Programmes

Venue: Doson Resort Hotel, Hai Phong, Viet Nam
Dates: 19-21 April 2007

Objective: To review experiences so far with the application of EIQ in IPM Programmes.

Outcome of the workshop will contribute to a guidance document on the application of EIQ in IPM programmes, to be made available to ongoing regional programmes.

Draft Programme **(version 12/4)**

Thursday, 19 April

08.15-08.30 Opening, co-chaired by FAO and MARD/ Plant Protection Department

08.30-08.45 Welcome, introduction and purpose of workshop (Harry van der Wulp)

08.45-09.30 Introduction into EIQ (Ole Martin Eklo)
- What is it, and how does it work,
- Summary of the Bioforske work on EIQ
  (Adjustments made for Asia, remaining gaps and shortcomings)
- Comparison to similar European indicators

09.30-10.15 International experience with EIQ: its potential and limitations (Paul Jepson)

10.15-11.30 Coffee

10.30-11.15 Experience with EIQ in Vietnam (Ngo Tien Dung)
- Experiences and results so far
  - -How has it been used so far, what worked well and what did not
  - -Technical and operational issues that emerged
- Plans related to EIQ

11.15 -12.00 Regional review (Gerd Walter Echols)
- Experiences with EIQ in Asia
- Potential and limitations

12.00-12.30 Discussion

12.30-13.30 Lunch

13.30-18.00 Field Visit

Friday, 20 April

08.00-08.30 Experience with EIQ in Thailand (Pairote Nualnoom)

08.30-09.00 Experience with EIQ in Cambodia (Ngin Chhay)

09.00-09.30 Experience in environmental monitoring - Near East (Imad Nahhal)

09.30-10.00 Experience in environmental monitoring - West Africa (Paul Jepson)

10.00-10.15 Coffee

10.15-10.45 Discussion on country presentations

10.45-12.00 Discussion on technical aspects of EIQ

12.00-13.30 Lunch

13.30-15.00 Discussion on operational aspects of EIQ

15.00-15.15 Tea

15.15-16.45 Discussion on potential and limitations of the application of EIQ in IPM Programmes

Saturday, 21 April

08.00-08.30 Summary of Discussions

08.30-09.30 Consolidation of conclusions and recommendations

09.30-10.00 Coffee

10.00-11.30 Review of draft guidelines (prepared by Gerd Walter-Echols)

11.30-11.45 Closing

12.00-13.30 Lunch

Annex 2: List of Participants

International Workshop on the application of Environmental Impact Quotient (EIQ) in IPM Programmes

No.	Full Name	Organisation	Telephone	Email Address
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Annex 3: Summary of discussion on technical issues

Rough indicator:

- Indicative only. Averages out the three components
- Relationship between EIQ and reduced risks is not linear (on biodiversity, human health etc.)
- No reflection of importance of timing, including pre-harvest interval, (PHI)
- "No zero" value for non-toxic products in the model
- Risk of false positives and false negatives

Not location specific:

- Developed for a specific purpose in a specific context (North America)
- Not location specific (e.g. type of natural enemies, fish, etc.)
- Leaching data vary strongly depending on soil, rain and irrigation

Health and environmental monitoring:

- Combines effects on health and the environment, with emphasis on the environment.
- Not linked to actual human and environmental effects in the field
- Validation standards not developed
- Exposure pathways not reflected
- Does not substitute for monitoring actual health or environmental effects, but does provide a rough idea in the absence of specific data

Data gaps:

- Data gaps (filled with averages) – inaccuracies; half of products have missing data, e.g., chronic toxicity

Summary of discussion on operational issues

Limitations:

- Product not identifiable (e.g.: label information missing, label in foreign language, made-up names, etc.)
- Pesticides for which no EIQ value is available
- Incomplete records (entries missing)
- Misspelled and incomprehensive names in farmer records
- Inaccurate assessment of dosage (volume used, area treated)
- Accuracy of dose complicated by self-made mixtures
- Crops changing – EIQ, before and after, not comparable

Recommendations:

- Book with pictures of pesticides on the market was useful in Cambodia
- Preparatory work needed, e.g., as much as all materials should be available (e.g know active ingredients for tradenames)
- Exchange of information on calculated EIQ values; a clearing house would be useful
- If working with recall data, use recommended dose (as in the label) as proxy if field use data are incomplet

Annex 4: Summary of discussion on application in IPM programmes

	Potentials	**Limitations**	**Recommendations**
Awareness	EIQ profiles bring to attention farmers potential health and environmental risks. EIQ table (with 3 or 8 components) may help illustrate diversity of risks and help farmers' groups identify priorities, for instance through group exercises to review EIQ data for selected commonly used pesticides.	Low EIQ does not mean you are free from toxic effects; use local examples of risk/exposure An EIQ number cannot relate to actual risks because site-specific information is not included, but provides an indication of potential risks. Important to point out that actual risks depend upon level of site-specific exposure, which is not accurately reflected in EIQ values.	We should not give training in EIQ, but on pesticide risk reduction; EIQ is a means and not a purpose in itself. Reduce risk by altering pesticide use practices as well as by selection.
Impact assessment	Useful as retrospective assessment tool (after the event review) if no specific studies on health or environmental impact have been done. Useful in addition to pesticide reduction to show improved pesticide selection. EIQ is the only impact index that can apply to every participant in a study. It can therefore provide frequency distributions of potential impacts for very large number of farmers and once verified reflects actual impacts. Can be used for rigorous statistical analysis, e.g., double delta.	EIQ is an indicator of potential effects and does not reflect actual effects, and hence only a means to support farmer education and not a direct measure of impact. Requires solid farm records about pesticide use.	Based on project objectives, consider other indicators that complement the EIQ. For example, pesticide classes, signs and symptoms, etc. Distinguish between impact assessment for farmer and programme/policy level. Whenever possible compare EIQ trends with actual impact data to obtain a qualitative validation. Consider listing IPM alternatives as well as EIQ values. Reduce EIQ by choosing non-chemical options, e.g., crop rotation, etc.

	Potentials	Limitations	Recommendations
Pesticide selection	At best, only suitable for further selection of pesticides after a number of other criteria have been applied. EIQ can add to the development of the "reduced-risk" pesticide list if used in addition to information such as toxicity, pre-harvest interval, pest resistance. As such, it may provide a justification for the drawing up of list of reduced-risk pesticides. Comparative risk assessment for products that are registered for a specific pest on a specific crop. Add EIQ values (the three columns) to the list of pesticides approved for vegetables in addition to information already on the list, e.g., WHO classification, PHI, etc. Useful to identify trends and distributions but not to measure site specific risks. It does not constitute a risk management tool. As part of end of the season review, feed back on trends.	Not a substitute to alternative control measures that should always be considered first. Only one tool in the tool box for pesticide risk reduction exercises.	Use the IPM decision making tree for selection of options; use pesticide only as a last resort. Training objectives need to be consistent with ToT/FFS objectives; the treatment of pesticide selection should be preceded by ecologically-based curriculum components.