Scientific Colloquium Series

EFSA Scientific Colloquium 10

Pest Risk Assessment
Science in support of phytosanitary decision making in the European Community

6-7 December 2007 Parma, Italy

BRIEFING NOTES FOR DISCUSSION GROUPS

The objectives of the Colloquium are:

- **To discuss in an open scientific debate the state of the art, current issues and future challenges in pest risk assessment**
- **To discuss advantages and disadvantages of the scientific approaches and methods available and data needed for conducting a pest risk assessment**
- **To discuss to what extent indirect impacts of organisms harmful to plant and plant products should be addressed by pest risk assessment**
- **To explore the scientific basis for combining the assessment of direct and/or indirect impacts with scientific assessment of economic consequences of entry, establishment and spread of organisms harmful to plants, plant products and/or biodiversity/ human health**
- **To discuss possible joint efforts with EU Member States, EFSA, and possibly non-EU Member States and international organisations to further develop harmonised approaches to carry out risk assessments of organisms harmful to plants, plant products and/or biodiversity**

These briefing notes have been prepared to stimulate an open interactive exchange of views and expertise on scientific aspects and issues to be considered when risk assessing pests of plants and plant products. Focus should be on the risk assessment methodology and, in particular, on quantitative and qualitative risk assessment.

DISCUSSION GROUP 1 - *Methodologies in pest risk assessment: quantitative vs. qualitative approaches in the assessment of the pest introduction potential*

INTRODUCTION

Following international phytosanitary standard ISPM11, the assessment of introduction potential requires a consideration of the likelihood of both pest entry and establishment. Some of the factors that need to be taken into account can be more readily quantified than others. Thus for a commodity pathway, risks may be directly related to data on the volume and frequency of trade, whereas the assessment of the probability of pest survival along the pathway will depend on a variety of factors related to the method of transport and pest biology.

Quantitative methods for the assessment of introduction potential can be used by risk assessors to obtain numerical probabilities from 0-1. Qualitative approaches require risk assessors to choose from categorical ratings based on ordinal scales, e.g. low, moderate, high, or 1, 2, …, 9. While quantification is an important objective, pest risk assessments require both qualitative and quantitative approaches for two principal reasons:

- when some of the evidence required is missing or difficult to quantify, expert (qualitative) judgements are needed.
- even when extensive relevant datasets are available, there are cases when the magnitude of the risk can be clearly demonstrated without quantification. The amount of detailed analysis in a pest risk assessment may also be constrained by the funding and the time available.

It is important to identify the most appropriate methodologies for both approaches and to ensure that the results from each approach are interchangeable.

DISCUSSION POINTS

1. Qualitative approaches for assessing entry potential: risks rating methods; linking risk ratings to quantities/probabilities or examples; summarising risk ratings and capturing/communicating uncertainty.
2. Quantitative approaches for assessing entry potential: available models; parameter estimation; assessing and communicating model accuracy.
3. Qualitative approaches for assessing establishment potential: risks rating methods; linking risk ratings to quantities/probabilities or examples; summarising risk ratings and capturing/communicating uncertainty.
4. Quantitative approaches for assessing establishment potential: available models; parameter estimation; assessing and communicating model accuracy.
5. How to choose? Do we need to choose? Advantages and disadvantages of each approach for the assessor (ease of use, accuracy etc.) and for the communication to risk managers and stake-holders. Linking qualitative and quantitative assessment methods.

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DISCUSSION GROUP 2 – *Challenges in pest risk assessment: are climate changes and global trade influencing the pest introduction potential?*

INTRODUCTION

There is scientific consensus that anthropogenic emissions of greenhouse gases into the atmosphere will likely modify the Earth's climate over the coming decades. According to model projections, global and regional climate change in this century will be characterised by higher temperatures, altered precipitations regimes and increases in the frequency of extreme events, with serious consequences to many human activities; agriculture is a sector particularly at risk, given its strong dependence on climate.

Globalization has deeply modified the movement of commodities and people, both in quantity and speed, creating new commercial pathways, new transport conditions, new products and packages. Global trade offers thus new opportunities for movement of plant, plant products and their pests.

Climate change and global trade are the two main components of the global change, which also includes other aspects, as increasing urbanisation, changes in land use, vulnerability of the ecosystems, etc.

Climate, trade and land use are key parameters for the assessment of the pest introduction potential. The aim of this discussion group is to explore the effects of global change on the pest risk assessment process. For instance, climate change with earlier springs, modified growing seasons, etc. may result in shifting of pest and host distribution ranges, establishment potential of pests, phenological "timetables" of plants, synchronisation between pests and plants. Furthermore, trade with new exporting countries like China and India, with different climatic zones and a large diversity of plants and pests, may increase the risk of introducing new pests.

DISCUSSION POINTS

The focus is made on the potential impact of climate changes and global trade on pest risk assessment and NOT on climate changes or global trade *per se*. The discussion should consider the influences of climate changes and global trade on the pest introduction potential and on the pest risk assessment process.

1. General Circulation Models (GCMs) are the main tools used for the prediction and quantification of climate change as a function of greenhouse gas emissions scenarios. Are these predictions accurate enough? Are the predicted changes in the climatic variables equally robust for temperatures and rainfall (rate and distribution)? Does climate change maintain the present geographical distribution of the climatic zones?
2. How can the potential impacts of climate change on host plants, including their phenology and growth, be effectively considered?
3. What effects (both direct and indirect) may be considered when analysing the potential impacts of climate change on pest biology, ecology, demography and distribution? Are these effects considered in the methods presently used to asses the potential for pest introduction in new areas (*e.g*. climate matching)?
4. How the models for the development of crops and pests (arthropods, fungi, weeds, etc.) are affected by meteorological variables? Can differences in climate change predictions affect the ability to model pest and plant development accurately?
5. Is the complex nature of the plant-pest relationships accounted for in the pest risk analysis? Can this complexity be considered in analysing the effects of the future climate scenarios? How can we account for the multitrophic nature of several natural and agro-systems due to the presence of parasitoids, antagonists, vectors, etc.? How can the synchronisation between plant and pests be better accounted for?
6. Are there estimates of the future global trade trends which may be useful for the pest risk assessment?
7. Are there relationships between the effects of climate change and of global trade on the pest introduction potential?

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DISCUSSION GROUP 3 – *Methodologies in pest risk assessment: quantitative vs. qualitative approaches in the assessment of direct and indirect pest impacts*

INTRODUCTION

According to ISPM11, a pest risk assessment should assess direct and indirect impacts of plant pests. Moreover, the assessment of the pest impacts should include economic, environmental and social impacts.

Whereas a quantification of the pest impacts with a sufficient level of analytical depth is generally preferred, in practice, both quantitative and qualitative approaches have to be used. The main reasons for the need to consider qualitative approaches are:

- In situations where the potential impact is very clear, the need for detailed quantitative analysis is not justified.
- Lack of resources or limited information available on the impacts may force the risk analyst to employ qualitative approaches.
- Quantification of some impacts is complicated by a lack of well-defined markets (environmental impacts) or by controversy on their measurement is (e.g. human health impacts).

A qualitative pest risk assessment using non-numerical terms to describe impacts may use adjectives, such as "highly damaging" or "serious impact", to describe the impact of a plant pest. Words are adaptable and can be used to distinguish an array of values effectively. Nonetheless, qualitative methods have some limitations and present some challenges. A primary difficulty lies in ensuring consistency between assessments and between assessors. This is because qualitative methods rely on words and words can be translated or interpreted differently with the result that they may no longer have the intended meaning. On the other hand, quantitative measures of impact use measurable, numerical terms to describe impacts. Whilst such methods can overcome some of the limitations of qualitative methods, such as providing a more consistent interpretation, quantitative methods can be seriously hampered by the time and data needed. If a risk analysis is not transparent in how impacts have been measured, a quantitative approach may give a false sense of accuracy. Very complex analytical methods can also be difficult to present during risk communication.

DISCUSSION POINTS

1. Do we have a common definition of economic, environmental and social impacts?
2. What level of analytical depth and what time frame should the impact assessment have? Should the assessment be limited to the current situation or should it be extended to future scenarios (e.g. climate changes or geopolitical changes)? In case of direct and indirect effects, should we assess short (1 year) or medium-long term impacts?
3. Quantitative and qualitative methods for measuring economic (commercial) impacts: when and how to use which?
4. Quantitative and qualitative methods for measuring environmental and social (including impacts on human health) impacts.
5. How to combine the assessments of economic, environmental and social impacts?
6. Methods for summarizing uncertainty and dealing with lack of data.

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DISCUSSION GROUP 4 - *Challenges in pest risk assessment: evaluating evidence and addressing uncertainties*

INTRODUCTION

International Standards for Phytosanitary Measures (ISPM) tells that Pest Risk Assessment is the process of evaluating scientific ***evidence*** to determine whether an organism is a pest (FAO, 2007a; 2007b). Moreover, the ISPMs tell that ***uncertainty*** is a component of risk and therefore important to recognize and document when performing PRAs. Sources of uncertainty with a particular PRA may include: missing, incomplete, inconsistent or conflicting data; natural variability of biological systems; subjectiveness of analysis; and sampling randomness. Hence, the evaluation of evidence and addressing of uncertainties are central challenges in pest risk assessment.

A characteristic challenge in pest risk assessment is that the analyst is forced, based on available evidence and presence of uncertainty, to formulate statements about whether an organism will act as a pest in relation to a PRA area. In the field of ecology there has been an interesting debate about similar issues. Ellison (1996) noted that, despite ecologists being certain that e a number of components of the global environmental change occurr and are driven by human activities, a quantitative expression of that certitude, stated in a way that is meaningful to decision makers, normally is absent from ecological publications. Furthermore, Underwood (1995) noted that the lack of quantifiable uncertainty is often used by ecologists to justify their lack of involvement with the decision-making process, and on the other hand, by some decision analysts as a vehicle to avoid using scientific information in the decision-making process. These examples illustrate the intricateness of the challenge the pest risk analyst is facing. Hansson (1999) asked once about risk analysis in general: "Do the technical meanings, and the quantifications, of risk, really help us to understand the problems of risk? Or can they instead distract us from the concerns that should be central in our endeavours?"

DISCUSSION POINTS

1. Should inductive and deductive scientific evidence be differently considered in the pest risk assessment? For example, the pest establishment potential can be deduced from laboratory or field experimental data, whilst with the inductive approach it may be predicted based on environmental similarities with areas where the pest have already established. Other examples of inductive reasoning are statements like "the pest establishment potential is low because the pest has had the possibility to establish for a long time without doing so".
2. In statistical evaluation of evidence, i.e. hypothesis testing, 'Type I' and 'Type II' errors are distinguished as false rejection of the null hypothesis and false acceptance of the null hypothesis.
   - Are these concepts valuable for characterisation of risk?
   - What could be the type of hypothesis formulation to which type I and type II errors of risk assessment are to be related?
   - Is it necessary to relate type I and II errors to risk management scenario's or is there another way?
3. Modelling is used to generate evidence for pest risk assessment
   - What validity and constraints is present in their use?
   - How should uncertainty in model parameters be related and available in model results?
   - How should decision makers use information generated by models (e.g. model results versus model assumptions)?
4. Much of the international controversy centres around the concepts of "acceptable risk" and "appropriate level of protection" (ALOP).
   - Can the process of evaluating evidence and addressing uncertainties reduce controversy in this respect?
   - What is required for a 'meaningful' presentation of pest risk, its relation to evidence and the degree of uncertainty?
   - How can pest risk analysts be brave in their endeavours without being bold?

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GENERAL BACKGROUND DOCUMENTS COMMON TO ALL DISCUSSION GROUPS

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