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PRATIQUE: a research project to enhance pest risk analysis techniques in the European Union

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PRATIQUE is an EC-funded 7th Framework research project designed to address the major challenges for pest risk analysis (PRA) in Europe. It has three principal objectives: (a) to assemble the datasets required to construct PRAs valid for the whole of the EU, (b) to conduct multi-disciplinary research that enhances the techniques used in PRA and (c) to provide a decision support scheme for PRA that is efficient and user-friendly. The research will be undertaken by scientists from 13 institutes in the EU and one each from Australia and New Zealand with subcontractors from institutes in China and Russia. They will produce a structured inventory of PRA datasets for the EU and undertake targeted research to improve existing procedures and develop new methods for (a) the assessment of economic, environmental and social impacts, (b) summarising risk while taking account of uncertainty, (c) mapping endangered areas (d) pathway risk analysis and systems approaches and (e) guiding actions during emergencies caused by outbreaks of harmful organisms. The results will be tested and provided as protocols, decision support systems and computer programs with examples of best practice linked to a computerised European and Mediterranean Plant Protection Organization (EPPO) PRA scheme.

Background

Pest risk analysis (PRA) in the European Union

The pest risk analysis (PRA) process evaluates scientific and economic evidence to determine whether an organism is a pest, whether it should be regulated and the strength of any phytosanitary measures that may be required (FAO, 2007a). PRAs provide the technical justification for phytosanitary regulations such as those listed in the European Community (EC) Plant Health Directive (EC, 2000) and are an essential component of an efficient and effective plant health system that takes appropriate measures to prevent the entry and establishment of quarantine pests while allowing trade to flow as freely as possible.

However, the PRA methodology, data and tools are currently insufficiently developed to guarantee relevant, effective and efficient scientific analyses of plant health risks for the EU, hampering effective, sustainable plant health policy and decision making. This is partly due to the fact that PRA is a young science. Although phytosanitary regulations in Europe have been in force for over 100 years (Ebbels, 2003), these were

Table 1 The History of PRA in Europe in relation to the publication of international standards

Year	Event
1990	1st PRA discussions, UK & NL PRA schemes developed
1991	1st EPPO PRA Panel meeting
1996	ISPM2 on PRA published
1997	1st EPPO pest risk assessment schemes published; 1st EPPO PRA workshop (Florence)
2000	1st EPPO pest risk management scheme published
2001	ISPM11 PRA for quarantine pests published (supplements published in 2003–4)
2004	2nd EPPO PRA workshop (Budapest)
2005	1st Annual EPPO PRA scheme published; 1st EPPO PRA Expert Working Group; EPPO PRA scheme adapted to all non-natives by the UK
2006	EFSA Plant Health Panel formed
2007	ISPM2 revision framework for PRA published; EFSA Scientific Colloquium on Pest Risk Assessment
2008	PRATIQUE starts; 17th EPPO PRA Panel meeting; 1st EPPO PRA Training Workshop (Cyprus)

based primarily on *ad hoc* considerations of risk by experts and it was not until the early 1990's that procedures for analysing risk began to be formalized. These procedures are now undertaken worldwide and follow the IPPC's International Standards on Phytosanitary Measures (ISPMs), principally ISPM11 (FAO, 2004), which was first published in 2001 and sets out the full structure and all the elements to be included in PRAs for quarantine pests and ISPM2 (FAO, 2007b), which provides the overall framework for all PRA activities. Table 1 provides a list of the major events in the short history of PRA in Europe in relation to the publication of these standards.

Although the IPPC PRA standards set out the structure for PRA, they do not provide a decision support scheme that enables the analyst to work through a logical series of questions for each pest or pathway in order to reach a conclusion. To meet this requirement a number of PRA schemes have been developed around the world. In the European Union (EU), the European and Mediterranean Plant Protection Organization (EPPO) PRA scheme (EPPO, 1997), which is subject to annual revision (EPPO, 2007), is widely used and has even been adapted for a much wider range of non-native species in the UK (Baker *et al.*, 2008). EPPO has also published a shortened version of the PRA scheme to support action in emergencies and both the UK and the Netherlands also use short schemes. Although these schemes have a number of limitations (see below), they have enabled national plant health services in the EU to produce large numbers of PRAs that follow ISPM11 and justify regulations. Recognising the key role played by PRA in the EC Plant Health Directive, the increasing global scrutiny of phytosanitary legislation and the need to ensure that the decision making process is separated from risk analysis, the EC has set up an independent panel within the European Food Safety Authority (EFSA) to review PRAs.

Despite this progress, there are three major challenges for PRA development in the EU: (a) the data required to make accurate analyses of the risks throughout the EU are often lacking, (b) PRA processes have insufficiently exploited important new scientific and technological developments and (c) the PRA procedures are complex, discouraging take-up among all EU member states. These challenges are described in more detail below.

PRA Challenge 1: lack of data

The first major challenge arises because PRAs have very high data demands. A very large amount of information may be required on: the pest itself, the situation in its current area of distribution, the pathways of movement, the factors affecting its establishment, spread and impacts in the area under threat and the measures available for its management. In the EU, PRAs are produced by experts who are likely to have access to the data required to analyse the risks posed to their own country but cannot readily obtain the data necessary to expand their analysis to cover the whole EU. Clearly, it is essential that such data are obtained so regulations are based on PRAs relevant to every EU member state.

PRA Challenge 2: insufficient exploitation of scientific developments

The second major challenge is to tackle the key difficulties that have been identified not only in the PRA schemes used within the EU but also worldwide. While numerous attempts have been made to resolve these issues, there have been insufficient opportunities to bring together a multi-disciplinary team with the skills to exploit recent scientific advances and tackle key problems such as the assessment of economic and environmental impacts (Vilà *et al.*, 2009), ensuring consistency by standardising PRA production, capturing and communicating uncertainty, mapping endangered areas (Chytrý *et al.*, 2009), summarising risk, linking pathway analysis to the construction of systems approaches to prevent pest entry and creating a decision support system for the management of pest outbreaks.

PRA Challenge 3: the complexity of the PRA process

The third major challenge occurs because many factors need to be considered to determine (a) whether particular pathways can introduce pests (Hulme *et al*., 2008), (b) whether a particular pest can enter, establish and cause impacts in an area and (c) what measures would be appropriate to reduce the risk to an acceptable level. The PRA process can therefore be daunting for new users and time-consuming for experts while generating lengthy outputs that are difficult for regulators to assimilate. New techniques need to be investigated to enhance the user-friendliness of PRA schemes, to reduce the time required to conduct PRAs for experienced pest risk analysts, especially in emergencies, and improve the way PRAs are communicated to decision makers.

The Objectives of PRATIQUE

PRATIQUE will directly tackle these three challenges by: (a) assembling the datasets required to construct effective PRAs valid for the whole of the EU, (b) conducting multi-disciplinary research that enhances the techniques used in PRA and (c) providing a decision support scheme for PRA that is efficient and user-friendly. These objectives are tackled in six technical work packages (WPs):

1 To assemble the datasets required to construct PRAs valid for the whole of the EU
2 To enhance techniques for assessing economic, environmental and social impacts
3 To enhance techniques for standardising and summarising pest risk assessments
4 To refine methods for pathway analysis and systems approaches
5 Developing a decision support system for the eradication and containment of pest outbreaks
6 Ensuring that the PRA scheme is fit for purpose and user-friendly.

They are described in more detail below and their relationship to the different stages of PRA is given in Fig. 1.

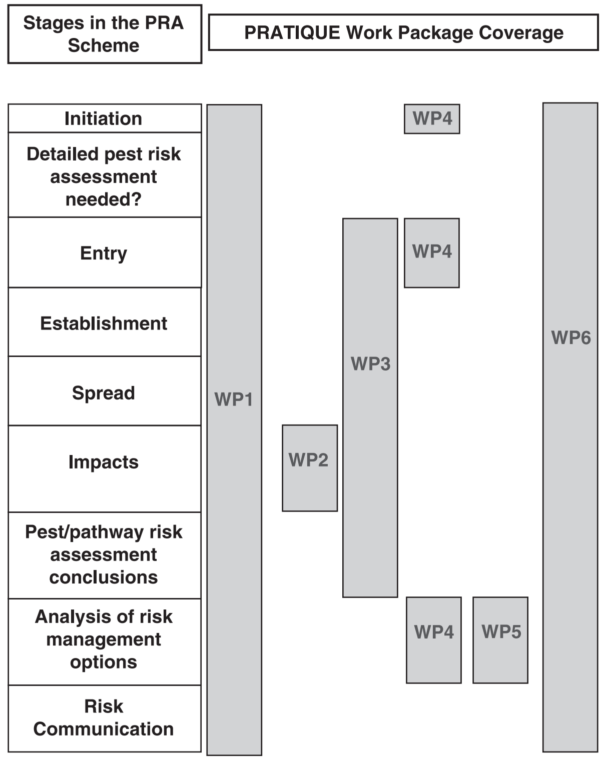

Fig. 1 Diagram showing which key stages of the PRA scheme are tackled by the different PRATIQUE Work Packages.

WP1: to assemble the datasets required to construct PRAs valid for the whole of the EU

WP1 will be primarily concerned with identifying, describing, assembling and enhancing the availability of the datasets required in the PRA process by creating a detailed inventory structured according to each stage of the PRA scheme and appropriate to the pests, pathways and receptors concerned. Sufficient metadata will be recorded for pest risk analysts to determine the relevance and suitability of each dataset. Access to the datasets will be determined and provided so that, where possible, directs links can be made through the computerised PRA scheme that therefore acts as a data portal. A high priority will be placed on obtaining the data from every EU member state required to produce PRAs that are representative for the whole of the EU. Trade with Eastern Asia is rapidly increasing and many new pests are expected to invade the EU via this route. To create a new dataset of potentially damaging Eastern Asian pests, WP1 will monitor European sentinel trees growing in Russian arboreta and planted in China with the help of Russian and Chinese subcontractors. WP1 will also assemble PRA schemes from different countries worldwide and obtain the data needed to test the developments to PRA techniques and draft examples of best practice. PRATIQUE will build on the DAISIE (Delivering Alien Invasive Species Inventories for Europe) database of non-native species established in Europe (DAISIE, 2009) and explore its capacity to support PRAs.

WP2: to enhance techniques for assessing economic, environmental and social impacts

The assessment of impacts is generally considered to be the most difficult section of any PRA. This arises because of the limited datasets available, the absence of clearly defined indicators and deficiencies in the existing tools. To enhance the techniques used in the EU, WP2 will first identify best practice by studying PRA schemes from other parts of the world and risk analyses from other sectors, primarily the environment, animal health, fisheries and food safety.

Much can be learned by analysing the characteristics of species that have already entered, established, spread and caused significant impacts in the EU (Pyšek & Richardson, 2007). Through joint consortium membership, this project will exploit the analysis of species traits that lead to invasiveness undertaken within the ALARM EU project (e.g. Lambdon & Hulme, 2006; Sol *et al*., 2008). PRATIQUE will extend the risk assessment tools developed and tested in ALARM (e.g. Křivánek & Pyšek 2006) to determine the extent to which trait analysis can provide prior warning of harmful pests not only in uncultivated habitats but also in cultivation.

Enhancements to the techniques for both qualitative and quantitative impact assessments are needed. Consistent qualitative assessments at five levels of scale are required for the PRA scheme and these will be prepared by providing indicators for minimal, minor, moderate, major and massive economic, environmental and social impacts. For quantitative assessments, computerised modules will be constructed to lead the assessor through the procedures required to predict pest spread and follow the partial budgeting and partial equilibrium approaches addressed in ISPM11. Emphasis will be given to two particularly challenging topics: the assessment of environmental and long-term impacts. Environmental impact methods will be enhanced not only by developing the economic methodology but also through multi-criteria analysis. The extent to which crops, cropping systems, uncultivated and amenity receptor environments can be assessed in terms of their vulnerability, with sufficient information for maps to be created in WP3, will also be determined. Predicting future impacts depends on techniques for scaling up impacts, e.g. from field to farm to industry, and a generic integrated model will be created that combines spread with the impacts. The methodology developed will be tested with a range of examples, representative of the diversity of PRA types.

WP3: to enhance techniques for standardising and summarising pest risk assessments

Four key risk assessment problems, (a) difficulties in standardising PRA production due to the lack of consistency in scoring responses to PRA questions, (b) capturing and communicating uncertainty, (c) mapping endangered areas and (d) summarising risk, will be addressed by separate tasks in this work package. Each will begin with a review of best practice worldwide, taking particular care to explore the techniques used in other sectors and being developed by risk scientists, and finish with the development of protocols for integration into the PRA scheme.

Consistency will be enhanced by constructing a protocol with decision rules, illustrated by examples, for scoring each of the five levels of risk in every question of the EPPO PRA scheme. Within WP3, examples and/or values for each of the five levels of risk in the 17 questions of the establishment potential section of the EPPO PRA scheme will be developed. Scoring rules for impacts and pathway analysis will be generated by WP2 and WP4 respectively and coordinated by WP3.

Uncertainty arises in PRA due to missing, incomplete, inconsistent or conflicting data. Based on best practice worldwide, techniques will be developed and guidance given to assist risk analysts on the most appropriate steps to be taken so that assessments can be made even in situations of high uncertainty and the amount of uncertainty in PRAs can be captured, quantified and clearly communicated.

Currently, the mapping of endangered areas is based primarily on historical climate using the computer program CLIMEX (Sutherst *et al*., 2007). In this project we will compare CLIMEX with other techniques, such as Maxent (hillips *et al*., 2006) and BIOCLIM (Busby, 1986), exploit new high resolution gridded climatologies representative of current and future climates and prepare guidance for the production of maps that integrate climate with the other biotic (e.g. hosts) and abiotic factors (e.g. soils) that are critical for pest establishment. Integration with land use and crop maps will greatly enhance not only the capacity to produce maps showing where pests can establish but also where economic impacts are likely to be most significant. Maps of endangered areas are an important method for summarising and communicating risk.

A variety of techniques for creating objective summaries of PRA have been proposed ranging from simple averages of scores to the application of conditional probabilities with or without Monte Carlo simulation. PRATIQUE will evaluate these different methods and determine which, alone or in combination, not only provide the most accurate and clear presentation of risk summaries but also communicate the summaries most effectively to decision makers.

WP4: to refine methods for pathway analysis and systems approaches

This work package will review best practice worldwide for the two components of PRA that are concerned with entry pathways: (a) assessing the potential for pests to move along pathways (pathway analysis) to enter the PRA area and (b) devising a set of combined management options (systems approaches) that prevent or reduce the impact of such movement (FAO, 2002). Primarily because (a) occurs at the beginning of the risk assessment stage and (b) is performed at the end of the analysis of risk management options there has been little attempt at linking the two procedures even though they are mutually dependent (Hulme *et al*., 2008). Links between the two processes will be developed and provided to risk analysts in the computerised scheme. Guidance on the scoring of the five levels of risk in the entry potential section of the EPPO PRA scheme will be produced.

Pathway analyses often generate very long lists of organisms and these then need to be screened to identify those that may pose the highest risk and thus have the highest priority for PRA production. Pest risk analysts may also study one pathway and determine what species may be able to use this pathway to enter an area. The information from such pathway analyses is clearly highly relevant in determining the optimal selection of measures through systems approaches to prevent the entry of quarantine pests. The systems approach is a mitigation measure (in fact, the product of a series of measures acting in combination) to reduce the risks in a particular pathway. There is a limitation on the application of the systems approach in many instances because of the complexity of evaluating such a set of methods applied in varying combinations. By establishing improved computational tools (covering both qualitative and quantitative assessments of individual risks and mitigation components) it will be possible to include systems approaches more widely in pathway analyses.

This project will utilise existing global pest databases and compendia to generate species lists and, in a novel approach, determine whether neural networks combined with self-organising maps (Worner & Gevrey, 2006) can be used to prioritise species for PRA. The concept involves the creation of a computerised linking system between key words or other items within distinct datasets or documents. So, for example, several sets of national PRA documentation could be searched by a neural network software engine to identify common elements (such as host species, climate references, geographical presence, pathway types, diction and control measures, etc.) which form patterns of association that can then be used in a new risk analysis. Without a neural network to link otherwise unrelated documents and data, a new risk analysis would not benefit from a systematic analysis of other available information. The patterns of association may reveal risk factors, or mitigation opportunities, that would otherwise be missed. Imagine a matrix linking pest species to the countries and hosts where they are found. Each can be viewed as a series of nodes and links. Neural networks explore the underlying order in this matrix and make predictions as to which links are likely to exist but are as yet unrecorded. This may help the prediction of future pest risks.

Neural network techniques can be employed to provide links between information bits in documentation on a wide range of risks and mitigation measures. By creating explicit links between what is now scattered information (for example, on hosts, geographical range, trade volumes, mitigation performance, costs, etc.) the process of pathway analysis will be made more effective and efficient. The neural network approach will benefit the pathway analysis approach both in conceptual terms, by demonstrating the ways in which information linkages should and could be considered, and by establishing techniques that can be directly applied to commonly held information in archives of PRAs and other databases. Because of the different formats of such information, a 'soft' neural network link is preferred to a 'hard' linkage that would require precise specification of the format and content of information bits in diverse national and international systems.

A framework for the generation of systems approaches within the EU PRA system will be developed with guidance on the identification and selection of efficient, feasible and reproducible measures that are operating together to reduce the risk of entry to an acceptable level. A significant issue to be addressed in the systems approach is how a combination of partially effective risk mitigation actions can, together, provide effective and efficient risk reduction. The wide range of measures that can be employed in a systems approach greatly increases the number of options that could be specified in risk management, and may include complex interactions and dependencies amongst the options. A modelling approach that can optimise, according to a range of policy objectives, will be used to develop tools that demonstrate the effectiveness of a systems approach to decision makers. Stochastic modelling with sensitivity analyses will be undertaken to explore the range of risk outcomes, to determine the degree of equivalence in management options and to provide appropriate weightings for system components.

WP5: developing a decision support system for the eradication and containment of pest outbreaks

The PRA process is often considered to be complete once the pest risk has been assessed and, if the risk is unacceptable, reliable, cost-effective management options have been identified for preventing pest entry. However, internal measures, taken after the pest has entered and before the pest has established, may still be highly effective. In the EU, some EC directives describe measures to be taken following outbreaks of a few well known quarantine pests, e.g. *Diabrotica virgifera virgifera*, but there is no generic decision support scheme to help guide eradication or containment actions for all quarantine pests, whatever the pest, the habitat or the state of the outbreak when first discovered. To develop the first EU decision support scheme to guide actions at outbreaks, PRATIQUE will identify best practice by reviewing plant health contingency plans (FAO, 1998) and conduct a meta-analysis of the successes and failures of eradication and containment campaigns worldwide (Wittenberg & Cock, 2001). Measures that have been successful in combating pests that are particularly difficult to control due to problems of detection, pesticide resistance, high mobility and impacts caused at low population densities will be highlighted.

Particular emphasis will be given to the provision of guidance for assessing the costs and benefits of measures that can be taken to eradicate or contain pests at three key stages: when developing contingency plans, when a new outbreak has been discovered and when deciding whether to continue an official control campaign (Waage & Mumford, 2008).

Pest surveying techniques play a key role in identifying new pest arrivals, first outbreaks and, once an outbreak has been detected, in defining its limits. This project will review pest surveying techniques worldwide (FAO, 1997) and prepare a guidance document describing best practice for detecting new incursions and surveying pest outbreaks. New technologies with considerable potential in this field will be investigated. These include (a) multi-lure traps especially designed to allow simultaneous trapping of a large number of target species and (b) 'smart-traps' that relay information automatically from pest surveillance systems, capture survey data remotely, include a spatial reference from global positioning systems and communicate between field and laboratory.

WP6: ensuring that the PRA scheme is fit for purpose and user-friendly

The EPPO PRA scheme, which is used throughout Europe, directly follows ISPM11 and provides risk analysts with a comprehensive series of questions that explore all the factors that must be considered, will form the basis for PRATIQUE's investigations and for the dissemination of its results. The principal outputs of PRATIQUE: datasets (WP1), guidance and enhancements to the PRA scheme (WPs 2–5) will be directly incorporated into the EPPO PRA scheme or provided as stand-alone modules and simple links. The EPPO PRA scheme, modules and links will all be available through a simple computerised interface.

Teams of independent experts from EPPO Panels, EPPO expert working groups and project partner institutes will test the revised PRA scheme including the draft protocols and guidance and their feedback will be used to improve the scheme and ensure it is appropriate in all circumstances irrespective of pest taxon, trophic level, habitat, whether the pest is intentionally or unintentionally introduced and whether a rapid or detailed analysis is required. Feedback on the PRA outputs will also be sought from those with experience in plant health regulation and stakeholders to ensure that the PRAs are easy to read and the key elements required for decision-making can readily be extracted. The scheme will be evaluated both by experts in PRA and those new to the subject to make sure it is useful at all levels of expertise. The testing phase will be completed six months before the end of the project to ensure that there is sufficient time for the key project deliverables to take the feedback into account.

The new computerised PRA scheme will provide risk analysts with:

- access to all technical project deliverables
- a validated, user-friendly computerised PRA scheme with detailed guidance, direct context-related links to relevant datasets, modules containing procedures to be adopted in difficult sections of the scheme, a manual and examples of best practice.

Risk managers, phytosanitary regulators and policy makers will benefit because PRAs:

- will be much easier to read
- will more clearly highlight the key factors to take into account when developing phytosanitary measures, ensuring that the choices made are based on sound science, reflect uncertainties and represent the most cost-effective options while following IPPC principles of minimal impact, transparency and equivalence
- will also be much easier for stakeholders to read, so they can understand more readily the justification for the measures being proposed.

To improve take-up, further guidance will be provided with a written manual and examples of best practice. The examples of best practice will be chosen during PRATIQUE and will be selected from the PRAs used to test the methodology developed by WPs 2, 3, 4 & 5. In some cases, existing PRAs will be extended to illustrate the benefits of PRATIQUE outputs. Where appropriate, new PRAs will be constructed to ensure that the examples given are representative of the diversity of PRA types.

Personnel and time scale

The PRATIQUE consortium brings together specialists from various different fields: pest risk analysis, phytosanitary regulation, invasive alien species, ecology, economics and modelling. The scientists involved come from fifteen organisations divided as follows into:

- four European universities (Imperial College London, United Kingdom; University of Fribourg, Switzerland; University of Padua, Italy and Wageningen University, the Netherlands)
- seven European research institutes (Institute of Botany, Academy of Sciences of the Czech Republic; Centre de Coopération International en Recherche Agronomique pour le Développement, France; Central Science Laboratory, United Kingdom; Institut National de la Recherche Agronomique, France; Julius Kühn Institute, Germany; Agricultural Economics Institute, the Netherlands; and Plant Protection Institute, Bulgaria)
- two international organisations (CAB International and EPPO)
- two partners from outside Europe (Cooperative Research Centre for National Plant Biosecurity, Australia and National Centre for Advanced Bio-Protection Technologies, Lincoln University, New Zealand)
- two subcontractors from China (Institute of Zoology, Chinese Academy of Sciences, Beijing) and Russia (Sukachev Institute of Forest, Siberian Branch, Russian Academy of Science, Krasnoyarsk).

The three-year project began in March 2008.

Further information

Further information can be obtained from the PRATIQUE website: http://www.pratiqueproject.eu.

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PRATIQUE: Un projet de recherche pour améliorer les techniques d'analyse du risque phytosanitaire dans l'Union européenne

PRATIQUE est un projet de recherche financé pour le 7^{e} Programme-cadre pour la recherche et le développement technologique (FP7) de l'Union européenne destiné à répondre aux questions principales qui se posent pour l'analyse du risque phytosanitaire (ARP) en Europe. Il a trois objectifs principaux: (a) assembler des jeux de données nécessaires pour construire des ARP valides pour l'ensemble de l'UE, (b) conduire une recherche multidisciplinaire qui améliorera les techniques utilisées dans l'ARP et (c) développer un schéma d'aide à la décision efficace et facile à utiliser. Ces recherches seront menées par des scientifiques de 13 instituts dans l'UE, ainsi qu'un en Australie et un en Nouvelle-Zélande avec des sous-traitants en Chine et en Russie. Ils produiront un inventaire structuré des jeux de données d'ARP pour l'UE et entreprendront des recherches ciblées pour améliorer les procédures existantes et développer de nouvelles méthodes pour (a) évaluer les impacts économiques, environnementaux et sociaux, (b) résumer le risque tout en prenant en compte les incertitudes, (c) cartographier les zones menacées (d) analyser le risque par filière et réaliser des approches systémiques et (e) guider les actions en urgence dues aux foyers d'organismes nuisibles. Les résultats seront testés et fournis sous forme de protocoles, de systèmes d'aide à la décision et de programmes informatiques avec des exemples de bonnes pratiques en lien avec le schéma d'ARP de l'Organisation Européenne et Méditerranéenne pour la Protection des Plantes (OEPP).

PRATIQUE: исследовательский проект, способствующий совершенствованию методик анализа фитосанитарного риска в Европейском Союзе

Финансируемый по линии 7-ой рамочной программы научных исследований, исследовательский проект PRATIQUE нацелен на разрешение основных проблем анализа фитосанитарного риска вредителей (АФР) в Европе. Проект преследует три основных цели: (a) собрать сводки действительных для всего ЕС данных, необходимые для проведения АФР, (b) провести мультидисциплинарное исследование, позволяющее усовершенствовать методики, используемые в АФР, и (c) создать такую схему поддержки принятия решений для АФР, которая была бы эффективной и вместе с тем простой. Исследования будут проводиться учеными из 13 институтов ЕС и по одному институту из Австралии и из Новой Зеландии с субподрядчиками из институтов Китая и России. В результате этих исследований будет составлен структурированный перечень сводок данных АФР для ЕС и будут предприняты целевые исследования, позволяющие улучшить существующие процедуры и разработать новые методы для: (a) оценки экономических, экологических и социальных воздействий, (b) подведения итогов в отношении риска, принимая во внимание фактор неопределенности, (c) картирования зон, подверженных опасности, (d) анализа риска для путей распространения и системных подходов, а также (e) выработки руководств по действиям в случае возникновения чрезвычайных ситуаций, вызванных вспышками вредных организмов. Результаты будут тестироваться и предоставляться в качестве протоколов, систем поддержки принятия решений и компьютерных программ с примерами наилучших методов, связанных с компьютеризированной схемой АФР Европейской и Средиземноморской Организации по Карантину и Защите Растений (ЕОКЗР).

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