Bulletin OEPP/EPPO Bulletin (2014) **44** (3), 443–456 ISSN 0250-8052. DOI: 10.1111/epp.12164

European and Mediterranean Plant Protection Organization
Organisation Européenne et Méditerranéenne pour la Protection des Plantes PM 9/18 (1)

National regulatory control systems
Systèmes de lutte nationaux réglementaires

PM 9/18 (1) Decision-Support Scheme for prioritizing action during outbreaks

Specific scope

The Decision-Support Scheme for prioritizing action during outbreaks (DSS for outbreaks) is used to identify measures for specific outbreaks, to review existing measures and to generate contingency plans.

Specific approval and amendment

Approved in 2014-09.

Introduction

NPPOs are often faced with the challenge of how best to respond rapidly, proportionately and effectively to pest outbreaks. Pest risk managers in NPPOs have to react quickly to outbreak situations by evaluating the information available, considering the possible options and then presenting justified recommendations for appropriate action to policy makers. Consequently many EPPO member countries are developing contingency plans or DSS for pests which are likely to cause a major economic and/or environmental impact. In 2009, a Standard PM 9/10 *Generic elements for contingency plans* was developed (EPPO, 2009). In addition, specific Standards outlining control strategies for certain important pests have been developed in the series PM 9 *National regulatory control systems*. These Standards should help EPPO countries to draft their own pest specific contingency plans.

In the framework of the PRATIQUE project a generic scheme was developed to provide guidance on possible pest management programmes (Sunley *et al.*, 2011). This generic scheme which is applicable to all pest outbreak situations was designed to enable policy makers to compare and contrast different management options. The Decision-Support Scheme presented in this Standard (DSS for outbreaks) is based largely on the outcome of the PRATIQUE project. The target user for the DSS for outbreaks is the pest risk manager.

The DSS for outbreaks is designed to aid decision making in the following situations:

- When a new outbreak of a quarantine or potential quarantine pest has been reported;
- When an existing management programme against a quarantine pest needs to be reviewed;
- If a contingency plan for a quarantine pest needs to be generated.

As specific information is needed to be able to run the DSS for outbreaks, it is particularly applicable for situations where:

- The pest has been identified;
- The pest is known to be a quarantine or a potential quarantine pest;
- A risk assessment is available for the pest;
- The situation in the outbreak area is at least partially known (or for contingency planning, an appropriate scenario or scenarios can be generated).

However, the scheme has been designed with sufficient flexibility to enable it to be also used even when there is very limited information available and/or in cases where there is no risk assessment available.

The DSS for outbreaks takes into account the pest biology, the assessment of costs and the operational constraints.

The structure of the DSS for outbreaks is outlined in Table 1.

The phytosanitary terms used in this Standard are defined in ISPM 5 (FAO, 2012), e.g. eradication containment and suppression.

This DSS covers all types of pests (including arthropods, bacteria, fungi, nematodes, phytoplasmas, viruses and viroids, and invasive alien plants). When dealing with specific pest groups (e.g. invasive alien plants), the assessor may need to be flexible in his/her interpretation of the questions.

Table 1 Structure of the DSS

Part	Table or decision point	Title	Function
Key information and selection of management measures			
A	1	Basic Information	To collect and summarize basic information on the pest and the location of the outbreak. The name and institute of the person completing this DSS for outbreaks together with the date are also recorded
A	2	Key factors to consider based on the current situation of the outbreak	To assess the key factors about the current outbreak situation that need to be known in order to select the most appropriate management measures
A	3	Additional key factors to consider based on the risk assessment	To summarize the key factors from the risk assessment that are required to select the most appropriate management measures
A	4	Definition of the risk management area	To define the risk management area to be considered in the assessment. This may extend beyond the immediate outbreak area
A	5	Decision on considering 'official action'	To determine whether it is already clear on the basis of the initial assessment that no eradication, containment or suppression action is appropriate
A	6	Selection of measures	To select the measures that are most appropriate for the current outbreak situation or scenario
Comparison and selection of measures			
B	1	Matrix for comparing different management measures	To provide a comparison of the most appropriate (combination of) measures in terms of efficacy and feasibility, cost and acceptability and safety
B	2	Summary report: detailed analysis and justification of the recommended strategy(ies)	To provide a summary of the reasons for selecting a strategy (ies) to control the outbreak
B	3	Other recommendations	To consider other measures (e.g. review of import requirements)

Computerized version of the EPPO Decision-Support Scheme for prioritizing action during outbreaks

A computer programme named CAPRA was developed by the EPPO Secretariat to assist experts in running the EPPO decision-support scheme for prioritizing action during outbreaks, and other decision-support schemes. It presents all questions included in the Decision-Support Scheme in a user friendly interface. The software, together with a manual for the user, can be downloaded at the following address: http://capra.eppo.int/download.php.

In Part A, the current outbreak situation (or scenario in the case of contingency planning) is summarized and information from the risk assessment is obtained in order to select the appropriate measures for evaluation in Part B.

The questions in the DSS for outbreaks are designed to structure the reasoning in order to ensure that decision-making is well informed. In emergency situations, it is recommended that the DSS for outbreaks is completed as quickly as possible and used as a checklist to ensure all key factors and potential management measures are considered. It will not always be possible to answer all the questions, and the information for some may not be available until after the onset of an eradication programme. Furthermore, questions may be answered in more detail when there is more time and as more information becomes available, especially in situations when the recommendation is not clear-cut.

The output of the DSS for outbreaks is a document that includes all the relevant information, together with the evidence and the rationale behind the selection of the management programme. The conclusions and report should also highlight why some measures were not selected.

In both Parts A and B, some scales are suggested to assist with the responses to these questions. These are by no means definitive. Indeed, the responses to the questions may be subjective depending on the situation, in which case the suggested scales may be less useful. The justification/basis for the assessment should be outlined in the comments boxes.

When eradication, containment and suppression programmes are continued over a prolonged period of time, it is important to review the situation and the relevance/success of the management programme. It is particularly useful to review the answers given in the DSS for outbreaks regularly, paying particular attention to the justification for the

initial decisions to ensure that the programme chosen is still the best management option.

Part A: Key information and selection of management measures

Before starting the DSS for outbreaks it is important to ensure that the species concerned is not native to the area, or for intentional introductions, that it is present in unintended habitats.

For applicable questions the user of the DSS for outbreaks should select both a score and an uncertainty for this score. When using the paper version these should both be reported in the comments section. Additional comments may also be added in the comment lines to justify the score and uncertainty.

A1. Basic information

Name of the assessor	Date

If this DSS is being conducted to generate a contingency plan, the scheme should be used for one or more outbreak scenarios, e.g. for Anoplophora chinensis *this could be a single infested tree in an urban area, or a small cluster of infested trees surrounding a nursery producing host plants.*

A1.1	Pest scientific name
Note	The scientific name and taxonomic position should be specified as appropriate. If the identity of the species is unclear, then there are limits to the application of this DSS for outbreaks.

A1.2	Pest common name

A1.3	Stage(s) of the life cycle present, where appropriate

A1.4	Host (s) on which the pest was detected, when appropriate
Note	Note that the pest may have been detected without being associated with a host (e.g. caught in a trap)

A1.5	Location of the outbreak/finding (maps should be provided if available)
Note	The geographical location should be given with as much detail as possible: latitude, longitude, grid reference and name as appropriate. The preliminary delimitation of the outbreak area should be indicated. Information should also be provided on the circumstances of the detection.

A1.6	Habitat type
Note	Relevant habitat(s) associated with the pest in the outbreak area should be selected from the EUNIS hierarchy at http://eunis.eea.europa.eu/habitats-code-browser.jsp.

A1.7	Hosts
Note	Hosts present in the outbreak area should be listed (including details of species, variety, developmental stage, and spatial distribution and abundance)

A1.8	Is a pest risk assessment already available for the pest or another comparable pest?
Note	If so, details should be given and its validity assessed, e.g. the risk assessment may concern a different ;area/country, be out of date or cover a closely related species or a pest with a similar biology. If no suitable pest risk assessment is available, then an Express PRA (EPPO Standard PM 5/5) or at least Stage 1 and Stage 2A of PM 5/3 should preferably be conducted before completing the DSS for outbreaks.
Reference to the existing PRA(s)	Information should be provided on the date when the PRA was performed, the name of the risk assessors who conducted it, their institute and country
Is the existing PRA relevant to this particular case?	

A1.9	Has an eradication or containment programme already been performed or is a contingency plan available for this pest or another comparable pest?
Note	If so, details should be given and it should be noted whether it is valid (it may concern a different area/country, be out of date or have been carried out for a closely related species or a pest with a similar biology)
Reference of existing documentation	Information should be provided on the date when the document was produced, the name of its author(s), their institute and country
Is the programme appropriate to this particular case?	

A2. Key factors to consider based on the current situation of the outbreak

A2.1	What is the extent of the infested area(s)?
Note	It should be the current best estimate, taking into account the fact that delimiting surveys may still be necessary or ongoing. The extent can be expressed in terms of the overall area or areas infested (ha, etc.), the number of infested sites (glasshouses, fields, gardens, parks, etc.), or the number of infested plants.
Score Suggested scale:	**Very small, Small, Moderate, Large, Very large** For field crops/forests: Very small: < 1 ha; Small: more than 1 to 10 ha; Medium: more than 10 to 100 ha; Large: more than 100 to 1000 ha; Very large: more than 1000 ha
Uncertainty	**Low, Medium, High** When rating uncertainty, the likelihood that the pest has already spread outside the delimited area should be considered, i.e. the confidence that the current outbreak has been successfully delimited and that no other outbreaks exist.
Comments	

A2.2	What is the incidence of the pest in the outbreak area?
Note	This should be expressed according to terms that are relevant to the type of organism, e.g. abundance, prevalence, density or in actual numbers. It can also be expressed as a proportion, relative to the total available hosts. In addition, it may be useful to compare with other known outbreaks.
Score	**Very low, Low, Moderate, High, Very high**
Uncertainty	**Low, Medium, High**
Comments	

A2.3	What is the reproductive capability of the pest in the outbreak area?
Note	In answering this question the following factors may be taken into account: • suitability of weather conditions for reproduction, • the proportion of the population capable of reproducing or infesting, • the likelihood of finding sexual partners or alternate hosts if required, • the expected length of time before pests become sexually "mature" or infective, • the expected number of "offspring" per "parent", • the number of generations per year.
Score	**Very low, Low, Moderate, High, Very High**
Uncertainty	**Low, Medium, High**
Comments	

A2.4	What is the natural spread capacity of the pest from the outbreak area?
Note	When a PRA is available, an assessment of the overall capacity of this pest to spread naturally should be available (see answer to question 4.01 in a PRA following PM 5/3(5), or point 11 in a PRA following PM 5/5(1)). However, it is also important to take into account specific factors relating to the current outbreak which may prevent the organism from exhibiting its full potential for spread. Examples include when: • life stages present are immobile • vectors are not present • the outbreak occurred in a contained or isolated physical situation or habitat, e.g. a glasshouse, an island or a lake • weather conditions are unsuitable (e.g. maximum daily temperatures are insufficient for insect flight, or too dry or too cold for spore release for a fungus)
Score	**Very low, Low, Moderate, High, Very High**
Suggested scale: (as in PM 5/3(5))	Use the guidance below to evaluate natural spread and adapt as necessary to take into account the situation of the outbreak (isolation, weather conditions…) **Very low**: The pest cannot spread naturally (the vector is absent or it can only spread by intervention of man (e.g. grafting or budding)) or the pest has a very low rate of spread (less than 10 m per year). **Low**: The pest has a low mobility (10 m to 1 km per year) that only allows movement within production sites or within sites of suitable habitat (Spreading to occupy a circular area at a linear speed of between 10 m and 1 km per year would, within 4 years, lead to up to 50 km^2 being occupied). **Moderate**: The pest has a medium mobility (more than 1 km to 10 km per year) (Spreading to occupy a circular area at a linear speed of between 1 and 10 km per year would, within 4 years, lead to between approximately 50 km^2 and 5000 km^2 being occupied). **High**: The pest has a high mobility (more than 10 to 50 km per year). (Spreading to occupy a circular area at a linear speed of between 10 and 50 km per year would, within 4 years lead to between approximately 5000 and 125 000 km^2 being occupied). **Very High**: The pest has a very high mobility (more than 50 km/year) (Spreading to occupy a circular area at a linear speed of 50 km per year would, within 4 years over 125 000 km^2 would be occupied).
Uncertainty	**Low, Medium, High**
Comments	

A2.5	What is the spread capacity of the pest from the outbreak area due to human activity?
Note	When a PRA is available, an assessment of the overall capacity of this pest to spread with human assistance should be available (see answer to questions 4.02 in a PRA following PM 5/3(5), or point 11 in a PRA following PM 5/5 (1)). However, factors regarding the current outbreak situation such as biological, geographical and environmental factors may limit human assisted spread.
Score	**Very low, Low, Moderate, High, Very High**
Suggested scale (as in PM 5/3(5))	1. Has a pathway that involves human activity been identified for this pest? If yes, the spread capacity from the outbreak area by human assistance is at minimum moderate go to 2. If no, the spread capacity from the outbreak area by human assistance is very low or low. 2. Can the pest be transmitted by seed or (other) plants for planting (cuttings, budwood, grafted plants, etc.), plant products, with packaging, conveyance, machinery? If yes, the rate of increase in the infested area by human assistance is at minimum high go to 3 If no, the spread capacity from the outbreak area by human assistance is moderate. 3. Is the pathway on which the pest is likely to be present widely distributed outside the outbreak area (trade or movement with persons) or is the pest likely to be moved intentionally by persons outside the outbreak area? If yes, the spread capacity from the outbreak area by human assistance is very high If no, the spread capacity from the outbreak area by human assistance is high
Uncertainty	**Low, Medium, High**
Comments	

A2.6	How easy is the organism to detect?
Note	When a PRA is available, see responses and guidance to question 2.09 in a PRA following PM 5/3(5), or point 2 in a PRA following PM 5/5(1)
Score	**Very easy, Easy, With some difficulty, Difficult, Very difficult**
Uncertainty	**Low, Medium, High**
Comments	

A2.7	How easy is the organism to identify?
Note	When a PRA is available according to PM 5/5(1), see section 2. Pest overview
Score	**Very easy, Easy, With some difficulty, Difficult, Very difficult**
Uncertainty	**Low, Medium, High**
Comments	

A2.8	How long has the pest been present in the outbreak area?
Note	A rating should be given and related to the length of the life cycle of the pest whenever appropriate in the comments box. For example, *A. chinensis* needs 2-3 years to complete its life cycle in Northern Europe, so the presence of this pest for less than a year does not have the same significance as for other pests with a much shorter life cycle.
Rating	**Less than one month, Less than six months, Less than one year, Less than three years, More than three years**
Uncertainty	**Low, Medium, High**
Comments	

A2.9	What damage is the pest currently causing in the outbreak area?
Note	An estimate of the economic, environmental and social impacts of the pest should be provided. When a PRA is available, see responses and guidance to section 6 in a PRA following PM 5/3(5), or point 12 and 13 in a PRA following PM 5/5(1), and/or refine to the area being addressed.
i.	**Economic damage**
Score	**Minimal, Minor, Moderate, Major, Massive**
Uncertainty	**Low, Medium, High**
Comments	
ii.	**Environmental damage**
Score	**Minimal, Minor, Moderate, Major, Massive**
Uncertainty	**Low, Medium, High**
Comments	
iii.	**Social damage**
Score	**Minimal, Minor, Moderate, Major, Massive**
Uncertainty	**Low, Medium, High**
Comments	

A3. Additional key factors to consider based on the risk assessment

In this section factors of risk for other areas are also considered.

A3.1	How likely is it that subsequent introductions of the pest may occur?
Note	This is an estimate of the overall probability of entry taking into account the risk presented by different pathways and an estimate the overall likelihood of entry. When a PRA is available this information should be provided, in the written summary and summary scores for Entry Potential in question 2.14 in a PRA following PM 5/3(5), or point 8 in a PRA following PM 5/5(1). When no PRA is available follow the guidance provided for entry in PM 5/5
Score	**Very unlikely, Unlikely, Moderately likely, Likely, Very likely**
Uncertainty	**Low, Medium, High**
Comments	

A3.2	How large an area is still available for further establishment?
Note	When a PRA is available, the area suitable for establishment should be described in section 3 in a PRA following PM 5/3(5) or in points 9 and 11 in a PRA following PM 5/5(1).
Score	**Very limited, Limited, Medium, Large, Very large**
Uncertainty	**Low, Medium, High**
Describe the area	

A3.3	What is the potential impact of this pest?
Note	When a PRA is available, the potential economic, environmental and social impacts should be described in section 6 in a PRA following PM 5/3(5) or in points 12 and 13 in a PRA following PM 5/5(1). If no PRA is available, refer to the guidance provided for impact in PM 5/5.
Score	**Minimal, Minor, Moderate, Major, Massive**
Uncertainty	**Low, Medium, High**
Comments	
i.	**Economic impact**
Score	**Minimal, Minor, Moderate, Major, Massive**
Uncertainty	**Low, Medium, High**
Comments	
ii.	**Environmental impact**
Score	**Minimal, Minor, Moderate, Major, Massive**
Uncertainty	**Low, Medium, High**
Comments	
iii.	**Social impact**
Score	**Minimal, Minor, Moderate, Major, Massive**
Uncertainty	**Low, Medium, High**
Comments	

A4. Definition of the risk management area

A4	Define the risk management area to be considered in this assessment, i.e. the area beyond the immediate outbreak defined in A1.5 where measures should be taken.
Note	It is unlikely that the area to be subject to management measures can be precisely delimited in the first stages of an outbreak. However, uncertainty will usually be high and further investigations and delimiting surveys will be necessary in order to define the area in which measures are to be taken. Consequently, it is recommended to come back to this question as new information becomes available. This is an important question to carefully readdress each time the outbreak situation is reviewed, and this should be done regularly. When official measures are taken this will be defined as the regulated area.
Uncertainty	**Low, Medium, High**
Define the risk management area	

A5. Decision on considering 'official action'

A5	Based on the current situation and the information from the risk assessment, is it already clear that it is not appropriate to take official action? If yes with a low uncertainty: justify your recommendation to take no action Otherwise, continue by selecting and evaluating appropriate measures.
Note	At this stage it may be clear that taking official measures with the aim of eradication, containment or suppression of the pest in question is not feasible. Examples of such situations include cases where the pest is already widely distributed, is difficult to detect, has a high rate of natural spread and is very likely to enter again. If it is clear that no official action would be appropriate, this recommendation should be justified in the comments box. In situations where uncertainty is high about the recommendation to take no official action, it may still be useful to run potential scenarios (in particular "no action") through Part B in order to gather further information to assist with, and possibly also justify, this recommendation. It should be noted that when 'no official action' is recommended there this does not mean that the pest will not cause damage.
Score	**Yes, No**
Uncertainty	**Low, Medium, High**
Comments	

A6. Selection of measures

Potential official measures to be applied for a given strategy of action (eradication, containment or suppression) should be selected and listed. Expert judgement should be applied in this selection process, taking into account the pest biology, the outbreak area, and experience of pest management. The measures that are chosen through this process are taken forward to part B. When considering candidate measures for comparison, it may be useful to consider a range of different measures in terms of severity e.g. from complete destruction of all hosts, through to more targeted treatments with a different overall objective (e.g. containment or suppression), and the consideration of no action.

When a PRA is available, measures to prevent entry with commodities of plants and plant products may have been identified in section 7 in a PRA following PM 5/3(5) or in point 16 in a PRA following PM 5/5(1). This may provide valuable information for measures to prevent further spread from an outbreak area.

Measures that are not considered in part B because they are unlikely to be effective or practical, should be noted and the justification for their non-selection added to the summary report (B2).

The checklist in Table 2 is provided to assist with the identification of candidate measures but other measures can be added.

Table 2 Checklist of measures

Type of measures	Yes/No	Comments (optional)
a. Measures based on chemical control		
• Plant Protection products targeting the pest/vector (preventive/curative treatments)		
• Mating disruption		
b. Measures based on biological control		
• Biological control agents		
• Sterile insect release		
c. Measures based on physical control		
• Destruction of all host plants		
• Selective destruction of some host plants		
• Clear cut area		
• Trapping of the pest/vector		
• Physical barriers		
• Soil sterilisation (solar, by heat)		
d. Measures based on specific cultural practices		
• Crop rotation		
• Crop break		
• Changing sowing or harvest date		
• Restrictions to post-harvest processes		
• Hygiene measures		
• Sanitation (removing infested plant parts or pests)		
• Choosing resistant crop variety		
• Modifying environment (e.g. reducing moisture levels)		
• Cultivation (e.g. introducing deep ploughing, changing irrigation regime, creating stale seed bed, etc.)		
• Use of healthy planting material (e.g. certified material)		
e. Measures to be implemented to prevent further spread from an outbreak area		
• Sale restrictions		
• Restriction on movement of potentially infested plants and plant products, soil, machineries, etc. including treatments.		
• Restriction of movement of people in the outbreak area.		
f. Other requirements		
• Trace back and trace forward activities		
• Obligation to report findings		
• Safe disposal of infested material		
• Communication campaigns		
• Repeated surveys		

Part B: Comparison and selection of measures

B1. Matrix for comparing different management measures to determine their applicability for the outbreak

In addition to answering the questions for section B1, fill in the matrix (B1 Matrix for comparison of candidate individual or combined measures). It is recommended to evaluate the situation when no measure is taken by way of comparison (see baseline scenario).

Using expert judgment, measures should be identified that would be suitable as a stand-alone measure to achieve the objective of the potential strategy (eradication, containment, or suppression). These will need to be evaluated individually in this section. However, in many situations, outbreak management will involve a combination of measures which will need to be evaluated. In such cases it may not always be necessary to undertake a detailed analysis of each of the individual component measures.

In all cases, it is recommended to evaluate the situation when no official action is taken by way of comparison. For the case where no official action is taken, questions B1.1–B1.3 may not need to be answered. However in cases where voluntary control measures are taken by stakeholders (e.g. increase of plant protection products used by growers), these questions should be answered in order to be able to make a comparison with the other strategies. These measures may result in a reduction of pest populations which need to be compared to that achieved through official measures.

Detailed evaluation of the most appropriate measures.

Candidate measure or combination of measures:	
Objective:	

In the following questions '*measure'* should be understood as '*a stand-alone measure or a combination of measures*'.

B1.1	What is the likelihood that the measure will be successful?
Note	The response should be based on an assessment of the chances of achieving the desired aims of the measure over the time period specified (B 1.2). This should take into account not only the knowledge of the general efficacy of a particular measure, but also on how well the measure will work in the current situation as described in Part A. Factors that have a significant impact on the success and failure of eradication programmes, include: - Early detection/official action (see A2.6) - Size of the infested area (see A2.1) - Spread related factors (see A2.4, 2.5) However, other crucial factors affecting success may relate to the specific outbreak scenario and may include e.g. local geography, prevailing weather, season.
Score	**Very likely, Likely, Moderately likely, Unlikely, Very unlikely**
Uncertainty	**Low, Medium, High**
Comments	

B1.2	How long will it take for this measure to be successful?
Note	The chances of achieving the desired aims of the measure over a time period should be assessed taking into account an evaluation of the efficacy of the measure and the biology of the pest. If the objective is containment or suppression, then success is considered differently and the measure will be continued indefinitely. Explain your response accordingly.
Score	**Less than one month, Less than six months, Less than one year, Less than three years, More than three years**
Uncertainty	**Low, Medium, High**
Comments	

B1.3	How difficult will it be to apply this measure taking into account enforcement, resources and operational factors?
Note	For the purposes of a quick assessment, it may be sufficient to assume that all of the chosen official measures are complied with in full. However, it is possible that there are known compliance problems associated with certain measures and these should be captured. The following factors should be taken into account: • Are funds available to support action? • Is there supporting political will and clear lines of responsibility in the outbreak management team (Ministerial/departmental ownership/leadership)? • Are there sufficient numbers of well trained and competent staff available? • Is there an adequate legal basis for action? • Have relevant parties (growers, nurseries, public) been informed about the outbreak and possible official measures? • Are all relevant authorities involved and supportive of the proposed strategy (municipal, provincial, police, water boards, etc.)? • Are other relevant parties likely to be cooperative, or do you expect significant opposition (opposing lobbies, organizations, legal restrictions)? • Are specific derogations or approvals necessary for the use of appropriate plant protection products? If yes, this is likely to delay treatment? • Is access possible to relevant areas and can entry and the application of measures be undertaken in a timely manner? • Have issues of infrastructure and transport been addressed (e.g. road control)? • Are there effective means of communication in place (including publicity)?
Score	**Very easy, Easy, Some difficulty, Difficult, Very difficult**
Uncertainty	**Low, Medium, High**
Comments	

B1.4	How high are the direct costs of the measure?
Note	Direct costs include the costs of applying the measure itself as well as the costs incurred as a consequence of the application of the measure(s). Direct costs are sometimes called 'on-farm costs'. This implies that any costs that occur at the place where the measures are applied (this may not only be a farm but also a private garden, a public park or a forest etc.) should be considered as direct costs. Direct costs include costs associated with • Treatments (including additional machinery and workforce costs), • Surveys/monitoring (including additional machinery and workforce costs), • Crop/host plant or consignment losses, • Financial compensation, • Income losses resulting from the measures (e.g. from yield loss or crop rotation), • Destruction of hosts (including additional machinery and workforce costs), • Waste removal/disposal (including additional machinery and workforce costs), • Loss of land value and availability of land for other crops, • Communication costs. Costs may be borne by different parties (official authorities such as NPPOs, farmers/growers, or private persons such as gardeners). In the framework of the EU FP7 PRATIQUE project, documents have been prepared on Cost: Benefit Analysis (Breukers *et al.*, 2011) and can be referred to for a detailed analysis (http://capra.eppo.int/deliverables/get.php5?f=38).
Score	**Minimal, Minor, Moderate, Major, Massive**
Suggested scale:	Minimal: less than 5 000 EUR, Minor: 5 000 EUR to 25 000 EUR, Moderate: 25 000 EUR to 250 000 EUR, Major: 250 000 EUR to 2 500 000 EUR, Massive: more than 2 500 000 EUR.
Uncertainty	**Low, Medium, High**
Comments	

B1.5	How high are the indirect costs of the measure?
Note	Indirect costs do not include environmental impacts, as these are considered in B 1.6. Indirect costs are those effects that are not wanted or expected from the application or termination of a measure. They include costs related to: • Potential impact on future trade in plants and plant products (e.g. loss of pest-free area status, loss of market due to the increase in price of plants and plant products), • Penalties associated with failure to satisfy existing contracts for plants/plant products • Social impacts including the impact on tourism and recreation, potential increase of plants and plant products price, or reduced availability of plants and plant products. These are sometimes called 'off-farm costs' (they occur at other "places" and also to other groups than those directly associated with the application of the measures). In the framework of the EU FP7 PRATIQUE project, documents have been prepared on Cost: Benefit Analysis and can be referred to for a detailed analysis (http://capra.eppo.org/deliverables/get.php5?f=38).
Score	**Minimal, Minor, Moderate, Major, Massive**
Suggested scale:	Minimal: less than 5 000 EUR, Minor: 5 000 EUR to 25 000 EUR, Moderate: 25 000 EUR to 250 000 EUR, Major: 250 000 EUR to 2 500 000 EUR, Massive: more than 2 500 000 EUR.
Uncertainty	**Low, Medium, High**
Comments	

B1.6	How high are the environmental impacts of the measure?
Note	Include, e.g.: • pollution (e.g. of water courses, soil or air) • indirect effects on non-target and/or beneficial organisms, • loss of biodiversity, habitat or ecosystem services
Score	**Minimal, Minor, Moderate, Major, Massive**
Suggested scale:	Minimal impact (e.g. the removal of a small number of plants by hand); Minor impact (e.g. application of pesticides to plants within a nursery, disposal of plants or plant products by burning or landfill); Moderate impact (anticipated short term [$\leq$3 years] impact [loss of biodiversity] on a native habitat - e.g. applying an insecticide to woodland or hedgerows); Major impact (anticipated long term impact [more than 3 years)] on a native habitat [<10 km^2] or short term impact on a sensitive/protected area, e.g. national park, or endangered species); Massive impact (anticipated long term impact [more than 3 years] over a wide area of any natural habitat [more than10 km^2], or to a sensitive/protected area, e.g. national park, or an endangered species).
Uncertainty	**Low, Medium, High**
Comments	

B1.7	How acceptable is the measure likely to be to the public?
Note	A judgement should be made on the acceptability of measures from a social perspective. This is likely to be related to perceived impacts on human health and the environment. It may also be necessary to consider other important stakeholders such as growers when considering this question.
Score	**Zero/minimal opposition, Minor opposition, Moderate opposition, Major opposition, Massive opposition**
Suggested scale:	Minimal: No or very little opposition to action anticipated, general public support for need for measure(s); Minor: Minor opposition anticipated - mostly from those directly affected, but unlikely to draw media attention; Moderate: A local campaign against measure(s) likely, but not leading to national media interest. Public support exceeds opposition; Major: Anticipate a co-ordinated campaign against measure(s), but balanced by support for action. Disruption by protesters also possible; Massive: Anticipate a national campaign against measure(s) to be taken up by significant Non-Governmental Organizations and a strong possibility on protesters disrupting action.
Uncertainty	**Low, Medium, High**
Comments	

B1. Matrix for comparison of candidate individual and combined measures											
	Proposed individual measure or combination of measures	Efficacy and feasibility			Costs		Acceptability and safety		Suitability of measure (s) for:		
		B1.1 Likelihood of success and feasibility	B1.2 Time needed for success	B1.3 Enforcement, resources and operational factors	B1.4 Direct costs	B1.5 Indirect costs	B1.6 Environmental impacts?	B1.7 Acceptability of the measures	Eradication	Containment	Suppression
i	No official action (but possible voluntary measures)										
ii	Physical host destruction										
iii											
iv											
v											
vi											

B2. Summary report: detailed analysis and justification of the recommended strategy(ies)

B2	Conclusions. The objective (eradication, containment, suppression) and associated measure (or combination of measures) proposed should be described, if the assessment shows that official measures should be considered. In most cases more than one strategy will be considered and a preferred option may be identified. The merits of the optimal strategy (ies) can usually be best illustrated by comparing it (them) with an evaluation of no action and the most stringent action. Presentation and comparison of these options will help the decision-makers. It may also be useful to describe the other potential options which are not considered to be appropriate. When the situation is changing, it is important to review the scheme and the justification for the preferred strategy accordingly.
Note	The questions in the comparison of measures matrix under Part B1 have been divided into three topics: efficacy and feasibility, costs, and acceptability and safety. Although some of the questions overlap, it is useful for decision makers to be able to see the responses broken down under the seven questions. It is also recognised that some questions are likely to be more important in the decision making process than others. It is considered that in general, the most important questions are as follows: • Likelihood of success • Direct costs • Indirect costs • Environmental impacts • Public acceptability However, the importance of the questions will vary on a case by case basis. Other information gathered when collecting information in Parts A and B will also be very important in the decision making process for selecting the best strategy.
Comment	

B3. Other recommendations

Review of import requirements. In the case of an outbreak of a quarantine pest, it is recommended to review existing import measures and any existing PRA (e.g. to check if all pathways for entry had been considered).

Additional national measures to be considered for organisms that are introduced intentionally. For organisms that are introduced intentionally and have invaded non-intended habitats, the following general measures may be considered

- Restriction on holding, sale and/or movement;
- Prohibition to release in unintended habitats;
- Requirements for specified growing/rearing conditions.

References

Breukers A, Kehlenbeck H, Cannon R, Leach A, Battisti A & Mumford J (2011) PRATIQUE Deliverable 5.2 A protocol for the cost: benefit analysis of eradication and containment measures during outbreaks. https://secure.fera.defra.gov.uk/pratique/publications.cfm#fldr_D5 [accessed on 17 April 2013].

EPPO (2009) PM 9/10(1): generic elements for contingency plans. *Bulletin OEPP/EPPO Bulletin* **39**, 471–474.

FAO (2012) ISPM No. 5 Glossary of Phytosanitary Terms, Rome, IPPC, FAO.

Sunley R, Battisti A, Cannon R, Baker R & Griessinger D (2011) PRATIQUE Deliverable 5.3 A Decision-Support Scheme that generates contingency plans and prioritises action during outbreaks. https://secure.fera.defra.gov.uk/pratique/publications.cfm#fldr_D5 [accessed on 17 April 2013].