Decision support scheme conducted for *Drosophila suzukii* in northern Italy.

Part A: Key information and selection of measures

A1. Basic information

A1.1 - Pest common name
Spotted Wing Drosophila (SWD)

A1.2 - Scientific name
Drosophila suzukii

A1.2b - Indicate the type
arthropod

A1.3 - Stage(s) of the life cycle present
All stages are present

A1.4 - Location (attach maps if available)

The eastern valleys of the province of Trento, northern Italy.

A1.5 - Habitat type
Arable land and market gardens

A1.6 - Hosts
Soft fruit crops of blueberry, raspberry, strawberry and blackberry.

A1.7 - Is a pest risk assessment already available for this or a closely related organism? (Please indicate in justification: reference,risk assessor, date, institute, country, and whether it is appropriate to this particular case?)
yes
An EPPO PRA is under due for publication shortly

A1.8 - Is a contingency plan already available for this or a closely related organism? (Please indicate in justification: reference,risk assessor, date, institute, country, and whether it is appropriate to this particular case?)
no

A2. Key factors to consider based on the current situation

A2.1 - What is the extent of the infested area(s)?
Large
Level of uncertainty: low
Comprises an extensive outbreak area of some 600 ha in the eastern valleys of the province of Trento

A2.2 - What is the size of the outbreak population(s)
Very large
Level of uncertainty: low
The pest outbreak population is large enough to cause considerable crop losses in soft fruit and cane fruit plantations.

A2.3 - What is the reproductive capability of the current population?
Very large
Level of uncertainty: low
The climate is very suitable to SWD and there are many potential horticultural hosts grown. Under such circumstances SWD can complete 10 - 15 generations per year.

A2.4 - What is the natural spread capacity of the organism/current population?

High
Level of uncertainty: medium
SWD can travel several km in a single flight, therefore hundreds could be covered in a single generation. However, it is not known haw far the pest may travel when sufficient resources are available, in which cases travel may be significantly more limited.

A2.5 - What is the spread capacity of the organism/current population due to human activity?
Medium
Level of uncertainty: medium
Transit of harvested fruit coult result in transport of SWD larvae over considerable distances. However, some uncertainty regarding how frequently infested fruit may enter the export chain - infested fruit quickly appears unmarketable. Nevertheless, it is possible that larvae may be transported with fresh produce, albeit infrequently.

A2.6 - How easy is the organism to detect?
Very easy
Level of uncertainty: low
Detection of adult SWD flies is very easy using simply contructed traps baited with cider vinegar.

A2.7 - How easy is the organism to identify?
With some difficulty
Level of uncertainty: low
Identification of SWD requires some expertise. Those not familiar may need to seek specialist advice. However, given training, growers are able to identify the adults with simple use of a hand lens.

A2.8 - How long has the species been present?
less than one year
Level of uncertainty: medium
It is assumed that this is the fist year that the insect has been present and built up to a large population (enough to cause damage). However, it is possible that SWD could have been in the region for some time in low numbers or away from cultivated land.

A2.9.1 - [Economic damage] What damage is the pest currently causing?
Massive
Level of uncertainty: low
In the present situation, the population is causing considerable direct losses in yield to the growers of soft fruit and cane fruit in the region.

A2.9.2 - [Environmental damage] What damage is the pest currently causing?
Minimal
Level of uncertainty: low
Although having a large impact on local fruit crops, the impact on the environment is minimal.

A2.9.3 - [Social damage] What damage is the pest currently causing?
Minor
Level of uncertainty: medium
Although not affecting a large proportion of the population, this problem is having an immediate direct effect on the local fruit growing farming community.

A3. Additional key factors to consider based on the risk assessment
A3.1 - How likely is it that subsequent introductions of the organism may occur?
Medium
Level of uncertainty: medium
Introduction is possible via the arrival of traded fruit although this is unlikely to be a frequent possibility. More likely is repeated entry of adults into cultivated areas from smaller populations inhabiting non-cultivated land.

A3.2.1 - [Economic damage] What is the damage potential of this pest?
Massive
Level of uncertainty: low
Evidence from other experience (e.g. California) where populations have reached damaging levels in susceptible crops is that significant crop loss tends to be observed, sometimes total crop loss.

A3.2.2 - [Environmental damage] What is the damage potential of this pest?
Minimal
Level of uncertainty: low
Environmental damage tends to be limited where outbreaks occur. Management practices tend not to impact land outwith the cultivated areas.

A3.2.3 - [Social damage] What is the damage potential of this pest?
Moderate
Level of uncertainty: medium
If the problem is not effectively managed, there could be issues with local farming practices. Local growers may have to consider changing to new crop possibilities, potentially affecting the local growing traditions of the region.

A3.3 - How large an area is still available for colonization?
Very large
Level of uncertainty: low
A substantial area could be affected. Most of Italy has a suitable climate and substantial agricultural land in fruit production.

A3.4 - Uncertainty summary based on the current situation and the risk assessment

NB: Larger points (bubbles) on the chart represent greater uncertainty

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 A1.4.
This infested area is a large area of northern Italy. The is some confidence that the majority of low lying agricultural land in Italy has both a suitable climate, and suitable fruit crops to implicate the risk management area to be considered the whole of the country. It is very likely that neighbouring countries are at risk, though the Dolomite alps to the north may restrict the northerly progression of this pest.
Level of uncertainty: low

A5. Feasibility of eradication, containment or suppression
A5 - Based on the current situation and the information from the risk assessment, is it already clear that no action is appropriate? If yes: justify your decision to take no action
If no or uncertain: continue by selecting and evaluating appropriate measures.

Yes
Level of uncertainty: low
It is well know that other areas affected by SWD have had some success on controlling this pest and minimizing agricultural damage.

A6. Selection of measures
A6 - List the eradication containment or suppression measures that may be appropriate for the pest in the current situation. Select from the proposed list or enter other candidate measures(free-text)

- Total crop destruction
- Selective crop destruction
- Changing sowing or harvest date
- Trapping
- Focused insecticide application based on monitoring information
- Collaborative site sanitation

Part B: Comparison of measures
B1. Comparing the attributes of different risk management measures to determine their applicability in the current situation
Scoring matrix for comparing the attributes of different risk management measures to determine their applicability in the current situation

Total crop destruction

B1.1a - Objective
Suppression

B1.1 - What is the likelihood that the measures will be successful?
likely
Level of uncertainty: low
For the objective of suppression, crop destruction is likely to be successful, although success with depend on communication with other affected growers in the region and likewise management measures implemented. This has been successful where carried out in North America and is a good course of action is significant crop damage is being incurred.

B1.2 - How long will this management measure take to be successful?
less than one month
Level of uncertainty: low
This is relatively straigh forward, though labour intensive for the period when it is being carried out. Crop material will need to be dealt with appropriately e.g. on-site burning.

B1.3 - How difficult will it be to apply this measure taking into account enforcement, resources and operational factors?
Easy
Level of uncertainty: low
Straightforward, though resource intensive (therefore may take more than a week)

B1.4 - How high are the direct costs of the management measure?
Massive
Level of uncertainty: low
If carried out across the whole region, the implementation of the measures are relatively low, however the losses incurred as a result of crop loss are very high, particularly for soft fruit and cane fruit, which are traditionally high market value crops.

B1.5 - How high are the indirect costs of the management measure?
Minimal
Level of uncertainty: medium
Some uncertainty regarding indirect costs. If local agricultural practices need to be changed as a result of

the problem, the this will incur costs to the farming community e.g. developing new agronomy for new crops, expert advice, new machinary. In this case, costs will be much higher. However, it is expected that indirect costs will be much lower - experience in North America has shown that adaptation of new management priciples to deal with SWD have enabled fruit growing to continue over the long term in affected areas.

B1.6 - How high are the environmental impacts?
Minor
Level of uncertainty: low
Use of plant protection products and burning of infested material should impose minimal environmental damage if well managed.

B1.7 - How acceptable is the measure likely to be to the public?
Zero/minimal opposition
Level of uncertainty: low
These activities may affect local fruit prices, and product availablity.

B1.8 - Uncertainty summary for proposed measure

NB: Larger points (bubbles) on the chart represent greater uncertainty

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Selective crop destruction

B1.1a - Objective
Suppression

B1.1 - What is the likelihood that the measures will be successful?
likely
Level of uncertainty: low
It is likely that the removal of infested material will achieve suppression of the pest population, though this action would be most effective when combined with other actions such as targeted use of PPPs.

B1.2 - How long will this management measure take to be successful?
less than one month

B1.3 - How difficult will it be to apply this measure taking into account enforcement, resources and operational factors?
Very easy

Level of uncertainty: low

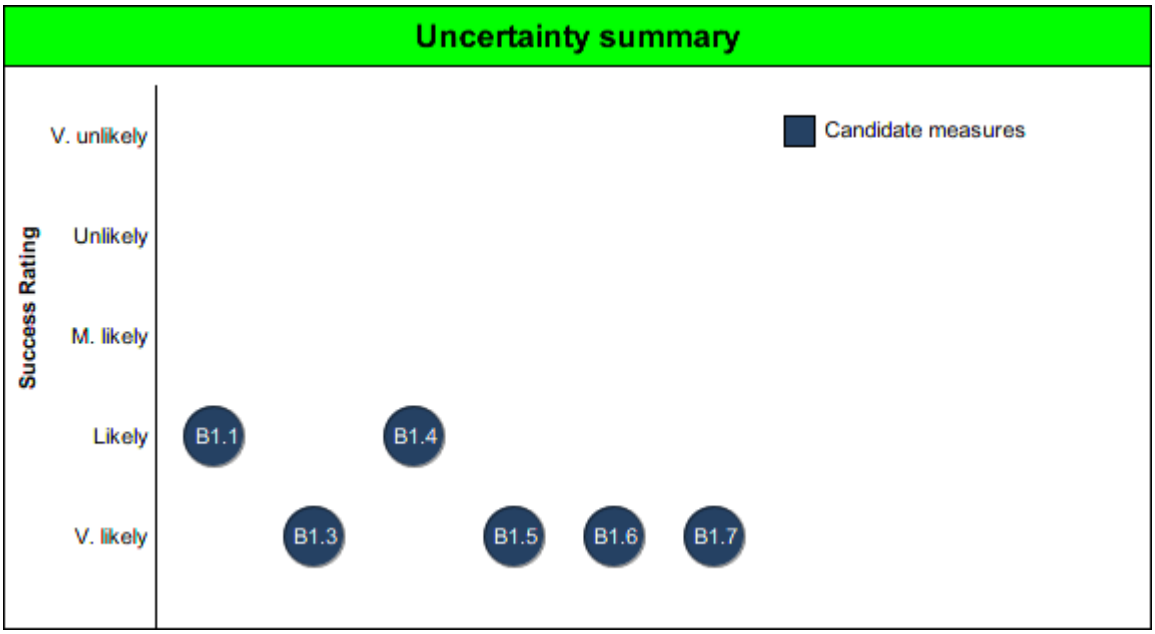
B1.4 - How high are the direct costs of the management measure?
Minor
Level of uncertainty: low
The main direct costs are the losses in yield. This will depend on how severe the infestation is and how much material has to be removed. Actual implementation costs are relatively low.

B1.5 - How high are the indirect costs of the management measure?
Minimal
Level of uncertainty: low

B1.6 - How high are the environmental impacts?
Minimal
Level of uncertainty: low

B1.7 - How acceptable is the measure likely to be to the public?
Zero/minimal opposition
Level of uncertainty: low

B1.8 - Uncertainty summary for proposed measure



NB: Larger points (bubbles) on the chart represent greater uncertainty

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Changing sowing or harvest date

B1.1a - Objective
Suppression

B1.1 - What is the likelihood that the measures will be successful?
moderately likely
Level of uncertainty: medium
If SWD remains in the region, this type of practice may be considered in the long term. The replacement of stock with early fruiting varieties will assist in the reduction of losses, since it is known that SWD populations accumulate to damaging levels, generally by the end of the growing season. Medium uncertaintly, as there is scope for the habits/lifecycle of the pest to chenge, i.e. they could adapt life-cycle to early season.

B1.2 - How long will this management measure take to be successful?
more than one year
Level of uncertainty: low
This would be a long term measure. Cane and bush fruits tend to be grubbed and replaced every 5-7 years.

B1.3 - How difficult will it be to apply this measure taking into account enforcement, resources and operational factors?
Very easy
Level of uncertainty: low
Simply a replacement of varieties over time. It is well known that ealry varieties exist.

B1.4 - How high are the direct costs of the management measure?
Minimal
Level of uncertainty: low
There should not be any direct costs, unless the earlier varieties are of a lower quality or lower yielding nature.

B1.5 - How high are the indirect costs of the management measure?
Minimal
Level of uncertainty: low

B1.6 - How high are the environmental impacts?
Minimal
Level of uncertainty: low

B1.7 - How acceptable is the measure likely to be to the public?
Zero/minimal opposition
Level of uncertainty: low

B1.8 - Uncertainty summary for proposed measure

NB: Larger points (bubbles) on the chart represent greater uncertainty

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Trapping

B1.1a - Objective

Suppression

B1.1 - What is the likelihood that the measures will be successful?
likely
Level of uncertainty: low
Trapping should be used as a basis of monitoring the population. Trapping techniques for SWD have been developed which are cheap and easy to carry out. The information is used as a basis for decision making for PPP application.

B1.2 - How long will this management measure take to be successful?
more than one year
Level of uncertainty: low
This is a continuous process but would be more critical as the growing season pregresses.

B1.3 - How difficult will it be to apply this measure taking into account enforcement, resources and operational factors?
Very easy
Level of uncertainty: low
The trapping techniques for SWD are well defined and easy to carry out. Identification may require expert input to begin with, until growers can identify male adults. In some cases farms may wish to use a monitoring consultancy service.

B1.4 - How high are the direct costs of the management measure?
Minimal
Level of uncertainty: low
Trapping using simple home-made traps baited with cider vinegar are very cheap. Higher costs may be incurred if a consultancy service is employed to do the monitoring.

B1.5 - How high are the indirect costs of the management measure?
Minimal
Level of uncertainty: low

B1.6 - How high are the environmental impacts?
Minimal
Level of uncertainty: low

B1.7 - How acceptable is the measure likely to be to the public?
Zero/minimal opposition
Level of uncertainty: low

B1.8 - Uncertainty summary for proposed measure

NB: Larger points (bubbles) on the chart represent greater uncertainty

Focused insecticide application based on monitoring information

B1.1a - Objective
Suppression

B1.1 - What is the likelihood that the measures will be successful?
likely
Level of uncertainty: low
The use of PPPs can be used to supress SWD populations to in conjunction with monitoring information based on trapping. Once a spray system has been developed it is likely that this can be used as part of an integrated control system - application of PPPs alone is less likely to long-perm solution. Effective candidate PPPs are listed in the management section at:
http://www.eppo.org/QUARANTINE/Alert_List/insects/Drosophila_suzukii_factsheet_12-2010.pdf

B1.2 - How long will this management measure take to be successful?
more than one year
Level of uncertainty: low
This would be incorporated as part of a long term control system.

B1.3 - How difficult will it be to apply this measure taking into account enforcement, resources and operational factors?
Very easy
Level of uncertainty: low
Problems are unlikely, unless products are not authorized for use on the relevant fruit crops. In such cases off-label approvals may need to be sought requiring administrative time. If supporting data is required for the authorization e.g. residues or environmental fate, then it may take more than a year to attain PPP approvals.

B1.4 - How high are the direct costs of the management measure?
Minor
Level of uncertainty: medium
Direct costs are expected to be relatively low. However, if PPP approvals need to be sought (see 1.3), additional costs may be incurred.

B1.5 - How high are the indirect costs of the management measure?
Minimal
Level of uncertainty: low

B1.6 - How high are the environmental impacts?
Minimal
Level of uncertainty: low
As long as PPPs are used within the terms of the authorization and the label restrictions, there should be no discernible environmental impacts.

B1.7 - How acceptable is the measure likely to be to the public?
Zero/minimal opposition
Level of uncertainty: low
Public perception of PPP ('pesticide') use is usually not good. However, the public are probably used to seeing growers applying products to local crops, so there will be no noticable change to current practices.

B1.8 - Uncertainty summary for proposed measure

NB: Larger points (bubbles) on the chart represent greater uncertainty

Collaborative site sanitation

B1.1a - Objective
Suppression

B1.1 - What is the likelihood that the measures will be successful?
likely
Level of uncertainty: medium
Site sanitation involves the removal of any material that is able to host SWD. This would primarily be fallen fruit material. The materials should then be buried or sealed appropriately. Success with this measure requires extra diligence on behalf of farm staff, additional labour, and also area-wide communication to ensure that other farms are carrying out likewise action.

B1.2 - How long will this management measure take to be successful?
more than one year
Level of uncertainty: low
This is a long-term measure.

B1.3 - How difficult will it be to apply this measure taking into account enforcement, resources and operational factors?
Easy
Level of uncertainty: medium
This is not a difficult measure to carry out, though if there are compliance problems i.e. some growers not corrying out their sanitation obligations, then the sanitation program will be compromised.

B1.4 - How high are the direct costs of the management measure?
Minor
Level of uncertainty: medium
It is not known exactly how high the costs will be - these will primarily be to cover labour. The costs incurred for the whole area/region will be much higher.

B1.5 - How high are the indirect costs of the management measure?
Minimal
Level of uncertainty: low

B1.6 - How high are the environmental impacts?
Minimal
Level of uncertainty: low

B1.7 - How acceptable is the measure likely to be to the public?
Zero/minimal opposition
Level of uncertainty: low
Interstingly, an increased requirement for on-site labour could facilitate local employment, and this may be well received.

B1.8 - Uncertainty summary for proposed measure

NB: Larger points (bubbles) on the chart represent greater uncertainty

B1.9 - Scoring matrix for comparison of candidate measures

Measures available	Objective	Efficacy			Costs		Acceptability and safety	
		B1.1 - What is the likelihood that the measures will be successful?	B1.2 - How long will this management measure take to be successful?	B1.3 - How difficult will it be to apply this measure taking into account enforcement, resources and operational factors?	B1.4 - How high are the direct costs of the management measure?	B1.5 - How high are the indirect costs of the management measure?	B1.6 - How high are the environmental impacts?	B1.7 - How acceptable is the measure likely to be to the public?
total crop destruction	Suppression	likely	less than one month	Easy	Massive	Minimal	Minor	Zero/minimal opposition
selective crop destruction	Suppression	likely	less than one month	Very easy	Minor	Minimal	Minimal	Zero/minimal opposition
changing sowing or harvest date	Suppression	moderately likely	more than one year	Very easy	Minimal	Minimal	Minimal	Zero/minimal opposition
trapping	Suppression	likely	more than one year	Very easy	Minimal	Minimal	Minimal	Zero/minimal opposition
Focused insecticide application based on monitoring information	Suppression	likely	more than one year	Very easy	Minor	Minimal	Minimal	Zero/minimal opposition
Collaborative site sanitation	Suppression	likely	more than one year	Easy	Minor	Minimal	Minimal	Zero/minimal opposition

Legend

greater likelihood of success/lower cost/fewer confounding issues				lower likelyhood of success/high cost/many confounding issues

B2. Detailed evaluation of the most appropriate scenario
The questions are considered again, but in the context of the final, selected strategy, i.e. the package of measures for action.

B2.0 - Strategy (may include a combination of measures selected from B1):
All the proposed measures in B1 have the objective of contributing to a suppression of SWD population. It is likely to be almost impossible to eradicate SWD due to its mobility and ability to survive at low levels on uncultivated land.

A strategy for suppressing the population to within sustainable economic means must therefore be the goal for growers where SWD is known to be present. In the first instance, damaged material will need to be removed or even total crop destruction carried out if infestation is particulatly bad. In subsequent growing seasons, the population should be monitored using simple trapping techniques and good site sanitation must be observed to limit population development. Early fruiting crop varieties should be employed in the long-term since the cropping time will precede the times when the populations reach the most damaging levels. When monitoring indicatesthat populations are increasing rapidly, effective PPP regimes can be triggered to further supress populations. finally, there should be a cohesive, area-wide management approach and this will necessitate grower meetings and outreach programs.

B2.1 - What is the likelihood that the measures will be successful?
very likely
Level of uncertainty: low
Experience in the US has shown that while severe damage tends to occur in the first year when SWD is observed, sustainable crop production can be achieved in subsequent years by the employment of good integrated management practices.

B2.2 - How long will this management measure take to be successful?
more than one year
Level of uncertainty: low
The integrated control program would need to become standard long-term practice.

B2.3 - How difficult will it be to apply this measure taking into account enforcement, resources and operational factors?
Easy
Level of uncertainty: medium
None of the individual measures are difficult to carry out, though success will depend on the management practices of the growers to successfully integrate and implement the suppression program.

B2.4 - How high are the direct costs of the management measure?
Moderate
Level of uncertainty: medium
Initial costs may be high due to crop or yield losses. In subsequent years, the costs are more likely to be minimal, the main costs being the application of PPPs and the additional labour needed for tasks such as site sanitation and monitoring.

B2.5 - How high are the indirect costs of the management measure?
Minimal
Level of uncertainty: low
There are unlikely to be additional indirect costs, though there could be initial effects on the commodity trade due to crop loss. Once growers and managing SWD populations however, indirect costs should be minimal.

B2.6 - How high are the environmental impacts?
Minor
Level of uncertainty: low
In general it is expected that the impacts will be minor, though in the initial stages, landfill with infested material, burning, and PPP use may have some small impact.

B2.7 - How acceptable is the measure likely to be to the public?
Zero/minimal opposition
Level of uncertainty: low
None of the practices should raise public concerns, though initially there may be a notable lack or fruit produce and associated increase in shelf prices. However, there may be additional local jobs created by the increased labour needed for sanitation and monitoring.

B2.8 - Uncertainty summary for final strategy

NB: Larger points (bubbles) on the chart represent greater uncertainty

B3. Detailed analysis and justification of selected measure(s)
B3 - Describe which measure or combination of measures you propose for eradication, containment and suppression and why you have chosen this strategy. If you consider that more than one strategy would be viable, these options should be evaluated to help the decision-makers. Also describe why other potential options are not considered to be viable. In most cases, the merits of the optimal strategy or strategies can be best illustrated by comparing them with an evaluation of no action and the most stringent action, e.g. crop or habitat destruction.
During outbreak situations and when situations are changing, it is important to review the scheme and your justification accordingly.

An integrated strategy for suppressing the population to within sustainable economic means must therefore be the goal for growers where SWD is known to be present. In the first instance, damaged material will need to be removed or even total crop destruction carried out if infestation is particularly bad. In subsequent growing seasons, the population should be monitored using simple trapping techniques and good site sanitation must be observed to limit population development. Early fruiting crop varieties should be employed in the long-term since the cropping time will precede the times when the populations reach the most damaging levels. When monitoring indicates that populations are increasing rapidly, effective PPP regimes can be triggered to further suppress populations. finally, there should be a cohesive, area-wide management approach and this will necessitate grower meetings and outreach programs.

Costs in the first year due to crop losses will be most notable, however, in previous examples such as in the US, the associated costs are lower in subsequent years, once management systems become implemented.