



IPM Decisions

D6.10 Contribution to EIP Agri

Grant agreement number: 817617

Start date of project: 01/06/2019

End date of project: 31/05/2024

Deliverable due date: 31/5/2024

Date of delivery: 26/06/2024

Classification: Public

Version History

Version number	Implemented by	Reason
1.0	Harm Brinks	Production of deliverable 6.10
2.0	Harm Brinks	Final version for submission

List of Authors

Company	Author(s)	Contribution
Delphy	Harm Brinks	Main author

List of Reviewers

Company	Reviewer	Contribution
ADAS	Mark Ramsden	Review and formatting



Contents

1. Public summary	3
2. Introduction	3
3 Practice abstracts	3
3.1 DSS for Barley Yellow Dwarf Virus.....	4
3.2 DSS for Alternaria/Early blight in potatoes.	5
3.3 DSS for Cabbage Fly	6
3.4 DSS for Cabbage Moth.....	7
3.5 DSS for Cabbage Root Fly	8
3.6 DSS for Carrot Fly.....	9
3.7 DSS for Carrot Rust Fly.....	10
3.8 DSS for Coddling moth.....	11
3.9 DSS for Barley net blotch	12
3.10 CPO brown rust model in barley.....	13
3.11 CPO brown rust model in wheat	14
3.12 CPO powdery mildew model in barley	15
3.13 CPO powdery mildew model in wheat	16
3.14 CPO Septoria model in wheat.....	17
3.15 CPO tan spot model in wheat.....	18
3.16 CPO yellow rust model in wheat	19
3.17 DSS for cutworm.....	20
3.18 DSS for Orange wheat blossom midge	21
3.19 DSS for Downy mildew in grapes.....	22
3.20 DSS for Glume blotch in winter wheat	23
3.21 DSS for Grey field slug in cereals	24
3.22 DSS for Grey field slug in oilseed rape.....	25
3.23 DSS for Potato late blight Hutton Criteria	26
3.24 DSS for Large Narcissus Fly	27
3.25 DSS for Pollen Beetle (Warwick).....	28
3.26 DSS for Pollen Beetle (simplified model)	29
3.27 DSS for Potato late blight, negative prognosis	30
3.28 DSS for Potato late blight, Naerstad model.....	31
3.29 DSS for Saddle gall midge	32
3.30 DSS for Septoria, Humidity model	33
3.31 Risk maps on home page	34
3.32 IPM Decisions in Norway	35
3.33 IPM Decisions in Sweden	35
3.34 IPM Decisions in Finland	35
3.35 IPM Decisions in Lithuania	36
3.36 IPM Decisions in Germany	36
3.37 IPM Decisions in United Kingdom	37
3.38 IPM Decisions in Denmark.....	37
3.39 IPM Decisions in France	37
3.40 IPM Decisions in Netherlands.....	38
3.41 IPM Decisions in Slovenia	38
3.42 IPM Decisions in Italy.....	38
3.43 IPM Decisions in Greece	39



1. Public summary

IPM Decisions has produced 43 Practice Abstracts for the agricultural European Innovation Partnership, summarizing all decision support systems for integrated pest management fully integrated into the platform during the project. Additional practice abstracts were produced summarizing results in each of the participating countries.

2. Introduction

The agricultural European Innovation Partnership (EIP-AGRI) works to foster competitive and sustainable farming and forestry that 'achieves more and better from less'. It contributes to ensuring a steady supply of food, feed and biomaterials, developing its work in harmony with the essential natural resources on which farming depends, and forms part of the EU CAP Network.

3 Practice abstracts

The EIP-AGRI coordinates the sharing of knowledge from European funded projects with farmers and advisors across Europe. Short summaries of project results are shared through practice abstracts (PA's), published on <https://eu-cap-network.ec.europa.eu/>. IPM Decisions produced a PA for every fully integrated DSS. IPM Decisions produced in total 43 PAs, created in the EIP format. All practice abstracts about DSS's are also published as 'factsheets' on the project website (<https://www.ipmdecisions.net/documents/>, Figure 1) and are accessible through a link on the IPM Decisions platform (<https://www.platform.ipmdecisions.net/>). In addition, a PA has been produced for each partner country, summarizing the results of the platform for farmers and advisors in their country.

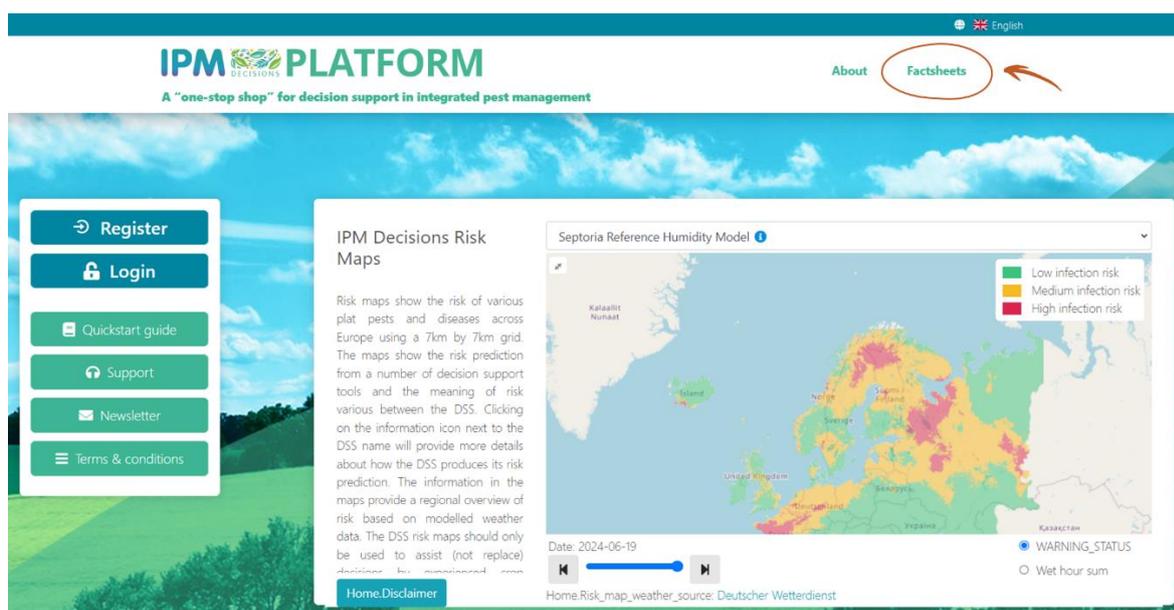
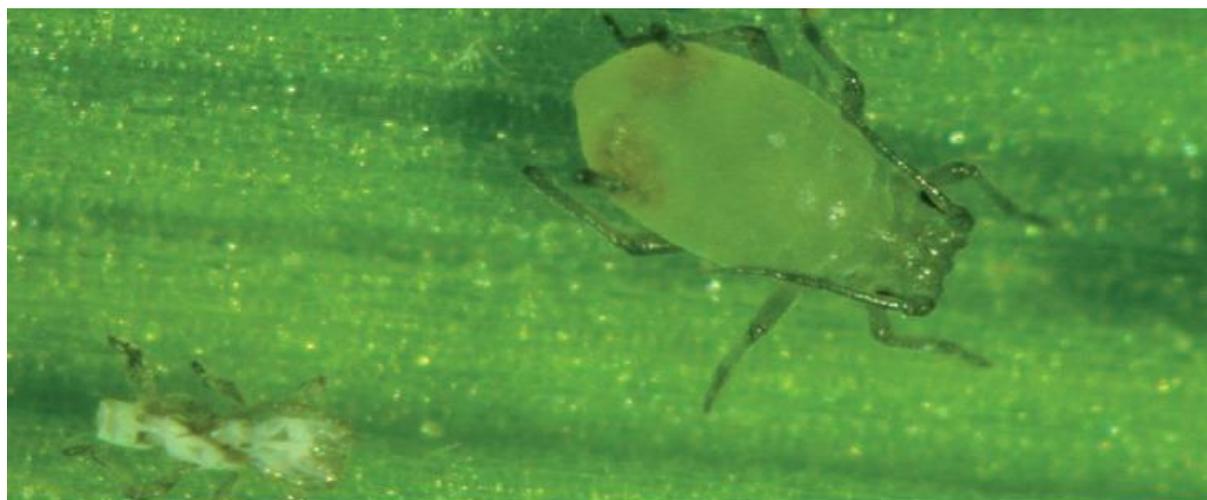


Figure 1 Screen shot of the IPM Decisions Platform homepage, highlighting access to DSS Factsheets

3.1 DSS for Barley Yellow Dwarf Virus.

On <https://www.platform.ipmdecisions.net/> you find a DSS for the BYDV. This DSS assumes that the user will update the date of emergence and last insecticide application, if any. When no aphids are found in the field at T-Sum 170 DD, or after insecticide application, a new calculation starts. It is important to set the parameters correctly, as the model uses the parameter settings for the calculation of the risk status: Start day or crop emergence date. The T-sum calculation starts from this date. Inaccurate start dates will affect risk status. Risk will be underestimated if the input start date is too late. Risk will be overestimated if the input start date is too early. Too early gives an over estimation of the risk, too late starting date an under estimation of the risk. The model provides risk information up to growth stage 31. The DSS gives information about the risk of winged aphids being present in the field and spreading the virus. The DSS displays; the T -Sum of the current day, the prediction for the development of the T-Sum over the coming days, and the expected date of reaching the threshold of 170 DD, which is associated with the emergence of winged aphids. The DSS was adapted from research carried out in the UK, and is considered applicable, but not yet validated, in Belgium, Luxembourg, Netherlands, France, Germany, Republic Ireland and Denmark.



Picture: Aphid, vector for virus transmission

3.2 DSS for *Alternaria*/Early blight in potatoes.

The DSS *Alternaria* in potato is a weather-based model, derived from a model originally developed for leaf spot diseases in tomato. Fungicide treatments may be needed to protect the crop when the lower or high threshold value for Aggregated Daily Disease Severity Value (DSV) is reached. When a fungicide against early blight is applied and entered into the DSS parameters, accumulation of DSV is reset and starts over at 0. The model uses temperature and leaf wetness as input parameters. The model calculates daily risk values (DSV: Disease Severity Values) based on temperature and leaf wetness the previous day. DSV represents the risk of attack of early blight the previous 24 hours. Daily values of DSV are accumulated until a threshold value is reached, and treatment is recommended. It is important to check and adapt the default DSS parameters to the location where used:

1. Start day of the control period, standard value is the first of March.
2. End day of the control period, depending on the length of the growing season.
3. Fungicide applications against early blight. These applications are considered effective.

The DSS is based on the dew sub model of FAST (Madden et al., 1978), originally targeted at predicting *Alternaria* in tomatoes. The DSS is tested and adapted to be used against early blight (*Alternaria solani*) in potato in Denmark and Norway. For other countries it is important to first test in practice before using the DSS for decision support in the control of potato early blight.



Picture: Symptoms of potato early blight on leaf and tuber

3.3 DSS for Cabbage Fly

The cabbage fly flight model (Scandinavia) determines the start of egg laying as 160 degree-days based on the soil temperature (10 cm) or based on the standard air temperature (2 m above the soil surface) at the same location. Egg laying starts at 210 degree days. This model should be used in combination with direct observations of eggs in the field. This due to the large variability and to get an idea of the severity of the attack. The model uses daily soil or air temperature as a parameter. In areas with early crops the preceding season, the flight period can start earlier due to higher soil temperature under the covers. The DSS gives information about the risk of adult cabbage root fly flight activity. It can be seen that at 210 degree days (which is the upper threshold value), the risk of flight activity is high and it is likely that egg laying has begun on vulnerable brassica crops. Action should be taken to protect the crop, taking into consideration the observations in your own field. The DSS is created by NIBIO which is based in Norway.



Adults locate host plant



Eggs laid close to stem of plant



Larvae feed on roots

3.4 DSS for Cabbage Moth

The model for the warning system for cabbage moth is based on the minimum temperature threshold and the requirement for accumulated day-degrees for the different stages of the cabbage moth. The accumulated degree-day model calculates forecasts for development of the cabbage moth through the summer, generates warnings for the time when eggs and small larvae can be registered in the field and the best time for treatment. The model uses soil temperature at a depth of 10 cm as a parameter. This means that it is not related to the presence or absence of cabbage moth in the field. The DSS gives information about the risk of cabbage eggs and small larvae that can be registered in the field and the best time for treatment. Yellow rectangles indicate that oviposition has begun and the farmer should make observations in the field. Red rectangles indicate the optimal time for treatment. Most larvae are small at this point and easily targeted on the outer leaves. Where can DSS be used. The DSS is created by NIBIO which is based in Norway. In order to work with this DSS, soil temperature at a depth of 10 cm should be available in the country of use.



Picture: Larvae/caterpillar of cabbage moth



3.5 DSS for Cabbage Root Fly

The Cabbage Root Fly model uses soil temperatures or air temperatures depending on the stage of development. Within the model it is possible to specify the proportions of the early and late emerging biotypes in the simulated population. As multiple cohorts progress simultaneously, adult emergence and egg laying can occur at the same time. The Cabbage Root Fly forecast requires hourly soil temperatures at a depth of approximately 6 cm and hourly air temperatures. This model requires historic data to provide risk forecasts. At present, suitable historic data is only available for a limited number of locations; please select 'Edit Parameters' and select the most appropriate location. The start date for the model is 1st February, as this is often the coldest period in the year. The DSS gives information about the risk of adult cabbage root fly flight activity. This DSS was developed by the University of Warwick (Warwick Crop Centre), England and adapted from work carried out in the UK. This model requires historic data to provide risk forecasts. At present, suitable historic data is only available for a limited number of locations.



Picture: Symptoms of cabbage root fly on roots

3.6 DSS for Carrot Fly

A series of development rate equations form the basis of the Carrot Fly model (Warwick HRI) and are linked together in a program. The model simulates the development of cohorts of 500 individuals through adult emergence, egg laying and hatching. For each stage, the percentage development is calculated each day by integrating the appropriate development rate curve. This percentage is accumulated over days until it reaches 100. At this point the individual moves to the next stage. Variability within the insect population is incorporated by assuming that, at any instant, the rates of development of a population held at a constant temperature are normally distributed (Phelps et al, 1993). The model uses soil temperatures or air temperatures depending on the stage of development. As multiple cohorts progress simultaneously, adult emergence and egg laying can occur at the same time. The Carrot Fly forecast requires hourly soil temperatures at a depth of approximately 6 cm and hourly air temperatures. This model requires historic data to provide risk forecasts. At present, suitable historic data is only available for a limited number of locations; please select 'Edit Parameters' and select the most appropriate location. The start date for the model is 1st February, as this is often the coldest period in the year. The model predicts the timing of adult emergence and egg-laying throughout the year, enabling users to undertake targeted monitoring and/or mitigating actions to reduce the risk of damage to the crop. This DSS was developed by the University of Warwick (Warwick Crop Centre), England and adapted from work carried out in the UK. This model requires historic data to provide risk forecasts. At present, suitable historic data is only available for a limited number of locations.



Picture: Carrot fly



3.7 DSS for Carrot Rust Fly

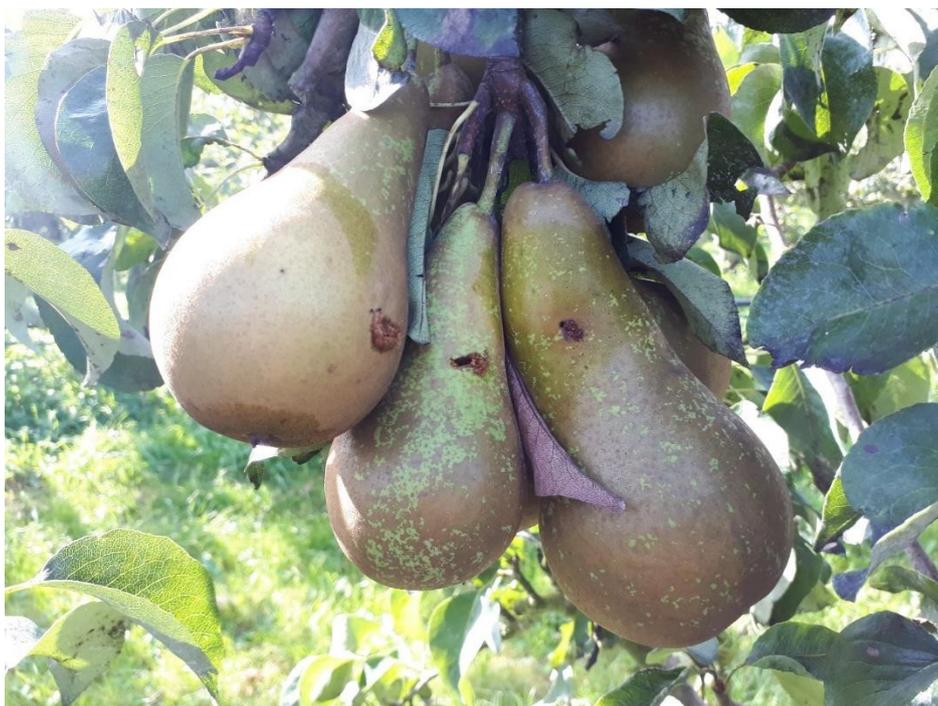
Carrot rust fly is an insect that can cause damage to carrots and some other crops. The first generation of adult carrot fly emerge from pupae in the soil in the spring, and lay eggs close to the base of vulnerable crops. Larvae initially feed at the surface, then tunnel into the tap root. Adults emerge mid-July and can lead to a second generation. Treatments may need to be applied soon after adults arrive in the crop, before larvae tunnel into the crop roots. The DSS determines the start of the flight period for the 1st generation of carrot rust fly based on accumulated degree-days (260 day-degrees) over a base temperature of 5°C. The model uses daily air temperature; the default starting day is 1 March. Please adapt if necessary for your country. Be aware that in areas with field covers (plastic, single or double non-woven covers, etc.) with early crops the preceding season (either on the current field or neighboring fields), the flight period can start earlier than predicted due to higher soil temperature under the covers. The DSS shows accumulated day degrees after 1 March and thresholds for the start of the flight period and the threshold for the peak of the flight period. When the first flight is expected, placing yellow sticky traps in the field is recommended to monitor if the flies indeed are present in the field. The DSS was developed by Luke, Finland, and is considered applicable, but not yet validated, in the United Kingdom, Belgium, The Netherlands, France, Germany, Luxembourg and Denmark.



Picture: Larvae of carrot rust fly

3.8 DSS for Codling moth

Codling moth causing damage in various fruits. The larvae emerged from eggs laid by the codling moth (*Cydia Pomonella*) on the surface of the fruit cause damage to apples, pears and other pome fruit. The larvae burrow inside and blemish the surface of the fruit which makes it unsellable. The DSS Codling moth flight model on platform.ipmdecisions.net, predicts the start of adult codling moth flight, enabling users to undertake targeted monitoring and/or mitigating actions to reduce the risk of damage to the crop. A 3-parameter non-linear regression model fits cumulative moth captures as a function of accumulated day degrees for all three of the male flights. The model predicts that 1st migration begins after 151 day degrees, 2nd migration begins after 673 day degrees and 3rd migration begins after 1303 day degrees. The start of migration events are reported in the DSS warning to the user. The model uses minimum and maximum temperature from the 1st of January. The DSS output gives information about the risk of codling moth migration. The 'Cumulative Captures' chart indicates the predicted accumulative proportion (%) of adult males likely to be caught by these dates. This DSS was adapted from work carried out in Greece, and is considered applicable, but not yet validated in, Albania, Romania, Bosnia, Croatia, Italy, Macedonia, Montenegro, Portugal, San Marino, Slovenia, Slovakia, and Spain.



Picture: Symptoms codling moth larvae in pear

3.9 DSS for Barley net blotch

The CPO net blotch model is recommending treatments in barley when thresholds are exceeded. The risk of attack is based on visual monitoring using frequency of plants attacked. The disease observation is the percentage of plants showing any infection. For example, if 25 plants out of 100 show even a very small amount of disease and the remaining 75 plants are completely healthy, then the observation is 25%. In susceptible cultivars treatments are recommended at lower incidence levels than in resistant cultivars. If treatments are recommended specific fungicides known to be effective against net blotch should be chosen. When running the net blotch model, the risk for yield losses from other diseases is not considered. If no action is recommended it is advised to revisit the crop after approximately one week to make a new evaluation of the risk. To obtain accurate risk predictions it is essential to click on the 'Edit parameters' button and enter information on the cultivar's susceptibility to net blotch. The model does not automatically adjust risk for the effect of previous fungicide sprays. If a fungicide effective against net blotch has been applied in the last 10 days, the risk can be interpreted as low. Created by Aarhus University and SEGES and released in Denmark in 2000. The whole CPO model has been tested in the Nordic and Baltic countries previously, but this might not have included testing of the specific barley net blotch part. This model may be of use in other countries in Northern Europe, it is important to first test in practice before using the DSS for decision support.



Picture: Symptoms net blotch in barley

3.10 CPO brown rust model in barley

The CPO brown rust model is recommending treatments in barley when thresholds are exceeded. The risk of attack is based on visual monitoring using frequency of plants attacked. Insusceptible cultivars treatments are recommended at lower incidence levels than in resistant cultivars. If treatments are recommended, specific fungicides known to be effective against barley brown rust should be chosen. When running the brown rust model the risk for yield losses from other diseases is not considered. If no action is recommended it is advised to revisit the crop after approximately one week to make a new evaluation of the risk. To obtain accurate risk predictions it is essential to click on the 'Edit parameters' button and enter information on the cultivar's susceptibility to brown rust. The model does not automatically adjust risk for the effect of previous fungicide sprays. If a fungicide effective against brown rust has been applied in the last 10 days, the risk can be interpreted as low. The DSS is created by Aarhus University and SEGES and released in Denmark in 2000. The whole CPO model has been tested in the Nordic and Baltic countries previously, but this might not have included testing of the specific brown rust part. This model may be of use in other countries in Northern Europe, it is important to first test in practice before using the DSS for decision support.



Picture: Symptoms of brown rust in barley

3.11 CPO brown rust model in wheat

The CPO brown rust model in wheat recommends treatments in wheat when thresholds are exceeded. The risk of attack is based on visual monitoring using frequency of plants attacked. The disease observation is the percentage of plants showing any infection. For example, if 25 plants out of 100 show even a very small amount of disease and the remaining 75 plants are completely healthy, then the observation is 25%). In susceptible cultivars treatments are recommended at lower incidence levels than in resistant cultivars. If treatments are recommended specific fungicides known to be effective against this brown rust should be chosen. When running the brown rust model the risk for yield losses from other diseases is not considered. If no action is recommended it is advised to revisit the crop after approximately one week to make a new evaluation of the risk. To obtain accurate risk predictions it is essential to click on the 'Edit parameters' button and enter information on the cultivar's susceptibility to brown rust. The model does not automatically adjust the risk for the effect of previous fungicide sprays. If a fungicide effective against brown rust has been applied within the last 10 days, the risk can be interpreted as low. Adjust risk for the effect of previous fungicide sprays. If a fungicide effective against brown rust has been applied in the last 10 days, the risk can be interpreted as low. The DSS is created by Aarhus University and SEGES and released in Denmark in 2000. The whole CPO model has been tested in the Nordic and Baltic countries previously, but this might not have included testing of the specific brown rust part. This model may be of use in other countries in Northern Europe, it is important to first test in practice before using the DSS for decision support.



Picture: Symptoms of brown rust in winter wheat

3.12 CPO powdery mildew model in barley

The CPO powdery mildew model is recommending treatments in barley when thresholds are exceeded. The risk of attack is based on visual monitoring using frequency of plants attacked. The disease observation is the percentage of plants showing any infection. For example, if 25 plants out of 100 show even a very small amount of disease and the remaining 75 plants are completely healthy, then the observation is 25%. In susceptible cultivars treatments are recommended at lower incidence levels than in resistant cultivars. If treatments are recommended, specific fungicides known to be effective against this disease should be chosen. When running the powdery mildew model, the risk for yield losses from other diseases is not considered. If no action is recommended it is advised to revisit the crop after about one week to make a new risk evaluation. To obtain accurate risk predictions it is essential to click on the 'Edit parameters' button to enter information on the cultivar 's susceptibility to powdery mildew. The model does not automatically adjust risk for the effect of previous fungicide sprays. If a fungicide effective against mildew has been applied in the last 10 days, the risk can be interpreted as low. The DSS is created by Aarhus University and SEGES and released in Denmark in 2000. The whole CPO model has been tested in the Nordic and Baltic countries previously, but this might not have included testing of the specific mildew part. This model may be of use in other countries in Northern Europe, it is important to first test in practice before using the DSS for decision support.



Picture: Symptoms powdery mildew in barley

3.13 CPO powdery mildew model in wheat

The CPO powdery mildew model recommends treatments in wheat when thresholds are exceeded. The risk of attack is based on visual monitoring using frequency of plants attacked. The disease observation is the percentage of plants showing any infection. For example, if 25 plants out of 100 show even a very small amount of disease and the remaining 75 plants are completely healthy, then the observation is 25%. In susceptible cultivars treatments are recommended at lower incidence levels than in resistant cultivars. If treatments are recommended specific fungicides known to be effective against this disease should be chosen. When running the powdery mildew model the risk for yield losses from other diseases is not considered. If no action is recommended it is advised to revisit the crop after approximately one week to make a new evaluation of the risk. To obtain accurate risk predictions it is essential to click on the 'Edit parameters' button and enter information on the cultivar's susceptibility to powdery mildew. The model does not automatically adjust the risk for the effect of previous fungicide sprays. If a fungicide effective against mildew has been applied within the previous 10 days, the risk can be interpreted as low. The DSS is created by Aarhus University and SEGES and released in Denmark in 2000. The whole CPO model has been tested in the Nordic and Baltic countries previously, but this might not have included testing of the specific powdery mildew part. This model may be of use in other countries in Northern Europe, it is important to first test in practice before using the DSS for decision support.



Picture: Symptoms powdery mildew in wheat

3.14 CPO Septoria model in wheat

The CPO Septoria model estimates risk of *Septoria tritici* blotch infections in winter wheat. Weather data from GS 32 to GS 69 are used. Spraying is recommended after minimum 4 days with rain (> 1 mm) in susceptible cultivars counting days between GS 32 and GS 69. In resistant cultivars risk of attack is assumed after 5 days with rain (>1 mm) between GS 37 and GS 69. Counting of days with rain goes back a maximum of 30 days. When running the Septoria model the risk for yield losses from other diseases than Septoria is not considered. If no action is recommended, it is advised to revisit the crop after approximately one week to make a new evaluation of the risk. To obtain accurate risk predictions it is essential to click on the 'Edit parameters' button and enter information on the cultivar's susceptibility to Septoria diseases. Only two categories are used: susceptible and resistant. The model does not automatically adjust for the effect of previous fungicide sprays. If a fungicide effective against septoria has been applied in the last 10 days, the risk can be interpreted as low. The DSS is created by Aarhus University and SEGES and released in Denmark in 2000. The whole CPO model has been tested in the Nordic and Baltic countries previously, but this might not have included testing of the specific Septoria part. This model may be of use in other countries in Northern Europe, it is important to first test in practice before using the DSS for decision support.



Picture: Symptoms septoria in wheat

3.15 CPO tan spot model in wheat

The CPO tan spot model is recommending treatments in wheat when thresholds are exceeded. The risk of attack is based on visual monitoring using frequency of plants attacked. The disease observation is the percentage of plants showing any infection. For example, if 25 plants out of 100 show even a very small amount of disease and the remaining 75 plants are completely healthy, then the observation is 25%. In susceptible cultivars treatments are recommended at lower incidence levels than in resistant cultivars. If treatments are recommended specific fungicides known to be effective against this tan spot should be chosen. When running the tan spot model the risk for yield losses from other diseases is not considered. If no action is recommended it is advised to revisit the crop after approximately one week to make a new evaluation of the risk. To obtain accurate risk predictions it is essential to click on the 'Edit parameters' button and enter information on the cultivar's susceptibility to tan spot. Only two categories are used susceptible and resistant, if a cultivar is categorized as partly resistant, it is recommended to consider it as susceptible. The model does not automatically adjust risk for the effect of previous fungicide sprays. If a fungicide effective against tan spot has been applied in the last 10 days, the risk can be interpreted as low. The DSS is created by Aarhus University and SEGES and released in Denmark in 2000. The whole CPO model has been tested in the Nordic and Baltic countries previously, but this might not have included testing of the specific tan spot part. This model may be of use in other countries in Northern Europe, it is important to first test in practice before using the DSS for decision support.



Picture: Symptoms Tan spot in wheat

3.16 CPO yellow rust model in wheat

The CPO yellow rust model is recommending treatments in wheat when thresholds are exceeded. The risk of attack is based on visual monitoring using frequency of plants attacked. The disease observation is the percentage of plants showing any infection. For example, if 25 plants out of 100 show even a very small amount of disease and the remaining 75 plants are completely healthy, then the observation is 25%. In susceptible cultivars treatments are recommended at lower incidence levels than in resistant cultivars. If treatments are recommended specific fungicides known to be effective against wheat yellow rust should be chosen. When running the yellow rust model the risk for yield losses from other diseases is not considered. If no action is recommended it is advised to revisit the crop after approximately one week to make a new evaluation of the risk. To obtain accurate risk predictions it is essential to click on the 'Edit parameters' button and enter information on the cultivar 's susceptibility to yellow rust. Only two categories are used susceptible and resistant. If a cultivar is categorized as partly resistant, it is recommended to consider it as susceptible. The model does not automatically adjust the risk for the effect of previous fungicide sprays. If a fungicide effective against yellow rust has been applied within the previous ten days, the risk can be interpreted as low. Created by Aarhus University and SEGES and released in Denmark in 2000. The whole CPO model has been tested in the Nordic and Baltic countries previously, but this might not have included testing of the specific yellow rust part. This model may be of use in other countries in Northern Europe, it is important to first test in practice before using the DSS for decision support.



Picture: Symptoms of yellow rust in wheat

3.17 DSS for cutworm

Cutworms can cause damage to a range of crops such as beet, carrot, potato, cabbage. Cutworm are caterpillars of a few species of moth (e.g. *Agrotis* species) that feed at the base and roots of various crops. Eggs are laid in late spring, and the first three instar feed on surface vegetation, before burrowing into roots. Once they've moved into the roots, they cannot be controlled using insecticides. As adults continue to lay eggs in the crop, several 'batches' of larvae, at different instars, can be present in the crop. This DSS assumes first arrival of adult moths to be 1st June; users monitoring abundance in field should edit the parameter to the correct first observation to improve accuracy. Significant rainfall events cause high levels of mortality in larvae, which is included in the model. The model uses a model start date, defined as the first day after 1st June where temperature exceeds 12 degrees as a default to predict adult moth arrival. Temperature (to determine growth rates) and rainfall (to determine mortality), ending on the 31st October. Any spray dates can be inputted into the model and are deemed to be 100% effective at removing cutworm from the model but does not prevent subsequent batches. The DSS predicts the number of instar 1, 2 or 3 larval batches that could be active in the crop. When 4 or more batches are predicted, treatment is recommended to prevent high numbers of larvae moving into the crop roots. This DSS was adapted from work carried out in the UK, and is considered applicable, but not yet validated in, Belgium, Luxembourg, Netherlands, France, Germany, Rep. Ireland, and Denmark.



Picture: Cutworm

3.18 DSS for Orange wheat blossom midge

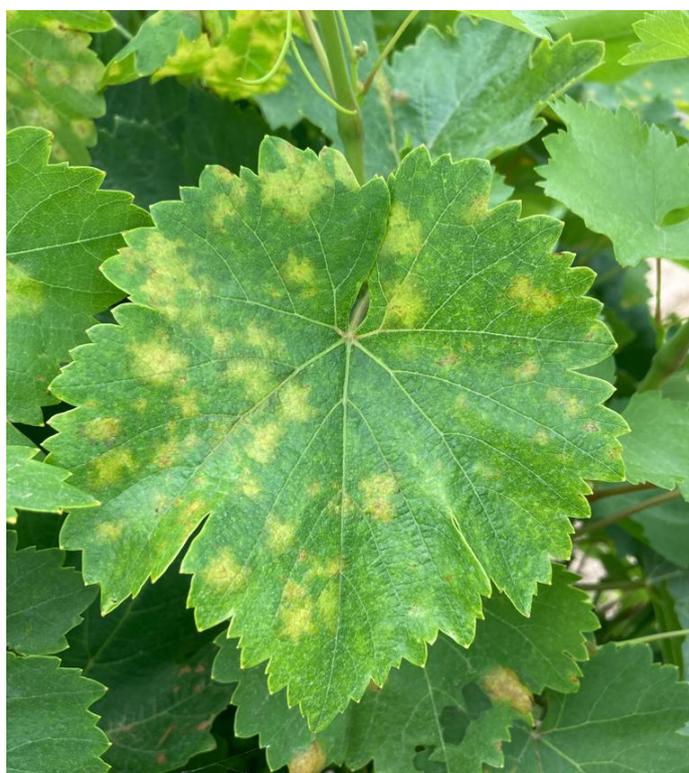
Orange wheat blossom midge larvae feed on developing grains. The larvae produced by the orange wheat blossom midge can cause grains to become small and shriveled. They can also damage the outer grain layer (pericarp) which allows water to enter. This results in grain which becomes vulnerable to fungal infection and premature sprouting. Control with help of DSS on platform.ipmdecisions.net The susceptible crops are at highest risk when adult midge emergence coincides with ear emergence, particularly at growth stages between 53 and 59. The model predicts the emergence of adults and associated migration of females into vulnerable crops and when increased monitoring and/or treatment may be appropriate. The model uses daily temperature (degree Celsius) and rainfall (mm) to identify the emergence of Orange Wheat Blossom Midge. It runs between the months May and June, but requires weather data from the 1st of January. The DSS output show that the risk of emergence of orange wheat blossom midge and migration into crops is increasing. Suitable rainfall events have taken place, and/or daily temperatures are suitable for orange wheat blossom midge emergence which is visualized as a red line in the risk status diagram. This means that increased monitoring efforts or treatments may be appropriate. This DSS was adapted from work carried out in Belgium, and is considered to be applicable, but yet to be validated in the UK, Luxembourg, Netherlands, France, Germany and Denmark.



Picture: Larvae from Orange wheat blossom midge

3.19 DSS for Downy mildew in grapes

Downy mildew results in severe loss in grapevines. Downy mildew is highly destructive in all grape-growing areas of the world. The symptoms, caused by the fungus *Plasmopara viticola*, firstly appear on the grape leaves 7-10 days after infection. Foliar symptoms appear as yellow circular spots with an oily appearance (oil spots). In order to control the pathogen, approved pesticides are used. The downy mildew model estimates infection from an organism's using cardinal temperatures (T_{min} , T_{opt} , T_{max}) and leaf surface wetness duration requirements for infection (W_{min} , W_{max}). The parameter W_{max} provides an upper boundary on the value of W since temperature is not always a limiting factor. The model is based upon a temperature response function which is scaled to the leaf wetness duration requirement. Hours of interruption to wetness are also important for estimation of infection from hourly weather data so this is also used as an input. The output of the model is normalized from 0-100, with 0 being the lowest risk index and 100 the highest. As mentioned, the model uses T_{min} ($^{\circ}C$), T_{max} ($^{\circ}C$), T_{opt} ($^{\circ}C$), Leaf Wetness min (hr) and Leaf Wetness max (hr) which are all recorded by the local weather stations. The DSS is created in Greece and part of the integrated "Gaiasense" smart-farming solution. The prediction model is developed based on literature reviews and adaptations through experiments and observation on local conditions. This means that the model is not yet validated in other countries and results should be treated with caution.



Picture: Symptoms downy mildew in grapes

3.20 DSS for Glume blotch in winter wheat

Leaf blotch diseases of wheat can be caused by septoria tritici blotch (*Zymoseptoria tritici*) and *Stagonospora nodorum* blotch (*Parastagonospora nodorum*), which are both favored by wet conditions. Fungicide treatments may need to be applied between stem extension and ear emergence, mainly to protect the upper leaves. Control with help of DSS on platform.ipmdecisions.net. Weather data from GS 31 are used. The humidity model estimates risk of septoria tritici blotch infections in winter wheat. Risk of attack is assumed after 20 hours with continuous wetness. A wet hour is defined as minimum 0,2 mm precipitation in an hour or minimum 85% relative humidity. The assumption is that septoria tritici blotch is present in the crop and periods with high humidity create risk for a damaging epidemic. Dates of key growth stages must be included for your location. To obtain accurate risk predictions it is essential to click on the 'Edit parameters' button, enter the estimated dates. These estimated dates can be updated during the season as growth stages are reached. Adding information on fungicide spray dates is vital for the model. After spraying, the model assumes that the crop is protected for 10 days. DSS is created by Aarhus University and SEGES and released in Denmark in 2017. Tested in Lithuania, Norway, Sweden, Finland and Denmark in 2018 and 2019.



Picture: Symptoms Glume blotch in wheat

3.21 DSS for Grey field slug in cereals

Grey field slug (*Deroceras reticulatum*) are the most important slug pest in cereals where they causing over 95% of most slug damage. Slug damage are commonly seed hollowing before and during seed germination leading to patchy fields, and damage continues on seedlings and young cereal shoots up to GS21. They thrive in humid conditions with large quantities of food. In most cases, they reside in soil up to 10 cm deep and are 3 to 5 cm in length. Due to its limited food reserve, this slug feeds more frequently under a variety of conditions. The slug can feed and reproduce year-round, regardless of whether it is below or above ground. Seedbeds with clods and plants that are direct drilled or minimally cultivated are likely to be damaged by slugs. Farming activities such as ploughing also fail to affect them as they move back to the soil surface to cause damage. Control with help of DSS Grey field slug model on platform.ipmdecisions.net. Slug refuge traps should be placed in standing cereal crops or in stubble over a one-night period from May to October when weather conditions such as temperatures between 5 -25°C and moist soil surfaces occur. Slugs should be counted before temperatures rise and they leave refuge traps. The trapping should continue until the vulnerable stage of the crop has passed. Crops are considered to be at risk of economic damage where an average of four or more slugs are found per refuge trap. Assessment is most effective where periods of slug activity are correctly identified; e.g. after period of wet or humid weather. Reference: Glen 2005; Glen et al. 2006. Number of slugs in the traps need to be monitored. Number of slugs per trap are to be included in the DSS under 'Parameters'. Threshold is in average, crops are considered to be at risk of economic damage where an average of four or more slugs are found per refuge trap. The DSS is developed by ADAS, England. For other countries it is important to first test in practice before using the DSS for decision support in the control of grey field slugs.



Picture: Grey field slug

3.22 DSS for Grey field slug in oilseed rape

The grey field slug can cause serious damage in oilseed rape. Grey field slug (*Deroceras reticulatum*) is the most important slug pest in oilseed rape, potentially causing over 95% of most slug damage. The most damage to oilseed rape occurs during the establishment phase (between sowing and the four true leaf stage), with leaf shredding more common than seed hollowing. They thrive in humid conditions with large quantities of food. In most cases, they reside in the soil up to 10 cm deep and are 3 to 5 cm in length. Due to its limited food reserve, this slug feeds more frequently under a variety of conditions. The slug can feed and reproduce year-round, regardless of whether it is below or above ground. Seedbeds with clods and plants that are direct drilled or minimally cultivated are likely to be damaged by slugs. Farming activities such as ploughing also fail to affect them as they move back to the soil surface to cause damage. If, on average, there are one or more slugs per trap; the risk of slug populations over threshold is high and management action is needed. In vulnerable crops, continue to monitor slug abundance and consider treatment options where crops require additional protection. Traps should be placed in standing crops or in stubble over a one-night period from May to October when weather conditions such as temperatures between 5 -25°C and moist soil surfaces occur. Slugs should be counted before temperatures rise and they leave refuge traps. The trapping should continue until the vulnerable stage of the crop has passed. Crops are considered to be at risk of economic damage where an average of one or more slugs are found per refuge trap. Set up a minimum of nine refuge traps per 20 ha (13 in fields larger than 20 ha) in a “W” pattern. Refuge traps can be made from an upturned saucer, baited with chicken layers mash. The threshold is assessed based on the overall average number of slugs found per trap 24hrs after setting them. Assessment is most effective where periods of slug activity are correctly identified; e.g. after period of wet or humid weather. Tracking slug abundance over time is recommended, rather than single assessments. Ref: Glen 2005; Glen et al. 2006 The number of slugs in the traps needs to be monitored. Number of slugs per trap are to be included in the DSS under ‘Parameters’. Threshold is on average, one slug per trap. The DSS is developed by ADAS, England. For other countries it is important to first test in practice before using the DSS for decision support in the control of grey field slugs.



Picture: Grey field slug

3.23 DSS for Potato late blight Hutton Criteria

Potato late blight can cause severe damage to potato leaves and tubers. Potato late blight is a disease caused by a fungus-like organism (*Phytophthora infestans*) that spreads rapidly in the potato crop canopy and can also infect tubers. Control with help of DSS on platform.ipmdecisions.net This model runs during the potato growing season and relevant as soon as the crop emerges. The model determines when weather conditions create high risk of infection, to guide targeting of fungicide treatment. The model uses daily air temperature and humidity. A high risk 'Hutton Criteria' period occurs when two consecutive days have a minimum temperature of 10°C, and at least six hours of relative humidity at or above 90%. Susceptibility of varieties is not taken into account. The risk information can be used for the timing of fungicide applications. There are many fungicides on the market with different modes of action. Information about properties of fungicides is available through Euroblight, a potato late blight network for Europe: <https://agro.au.dk/forskning/internationale-platforme/euroblight/control-strategies/late-blight-fungicide-table>

This DSS was adapted from work carried out in The UK and is not tested yet in other countries yet.



Picture: Severe symptoms of late blight in potato

3.24 DSS for Large Narcissus Fly

This model Large Narcissus Fly Model predicts the timing of adult emergence, egg laying and egg hatching, enabling users to undertake targeted monitoring and/or mitigating actions to reduce the risk of damage to the crop. A series of development rate equations form the basis of the simulation model and are linked together in a program. The model simulates the development of cohorts of 500 individuals through adult emergence, egg laying and hatching. The model uses soil temperatures or air temperatures depending on the stage of development. As multiple cohorts progress simultaneously, adult emergence, egg laying and/or egg hatching can occur at the same time. The start date for the model is 1st February, as this is often the coldest period in the year. The DSS shows information about the development of the large Narcissus fly during the growing season. The Large Narcissus Fly forecast requires hourly soil temperatures at a depth of approximately 6 cm and hourly air temperatures. This model requires historic data to provide risk forecasts. At present, suitable historic data is only available for a limited number of locations; please select 'Edit Parameters' and select the most appropriate location. The DSS Large Narcissus Fly Model was developed at University of Warwick (Warwick Crop Centre) and was adapted from work carried out in the UK.



Picture: Symptoms Large Narcissus fly

3.25 DSS for Pollen Beetle (Warwick)

Control with help of DSS Pollen Beetle Warwick model on platform.ipmdecisions.net. A series of development rate equations form the basis of the simulation model and are linked together in a program. The model simulates the development of cohorts of 500 individuals through spring emergence, egg laying and hatching, larval and pupal development and emergence, followed by dispersal of the new generation of adult beetles. For each stage, the percentage development is calculated each day by integrating the appropriate development rate curve. This percentage is accumulated over days until it reaches 100. At this point the individual moves to the next stage. Variability within the insect population is incorporated by assuming that, at any instant, the rates of development of a population held at a constant temperature are normally distributed (Phelps et al, 1993). The model uses soil temperatures or air temperatures depending on the stage of development. As multiple cohorts progress simultaneously, adult emergence/dispersal and egg laying can occur at the same time. DSS parameters The Pollen Beetle forecast requires hourly soil temperatures at a depth of approximately 6 cm and hourly air temperatures. This model requires historic data to provide risk forecasts. At present, suitable historic data is only available for a limited number of locations; please select 'Edit This model predicts the timing of spring emergence of adult beetles, egg laying and then the emergence of a new (summer) generation of adults ready to disperse, followed by their dispersal. This enables users to undertake targeted monitoring and/or mitigating actions to reduce the risk of damage to the crop. The start date for the model is 1st February, as this is often the coldest period in the year. This DSS was adapted from work carried out in the UK. At present, suitable historic data is only available for a limited number of locations; please select 'Edit Parameters' and select the most appropriate location.



Picture: Pollen beetle

3.26 DSS for Pollen Beetle (simplified model)

An adult pollen beetle is approximately 2,5 mm, with metallic greenish-black colour. Females bite oilseed rape buds and lay their eggs inside. Adults and larvae attack buds and flowers, resulting in withered buds and reduced pod set. However, damage rarely results in reduced yields for winter crops. Spring crops are more vulnerable, as the susceptible green/yellow bud stage often coincides with beetle migration. The model runs March-April. Control with help of the DSS Pollen beetle model on platform.ipmdecisions.net. Oilseed rape is only vulnerable if large numbers of pollen beetle migrate into the crop during green bud stage. This DSS predicts migration into crops based on air temperature, and so can be used to evaluate risk to crop. Only crops at growth stage 51 – 59 are vulnerable to damage, the period shortly before flowering: GS51: Flower buds visible from above ('green bud' stage). GS52: Flower buds free and level with the youngest leaves. GS53: Flower buds raised above the youngest leaves. GS55: Individual flower buds (main inflorescence) visible but closed. GS57: Individual flower buds (secondary inflorescences) visible but closed. GS59: Flower buds closed with first petals visible ('yellow bud' stage). The model uses Daily maximum air temperature. Only crops at growth stage 51 – 59 are vulnerable to damage, it is important to update growth stage in the DSS to indicate current crop growth stage. This DSS was adapted from work carried out in the UK, and is considered applicable, but not yet validated in, Belgium, Luxembourg, Netherlands, France, Germany, Rep. Ireland, and Denmark.



Picture: Pollen beetle

3.27 DSS for Potato late blight, negative prognosis

Potato late blight, caused by the fungus-like organism. *Phytophthora infestans* causes severe damage to the foliage and can infect the tubers at harvest. The DSS is designed to guide the timing of the first late blight fungicide application, when used in combination with other agronomic risk factors. The DSS uses weather data to estimate the 'epidemic free' period ('negative prognosis') by calculating the accumulated blight risk from the date of crop emergence. The model guides the first spray timing at the end of the 'epidemic free' period. Other agronomic factors than weather, such as time of row closure, cultivar susceptibility, the presence or absence of blight inoculum sources, are not included in the risk estimate. It is not applicable to potatoes grown under protection. From the date of crop emergence, daily risk values are accumulated based on weather data (temperature, relative humidity and precipitation). The risk is an accumulated value of how the weather affects late blight germination/infection, sporulation and growth. All processes are corrected for inhibition due to drying. After the accumulated risk has reached certain thresholds, there is likely to be moderate or high blight risk. The DSS was first introduced by Schrodter and Ullrich in Germany in the 1970s and has been widely used in Europe since. After the original paper by Ullrich, J. & Schrödter, H. (1966), the negative prognosis model was tested in other countries (e.g. by Taylor M. C. 2003 in the UK) and was commonly combined with other models to guide subsequent fungicide applications. Combined models, such as NegFry, have been tested in many countries, e.g. by Hansen J. G. et al., 1995 in Denmark.



Picture: Symptoms potato late blight

3.28 DSS for Potato late blight, Naerstad model

Potato late blight is caused by *Phytophthora infestans*, a fungus-like microorganism that causes the most devastating disease of potato. It spreads rapidly in the canopy, and can also infect tubers. Protective fungicide treatments are needed to protect the crop when conditions for infection are favorable. Control with help of DSS Potato Late Blight, Naerstad model on platform.ipmdecisions.net. The model predicts if there are favorable conditions for spore production and the following conditions for spread, survival and infection of these spores. The model produces an infection risk, where a value of 2.5 is the threshold where a warning is issued. The model uses temperature, humidity, precipitation, wind, radiation, leaf wetness and vapor pressure deficit as input parameters. Assuming spores of potato late blight are present. The DSS shows information about the risk of infection for potato. The risk output: Risk > 2,5 = warning issued. A control measure should be considered based on cultivar resistance, time of last application and choice of fungicide. Risk of infection is highest after several consecutive days with warnings, and especially if late blight has been observed in the area. The DSS was developed by NIBIO in Norway. Reference: Hjelkrem et al. 2021. For other countries it is important to first test in practice before using the DSS for decision support in the control of potato late blight.



Picture: Symptoms potato late blight

3.29 DSS for Saddle gall midge

Saddle gall midge (*Haplodiplosis marginata*) is a sporadic pest of cereals, which usually persists at low population levels. Yield loss can be caused by constricted vascular supply to the ears as a result of larval feeding and by lodging of gall-weakened stems in high winds. Pupae overwinter in the soil, from which adults emerge in the spring to lay eggs on vulnerable crops. Damage is caused by subsequent larval feeding. Once larvae have crawled under the leaf sheath, they cannot be controlled using contact treatments (e.g. insecticides). Control with help of DSS Saddle gall midge model on platform.ipmdecisions.net. This DSS indicates the best time to monitor crops for infestations (start of emergence). If abundance is high, and non-chemical management options are unlikely to achieve adequate control, treatment needs to be applied before, or soon after oviposition. DSS assumes the earliest date of emergence of saddle gall midge to be after 500 day degrees. User must interpret the reported risk against the vulnerability of the crop growth stage on farm and undertake in field monitoring to assess the abundance of emerging adults. The DSS starts on the date of first rainfall on or after the 1st March and ends at the end of July. The DSS uses accumulative daily temperature (500-degree days above 0 degrees) and rainfall. The DSS predicts proportion of cumulative emergence of the saddle gall midge, the associated risk and recommended action. This DSS was adapted from work carried out in the UK, and is considered applicable, but not yet validated in, Belgium, Luxembourg, Netherlands, France, Germany, and Denmark.



Picture: Larve of saddle gall midge

3.30 DSS for Septoria, Humidity model

Septoria blotch diseases of wheat can be caused by septoria tritici blotch (*Zymoseptoria tritici*) and *Stagonospora nodorum* blotch (*Parastagonospora nodorum*), which are both favored by wet conditions. The Septoria humidity model estimates risk of septoria tritici blotch infections in winter wheat. Risk of attack is assumed after 20 hours with continuous wetness. A wet hour is defined as minimum 0,2 mm precipitation in an hour or minimum 85% relative humidity. Fungicide treatments may need to be applied between stem extension and ear emergence, mainly to protect the upper leaves. The DSS assumes that septoria tritici blotch is present and periods with high humidity create risk for a damaging epidemic. Weather data from GS 31 are used. In addition, the dates of occurrence of growth stages 31 and 32 are entered. The model calculates the expected date for the other crop growth stages. This can be adjusted manually. Adding information on fungicide spraying dates is vital for the model. After spraying, the model assumes that the crop is protected for 10 days. The thresholds for number of wet hours and relative humidity can be adjusted manually. The DSS is created by Aarhus University and SEGES and released in Denmark in 2017. Tested in Lithuania, Norway, Sweden, Finland and Denmark in 2018 and 2019.

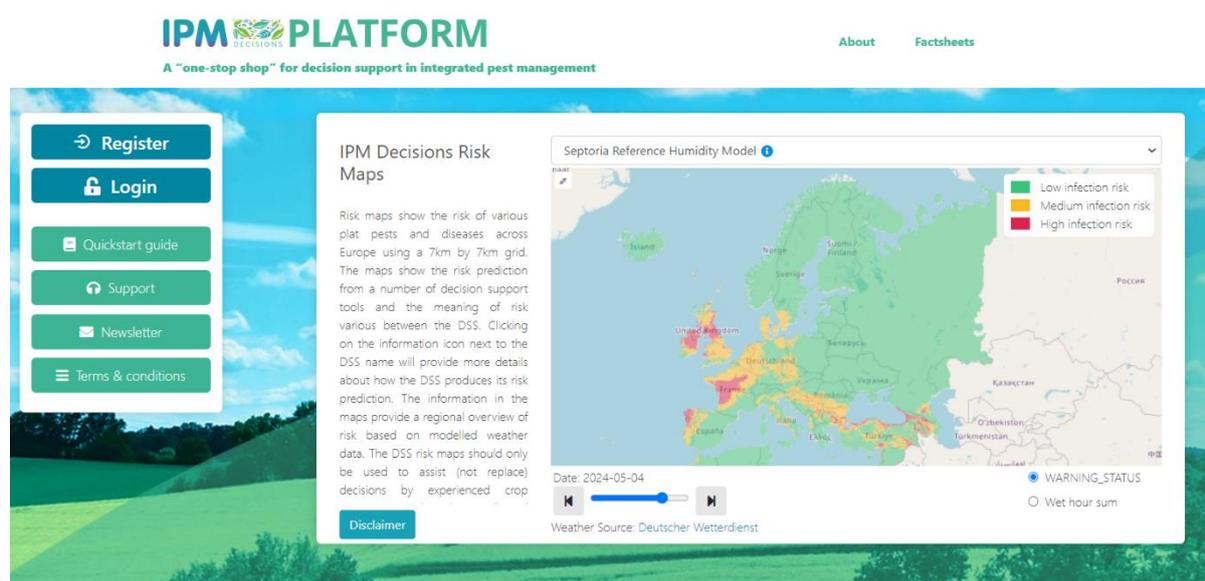


Picture: Symptoms of septoria in wheat

3.31 Risk maps on home page

The homepage of the IPM Decisions platform, <https://www.platform.ipmdecisions.net/>, contains crop damage risk maps. These risk maps show the infection risk of various plant pests and diseases across Europe for using a 7km by 7km grid, with weather data taken from the Deutscher Wetterdienst Open Data service. Currently the risk map for Septoria leaf blotch (*Zymoseptoria tritici*), the risk maps for pollen beetle (*Meligethes aeneus*) and the risk map for codling moth (*Cydia pomonella*) are available. The data is updated throughout the risk season for each pest and the user is able to scroll through the maps by date to see how the risk is changing over time. By zooming in, the user can view the local risk level. Attention: It is important to note that the information in the maps is only intended to provide a regional overview of risk based on modelled weather data and will not necessarily be an accurate prediction of risk for an individual crop. The DSS risk maps should only be used to assist (not replace) decisions by experienced crop managers as local conditions will need to be taken into account in making any crop protection decisions. The user has to login to become more in depth information about the current risk levels.

As the risk maps will show the risk prediction from a number of decision support tools and the meaning of risk varies between the different DSS. There is an information icon included next to the DSS name, which will provide more details about how the DSS produces its risk prediction. In addition to the risk map, maps of additional outputs relevant to the DSS are also provided.



Picture: Screenshot disease risk map

3.32 IPM Decisions in Norway

The IPM Decisions platform (www.platform.ipmdecisions.net) provides access to decision support systems (DSSs) for integrated pest management from multiple DSS providers across Europe. By May 2024 the platform includes more than 25 fully integrated DSS and several linked DSS for pests and diseases. In addition, 3 DSS are presented in risk maps displaying a European overview of risk prediction. After registration and the creation of a farm location, relevant DSS can be selected. The platform automatically connects to regional weather information. The platform provides solutions for direct use of selected DSS, comparisons or adaptations. The added value for Norwegian users, which have access to many of the DSSs through VIPS (www.vips-landbruk.no), will be to recognize, test and evaluate additional DSS of potential interest for Norwegian agriculture. Other benefits from the IPM Decisions platform, is the potential for integration of DSS into external services. This means that both DSSs and weather data from IPM Decisions can be integrated in the VIPS web service to provide direct access to additional features. The project ends in May 2023, but the platform will stay live: www.platform.ipmdecisions.net.

3.33 IPM Decisions in Sweden

A summary of the conclusions for Sweden: DSS for a limited number of important plant diseases are offered to Swedish advisors and farmers by chemical companies. There are a few commercial systems available, some of which are delivered free of charge by the Swedish Board of Agriculture. In addition the Board of Agriculture have their own web service with a few DSS for the most relevant pests and diseases in a limited number of crops. The IPM Decisions platform, with its free access to DSS in several crop x pest/disease combinations, will complement the current supply of decision support in plant diseases and pest management and has the potential to give a more comprehensive and better support for sustainable plant protection in Sweden. To reach larger proportions of the end user community the trust building process is very important. This includes local validation of DSS and to ensure the longevity of the platform. The project ends in May 2023, but the platform will stay live: www.platform.ipmdecisions.net

3.34 IPM Decisions in Finland

IPM Decisions developed a platform that gives access to a IPM-DSS across Europe. By May 2024 the platform includes more than 25 fully integrated DSS and several linked DSS for pests and diseases. After registration and the creation of a farm location, relevant DSS can be selected. The platform automatically connects to regional weather information. The output of the DSS is continuously updated and can be accessed through the 'DSS Use Dashboard', also on a smartphone. A summary of the conclusions for Finland: The platform gives Finnish farmers or other actors free access to a set of European crop protection models, and makes it easy to run models with local weather data. Employing DSS models can make crop health monitoring more effective and pest prevention decisions better grounded. Testing of the models under Nordic conditions is important. The project ends in May 2024 but the platform will stay live at <http://platform.ipmdecisions.net>.

3.35 IPM Decisions in Lithuania

Integrated pest management (IPM), which combines various measures and technological elements is constantly discussed at farmers, advisers and even political level, especially when it comes to the tasks raised by the European Green Deal. In response to the reduction in the use of plant protection products, a lot of attention is paid to the forecasts of diseases and pests, and the targeted use of plant protection products. During the Horizon 2020 project 'IPM Decisions', a platform was created with the possibility of connection throughout Europe. Farmers and advisers are especially appreciating the possibility to be able to use the information provided on the platform in Lithuanian language as well. In order to be an active participant of the platform, the only necessity is to register and provide information about the fields. The DSS automatically connects to regional meteorological data and, in the event of a risk of disease or pest occurrence, immediately provides information about the situation in a specific field. The 'IPM Decision' platform is attractive to the user, as it provides free access to Decision Support Systems (DSS), which are developed in other countries, but are also relevant in Lithuania. During project period in Lithuania, the Platform was presented at 20 different events (conferences, seminars, field days, etc.). In 2022 and 2024 information about the DSS was discussed at the exhibition of agricultural technologies and innovations "Agrovizija". More information about the platform and the DSS can be found at: www.platform.ipmdecisions.net.

3.36 IPM Decisions in Germany

IPM Decisions (IPMD) developed a platform for decision support systems (DSS) available across Europe, at www.platform.ipmdecisions.net. A prototype was launched in September 2022 and continuously developed, the design and functionality were significantly improved again at the end of 2023. Currently (May 2024) the platform includes more than 25 fully integrated DSS and several linked DSS for diseases and pests in numerous crops. After registering and creating a farm, you select relevant DSS. Based on local weather data, the pest and disease risk is recalculated daily, all in the typical traffic light color scheme. For each DSS you get the results, divided into three parts: a) a graphic showing the risk classification for the last few days and for the next 6 days, b) a graphic of the model-specific risk parameters, c) and a standardized recommendation for treatments for each risk level. A summary of the conclusions for Germany: Even though there have been providers of DSS in Germany for many years, the IPMD platform offers numerous new approaches, in addition to some new pathogen crop models that have not yet been established in Germany. In particular, free access for German farmers, advisors, researchers and DSS developers to models developed in other countries. These can be tested and easily adapted to regional conditions using a special "adaptation dashboard". Even after the end of the project, the platform will continue to operate and is therefore available throughout Europe for the inclusion of new DSS. The project ends in May 2023, but the platform will stay live: www.platform.ipmdecisions.net

3.37 IPM Decisions in United Kingdom

IPM Decisions developed a platform that gives access to a IPM-DSS across Europe. By May 2024 the platform includes more than 25 fully integrated DSS and several linked DSS for pests and diseases. After registration and the creation of a farm location, relevant DSS can be selected. The platform automatically connects to regional weather information. The output of the DSS is continuously updated and can be accessed through the 'DSS Use Dashboard', also on a smartphone. A summary of the conclusions for The UK: There are ~20 DSS available on the platform which have been produced and/or validated for crop x pest risk determination in the UK. These DSS can be used to determine risk of pest and disease in arable and horticultural crops and provide guidelines on appropriate actions. The platform also gives free access to DSS developed in other countries that are relevant for UK agriculture which can be adapted under the adaptation dashboard on the platform. The project ends in May 2023, but the platform will stay live: www.platform.ipmdecisions.net

3.38 IPM Decisions in Denmark

In the EU project “IPM Decisions” a platform for decision support systems (DSS) in Europe has been developed and launched. In Denmark, DSS have been available to farmers and advisors for many years. Through CropProtectionOnline (CPO), one can get suggestions for the control of weeds, fungal diseases, and pests in cereal species. Additionally, in “Cropmanager,” one can follow the number of hours with leaf wetness to assess the risk of Septoria attacks. Both the CPO-models and the Septoria humidity model are now also available on the IPM Decisions platform. Many consultants and farmers have visited the platform to see what DSS are available and test how the systems work. Farmers and consultants have used the platform for inspiration but have not followed the recommendations, as many of the systems have not yet been validated under Danish conditions. The idea behind the IPM Decisions platform is to gather available DSS on one platform, where one can set up several farms and choose different DSS, which provides a good overview of the decision support systems at the farm level. The platform may also inspire researchers to develop and adapt models for individual pests to other countries. The project ends in May 2023, but the platform will stay live: www.platform.ipmdecisions.net

3.39 IPM Decisions in France

The IPM-Decisions platform offers an easy access to a range of Decision Support Systems for pest management in agriculture. In a first step, the platform has been promoted in France through the DEPHY network, a network of farmers demonstrating their efforts to reduce pesticide use, facilitated by advisors (i.e. the French component of the EU IPMWORKS network). The platform was demonstrated in national seminars and specific webinars. This first promotion had little success, partly because French farmers already benefit from weekly warnings based on both monitoring of a field network and pest dynamics models, partly because the DEPHY network is promoting mostly the re-design of cropping system to reduce weed, disease and pest pressure, rather than the optimization of decision making. As a second step, the promotion targeted those advisors who are engaged in preparing the warning

bulletins, who proved to be very interested in making use of the platform as a complement to strengthen the warnings. This public would be happy to have all the models they are using, and new additional ones, made available through a single platform, and IPM-Decisions could be the solution.

3.40 IPM Decisions in Netherlands

IPM Decisions developed a platform that gives access to a IPM-DSS across Europe. By May 2024 the platform includes more than 25 fully integrated DSS and several linked DSS for pests and diseases. After registration and the creation of a farm location, relevant DSS can be selected. The platform automatically connects to regional weather information. The output of the DSS is continuously updated and can be accessed through the 'DSS Use Dashboard', also on a smartphone. A summary of the conclusions for The Netherlands: Commercial DSS for a number of important crop x pest combinations are available on the market for Dutch farmers for several years. The added value of the IPM Decisions platform for Dutch farmers is that the platform gives free access to DSS developed in other countries, but are relevant for Dutch agriculture. To make sure these DSS are useful for Dutch growers, testing of these DSS under Dutch conditions is important. The platform offers the functionality for this testing work through the 'adaptation dashboard'. The project ends in May 2023, but the platform will stay live: www.platform.ipmdecisions.net.

3.41 IPM Decisions in Slovenia

The European IPM Decisions project has developed a web-based platform that provides access to the results of a number of Decision Support Systems (DSS) for use in Integrated Pest Management (IPM) in Europe. On the IPM Decisions platform, registered users can access the risk assessment of damage caused by selected pests to selected crops. At the end of the project, more than 25 DSS will be integrated into the IPM Decisions platform. Two DSS have been validated in the IPM Decisions platform for Slovenia for use in IVR, namely for the prediction of the risk of damage caused by the apple weevil (*Cydia pomonella* L.) on apple and pear. Users can also use models developed or validated in neighboring countries if they wish, but it is necessary to check the accuracy of the predictions before using them. If the user determines that an adjustment to the DSS is required, they can do so in the 'DSS adaption dashboard' section. Once the user is satisfied with the model result, they can save it for future use. The IPM Decisions platform is available in 12 European languages, including Slovenian, and will continue to be available after the end of the project: www.platform.ipmdecisions.net

3.42 IPM Decisions in Italy

The IPM DECISIONS project has developed a platform that makes a variety of DSSs accessible from a single access point in different European countries for the control of plant diseases and parasites. Some DSS are fully usable across the platform; others are connected to it but not directly usable. The platform connects to the meteorological data of the area in which the farm is located and, through a dashboard system, allows users to receive indications for the treatments to be carried out, as well as to compare the indications provided by different DSS,

to make modifications based on the specific needs of each individual. The project highlighted that in Italy there still remains a certain skepticism about the usefulness and validity of DSS, although signs of increased confidence are emerging. Farmers, in particular, recognize a lack of skills in using such systems which limits them from taking the first step. It is therefore essential to work on the skills of agricultural entrepreneurs but also of consultants who can act as intermediaries in the use of the IPM DECISIONS platform. It is in this sense that the platform provides a type of access specifically for consultants, who can therefore follow the activities of the companies they assist, recommend their actions based on the results suggested by the DSS performed, and compare the results. The project ends in May 2023, but the platform will stay live: www.platform.ipmdecisions.net

3.43 IPM Decisions in Greece

The IPM Decisions platform provides a Decision Support System (DSS) for integrated pest management. The platform includes several integrated DSS for a variety of crops and offers useful external links as well. Farmers, advisors and researchers can specify their farm's location, choose their crop and access the relevant DSS. The available dashboards of the IPM platform enable users to compare results from various DSS for a given pest or disease or even set the parameters within the DSS to broaden their applicability. Outcomes for Greece: The concept of using DSS platforms is relatively new in Greece and not that common among farmers. However, the introduction of IPM Decisions has significantly added value to the agricultural sector of our country. Over the years, our efforts and activities have provided farmers, advisors, researchers and other stakeholders with the opportunity to become acquainted with this innovative tool. As a result, IPM Decisions has not only filled a gap in knowledge but also empowered them to make informed and effective decisions. Also, there are two significant DSS developed in our country; one for codling moth in pome fruits and another for downy mildew in grapes, both of which are cultivated by Greek farmers.

The project ends in May 2023, but the platform will stay live: www.platform.ipmdecisions.net