FAQ

KX Field EN

Contents

What is KX-Field?

KX-Field is a platform that provides advanced weather forecasts and crop disease insights, specifically designed for precision agriculture.

Who uses KX-Field?

KX-Field is used by farmers, crop advisors, and other agricultural professionals who need reliable weather and disease data for better decision-making.

How do I get access to KX-Field?

You can register at the KX-Digital website: https://www.kx-digital.com/
Once you are registered you can start using KX-Field by logging into the platform.

What do I see when I log in?

In the right upper corner, you will see a white circle. Clicking the circle will bring your account settings. Here you can set preferred language and a country. The country is needed to show you the correct registered crop protection products as authorised for the selected crop.

Depending on whether you are using a smart phone or desktop computer to look at KX-Field, the map will either zoom in to GPS location of your smart phone or show an overview of the country.

At the top of the screen are two rows of buttons. The first row shows the crops and the second the diseases for the selected crop. The selected crop is shown as a blue button. Clicking another crop selects it and the diseases on the second row change. This allows you to select your desired crop and disease and show the result on the screen. The result is shown as coloured circles (Figure 1).
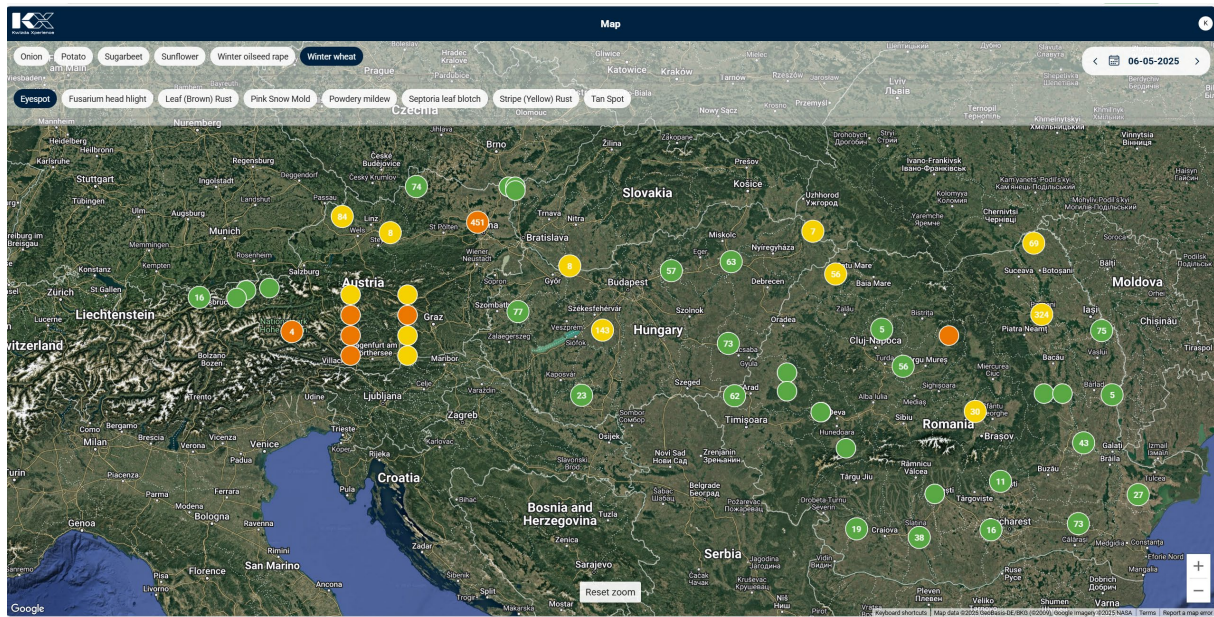
Figure 1 KX-Field interface

What do the colored circles mean?

The number gives the total grid points summarised in the corresponding circle. Clicking on a circle zooms in further and allows you to view the underlying grid points. The colour of a circle indicates the highest disease pressure of the underlying grid points. If no number is shown, it concerns a single grid point for which additional information is displayed when clicked (Figure 2).

Figure 2 Information of the grid point

The additional information shows the current temperature, humidity and the total accumulated rainfall. At the bottom there is time line, showing the historical and forecasted disease risk. The grey rectangle around a date, indicates the current date. By clicking the arrow in the right top corner, more information about the disease and weather can be found.

What is shown in the detailed information for a grid point?
The detailed information for a grid point shows an overview of (Figure 3):
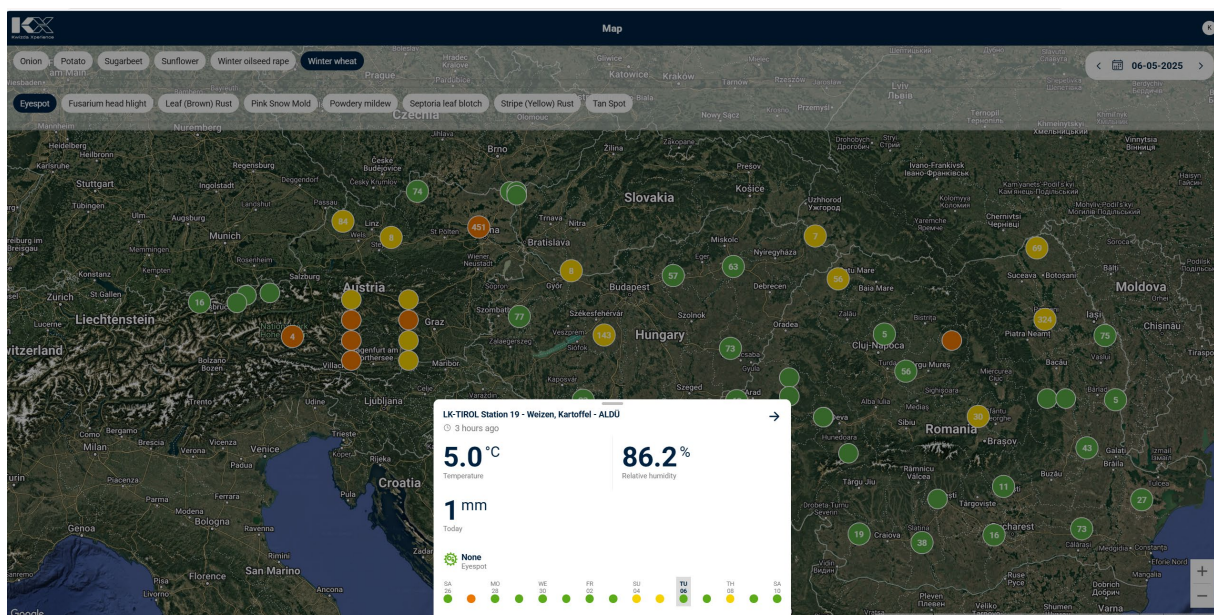1. Disease risk for the selected crop and disease
2. The weather forecast
3. The spray planner
4. The current weather conditions including historical weather
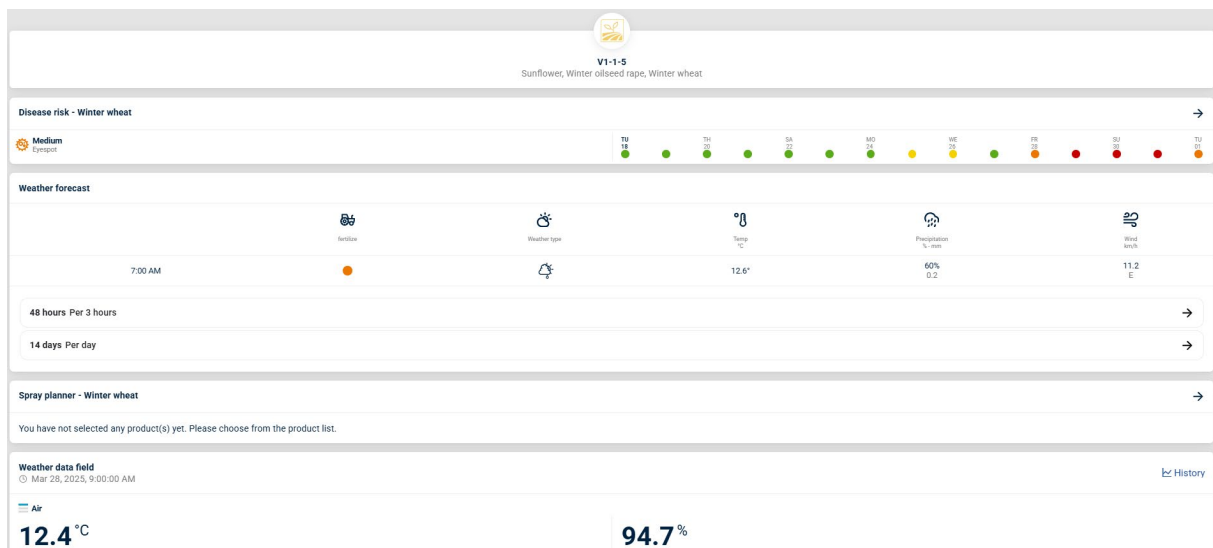
Figure 3 Detailed information window for a grid point

What is shown in the disease risk?

Figure 4 Disease risk time line on grid point details page

The disease risk time line is showing the historical and forecasted disease risk for 4 days for the selected crop and disease. The coloured circles show the severity of the disease for the indicated date (Figure 4).

What do the disease risk colours mean?
There are 5 colours indicating the risk of disease:

Green   No to low risk

Yellow   Moderate risk

Orange   High risk
Red   Extreme risk
Grey   Problem with the calculation
Blank   Crop outside susceptible period for disease

What should I do if the risk colour is orange or red?

Very important is that you control your fields and crops regularly for diseases no matter what color the prognosis predicts. If the color of the circles is orange or red you have an eye on your fields and some factors have to be considered before you plan to spray your fields. Not each orange or red color circle should triggered a spraying.

That depends on several factors, including:
- Type of disease (destructiveness)
- Variety susceptibility – Some varieties are more prone to a disease than others, due to genetic, physiological or crop structural differences.
- Stage of the crop
- Date of latest application of crop protection

Example: Red colour for "Late blight" for an unprotected potato crop means immediate action. While red for "Rust" in sugar beet at the end of the season could mean no action is needed.

What is shown in the weather forecast?

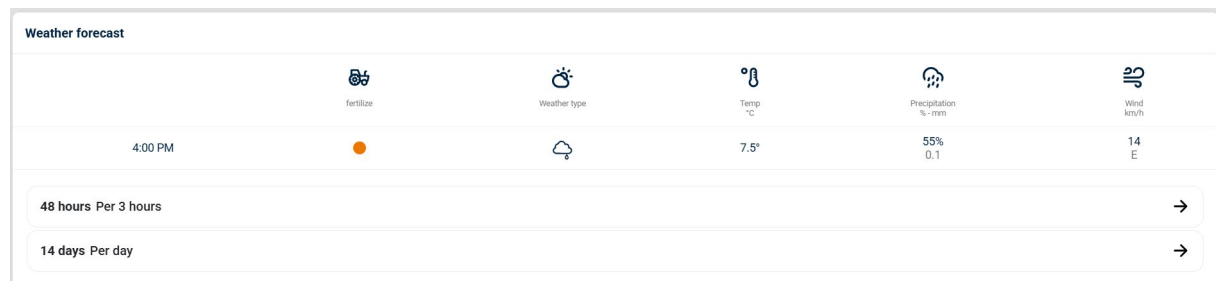| Weather forecast					
	fertilize	Weather type	Temp °C	Precipitation % - mm	Wind km/h
4:00 PM	🟠	☁	7.5°	55% 0.1	14 E
48 hours Per 3 hours					→
14 days Per day					→

Figure 5 The local weather forecast for a grid point

The local weather forecast shows the forecast for the next hour and two more options:
1. A three hourly forecast for the next 48 hours and
2. A daily forecast for the next 14 days.

The forecast for the next hour indicates the time, a circle indicating the spray window and the colour the conditions for spraying. (Green = Good condition, Orange = Moderate conditions and Red = Poor conditions). For the spraying condition, wind, rain and humidity are taken into account (Figure 5).

What is the Spray planner?

Weather conditions play a crucial role in the distribution and efficacy of plant protection products (PPP). From the moment a droplet leaves the nozzle, it is subject to various meteorological influences such as wind, humidity, and temperature. Wind speed and

direction, local airflow patterns, turbulence, and atmospheric stability are key factors determining how the product disperses—also known as drift. At the same time, humidity and temperature influence the evaporation rate of the carrier fluid. These processes occur in layer 1 (see Figure 6) and are called the spraying conditions.

Once the product reaches the plant or soil, layer 2 biological processes take over (see Figure 6). Weather conditions before, during, and after application significantly affect these biological processes and determine the spraying effect of the PPP. Ultimately, the active ingredients in the PPP must reach a biological target on or within the plant, insect, or fungus. These targets—and the routes to reach them—are often weather-dependent. Our system includes one or more process models for each active ingredient, capturing how weather conditions influence its behaviour and action. Each model assigns a relative weight to the specific weather parameters involved, reflecting their importance in the mode of action.
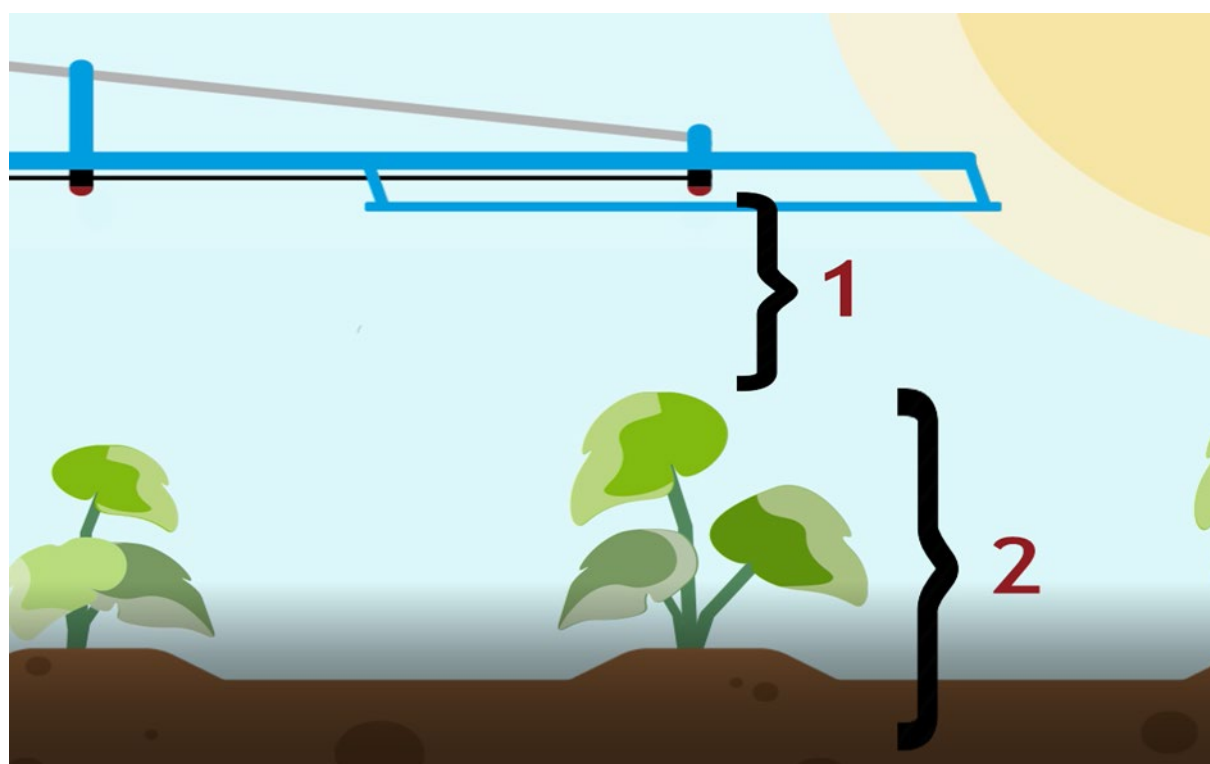

Figure 6 Weather conditions during spraying. 1. Spaying conditions: After leaving the nozzle, wind, relative humidity and temperature affect the droplets. 2. Spray effect: After the droplets have reached the plant, the soil or the insect, the weather has a strong influence on the action of the ppp.

How does the spray planner work?

Spray planner - Winter wheat   →

You have not selected any product(s) yet. Please choose from the product list.

The spray planner can be used to calculate the efficacy of a plant protection product when applied in the next 48 hours. To do so, the system will need some additional information:
   1. The product(s) you want to apply

2. The soil moisture content if different than the suggested value (10, 25, 50, 75 or 100%)
3. The soil coverage if different than the suggested value (Dry, Moist, Wet)

Clicking on product list (Figure 7), will show a new selection window:
1. Herbicide
2. Fungicide
3. Insecticide
4. Growth regulator or
5. Bio stimulant

Selecting one of these option will show a list of the authorised products in the given country for your selected crop. In other words, when wheat is selected and fungicide is clicked, the following list will show all authorised wheat fungicides in your country. You can select one or more from this list and save your selection.
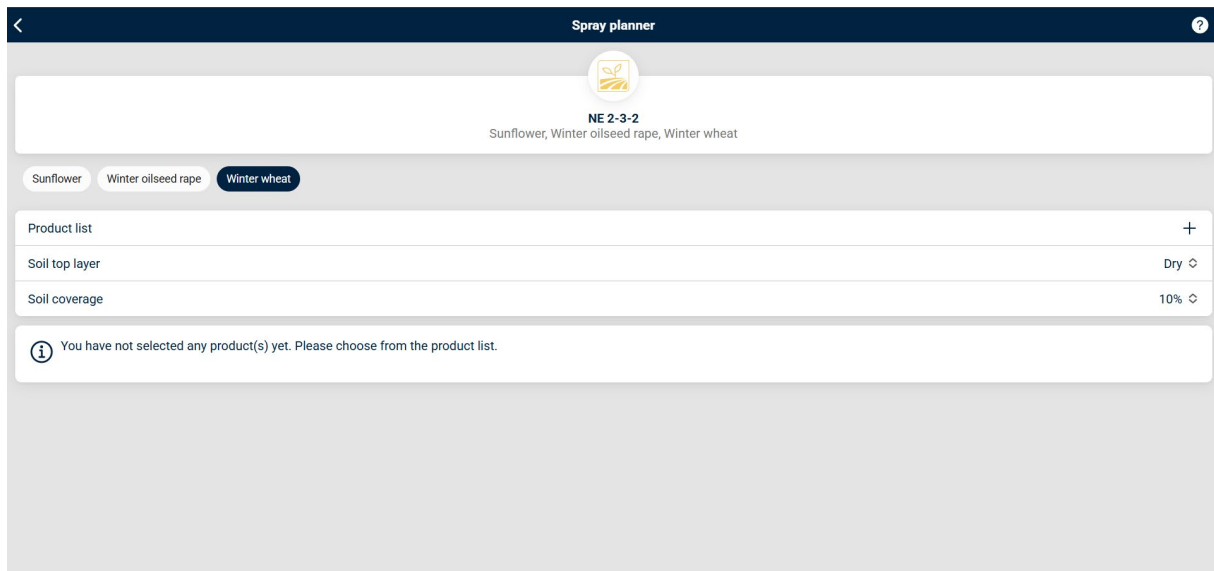

Figure 7 Spray planner window

Once one or more products are selected, the system will calculate the efficacy of the product(s). And show this in as a graph (Figure 8) on the Detail tab. Here the vertical bars indicate the efficacy of the product. Both the colour and height tell you something about the effect the product will have when applied on the indicated date and time as indicated on the x-axes. The colour green means a good effect of the products, yellow means a moderate effect and red means a minimal effect of the product. The effect is emphasised by the height of the bar. The higher the bar the higher the effect.
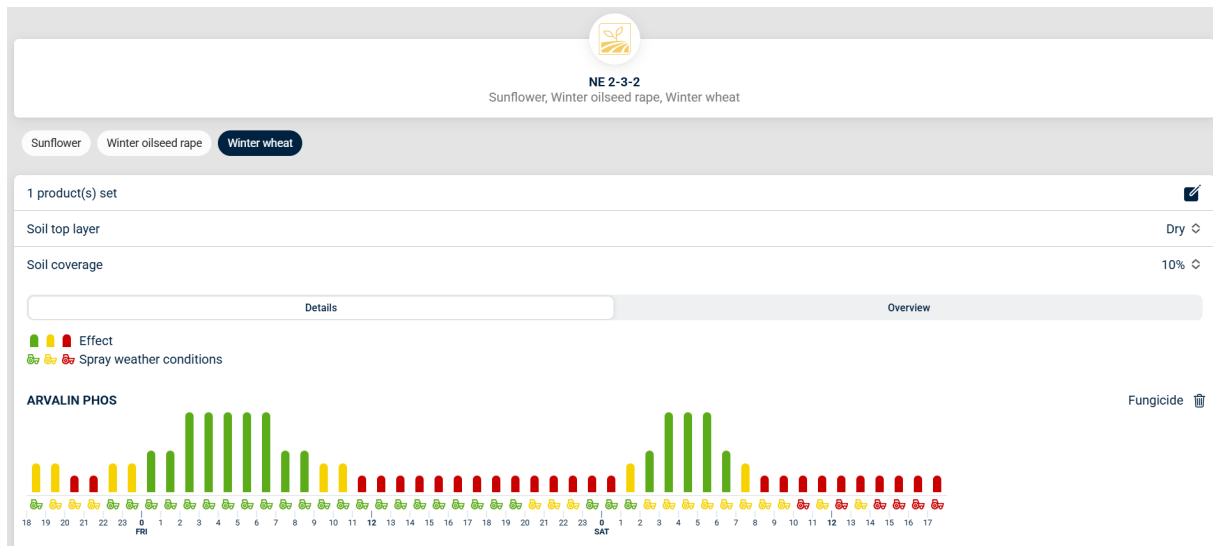
Figure 8 Spray planner result – Details tab

The tractor below the graph indicates the spray conditions. The details tab will show as much information as possible, depending on the device you are using.
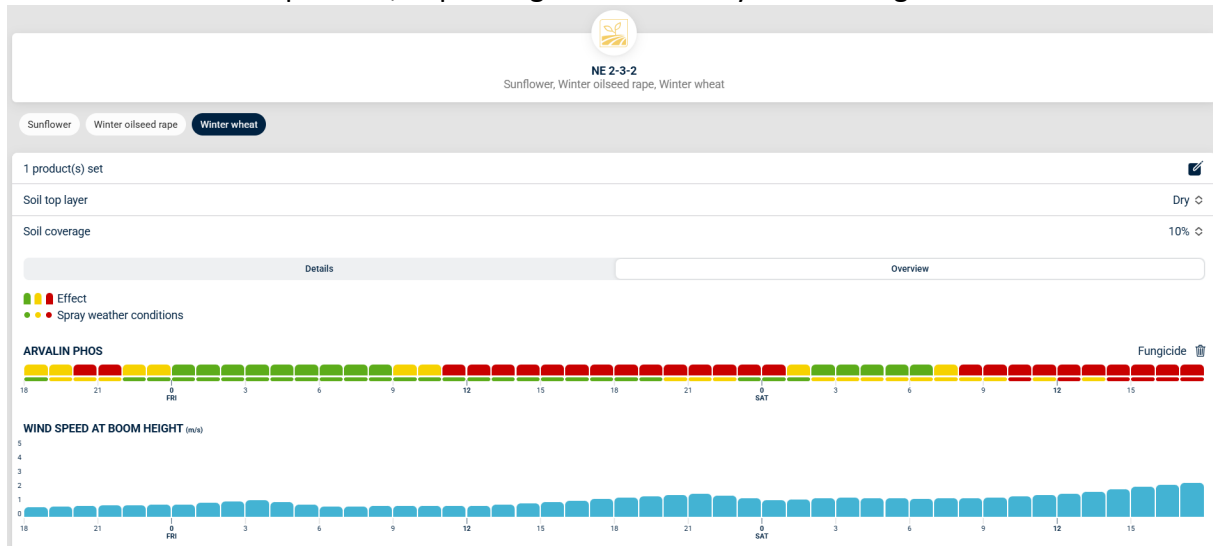
Figure 9 Spray planner result - Overview tab

The Overview tab (Figure 9) shows the same information, but will always show all 48 hour independent of the device you are using.

Which weather models does KX-Field use?

KX-Field uses weather data from the German Weather Service (DWD). The DWD and the Max Planck Institute for Meteorology have developed a weather forecasting model that can predict the weather by simulating how the atmosphere behaves over time. This model is called: the ICON (ICOsahedral Nonhydrostatic) model.

What is the resolution and domain of the ICON weather models?

The resolutions used for your locations depends on the country you live in. DWD deploys 3 different ICON models with different model output resolutions:

1. ICON-D2 2.2 km2 for Central-Europe (Figure 10 Left)
2. ICON-EU 6.5 km2 for Europe (Figure 10 Right)
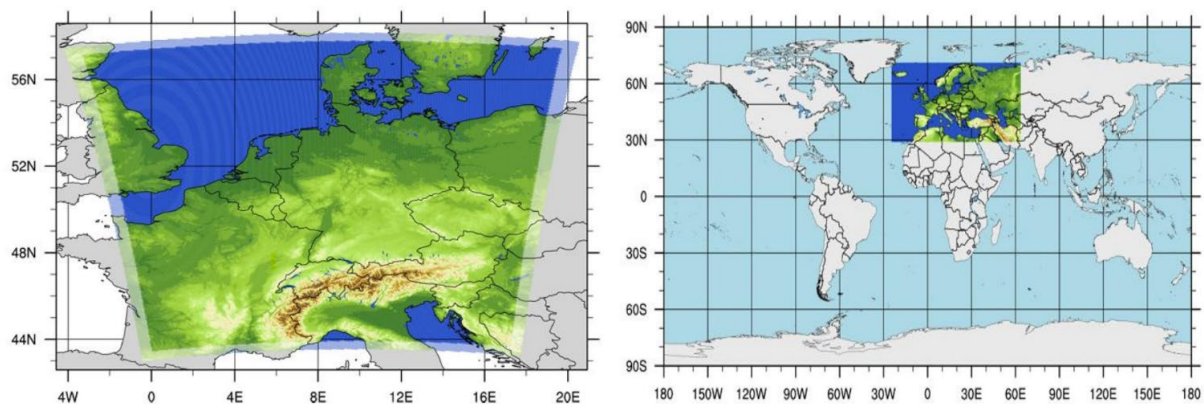3. ICON-WORLD 13 km2 globally

Figure 10 ICON-D2 & ICON-EU domain

If you live in Austria, Germany, the Benelux, Switzerland and parts of the other neighboring countries the ICON-D2 model is used. If you live outside these countries but still in Europe the ICON EU model is used. Outside Europe the global model is used as input for KX-Field. If you live in Hungary or Romania, the ICON-EU weather model is used as input for the disease risk assessment.

How does KX-Field determine current weather conditions?

Instead of putting a weather station in every field, KX-Field uses the first few hours of the ICON weather model as if they were actual weather measurements. Most of the time, these data are very reliable, especially in open areas or stable weather. But if there's very local weather (like fog, small rain showers, or sudden wind changes), a real weather station might still be better option. Even then, a small shower on one side of your field might not be picked up by a real weather station at the other side of the field.

Does KX-Field account for weather conditions at crop height?

Yes, KX-Field applies a unique crop weather model, which considers:

- Crop type and growth stage
- Soil texture and moisture content

The crop weather model leverages the dual-source energy balance approach (Norman, Kustas, & Humes, 1995), solving the energy balance equation to account for both crop and soil contributions. This ensures a more precise estimation of conditions within the crop and represents the weather plants, diseases and plant protection products at a grid point experience.

How does KX-Field calculate the growth stage?

The crop type is known parameter in KX-Field, the growth stage (BBCH), leaf area index and vegetation cover are calculated by a basic crop growth model, which takes growing degree days (GDD) and soil moisture into account. GDDs measure the amount of heat above a certain **base temperature** — the minimum temperature a plant needs to grow. If it's too cold, growth basically pauses.

How does KX-Field establish the soil texture?

Soil texture, based on USDA soil classification, refers to the relative proportions of sand, silt, and clay particles in a soil. It's like describing the "feel" of the soil — whether it's gritty, smooth, or sticky — but in scientific terms. The USDA soil texture system defines 12 soil texture classes, based on the percentages of sand, silt, and clay. These are visualized in the famous soil texture triangle (Figure 11). The percentages of sand, silt, and clay comes from SoilGrids, a global soil information system developed by ISRIC – World Soil Information. It uses machine learning to predict soil properties at a global scale, combining thousands of soil observations with remote sensing and environmental covariates (like climate, land use, topography, etc.). It offers gridded maps (raster data) of soil properties at multiple depths, including soil texture fractions.

Based on the location of the GPS coordinate of a grid point, the sand, silt, clay fractions are established and converted into a soil texture, using the table 2 below.

Table 1 USDA Soil texture classification

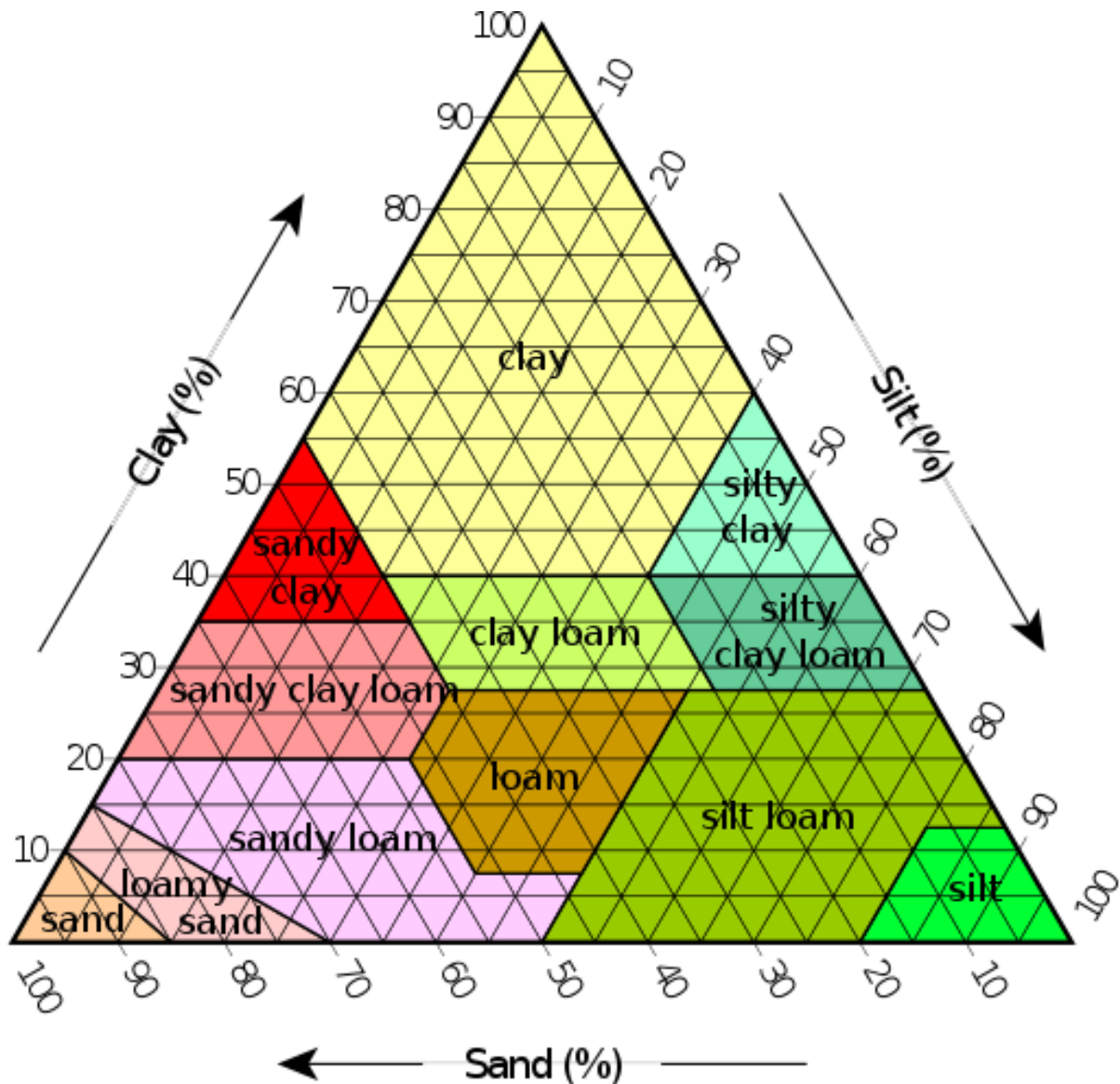| Texture Class	Sand (%)	Silt (%)	Clay (%)
Sand	85–100	0–15	0–10
Loamy Sand	70–90	0–30	0–15
Sandy Loam	45–85	0–50	0–20
Loam	25–50	30–50	7–27
Silt Loam	0–20	50–80	0–27
Silt	0–20	80–100	0–12
Sandy Clay Loam	45–80	0–28	20–35
Clay Loam	20–45	15–53	27–40
Silty Clay Loam	0–20	40–73	27–40
Sandy Clay	45–65	0–20	35–55
Silty Clay	0–20	40–60	40–60
Clay	0–45	0–40	40–100

Figure 11 USDA Soil Texture Triangle (Source: https://commons.wikimedia.org/wiki/File:SoilTexture_USDA.png)

How does KX-Field determine the moisture content at a grid point

Soil moisture content is provided by the ICON weather model at multiple soil depths. The soil moisture content values are typically expressed in volumetric percentages, representing the volume of water per volume of soil. These values can vary based on factors such as recent precipitation, evaporation rates, and soil characteristics.

Which crops does KX-Field monitor?

KX-Field provides insights into the diseases for five key corps, including:

- Wheat,
- Oil seed rape
- Potato
- Onion
- Sugar beet

- Sunflower

Which diseases does KX-Field monitor in wheat?

Fusarium head blight (*Fusarium graminearum*)
Brown rust (*Puccinia triticina*)
Stripe rust (Yellow rust) (*Puccinia striiformis*)
Septoria leaf blotch (*Zymoseptoria tritici*)
Powdery mildew (*Blumeria graminis f. sp. tritici*)
Eyespot (*Oculimacula yallundae*)
Pink snow mould (*Microdochium nivale*)

Which diseases does KX-Field monitor in oil seed rape?

Dark leaf spot (*Alternaria brassicae*)
Light leaf spot (*Pyrenopeziza brassicae*)
Sclerotinia stem rot (Sclerotinia *sclerotiorum*)
Leaf spot (black leg) (*Plenodomus lingam*)

Which diseases does KX-Field monitor in onion?

Downy mildew (*Peronospora destructor*)
Onion leaf blight (*Botryotinia squamosa*)
Stemphylium leaf blight (*Stemphylium vesicarium*)

Which diseases does KX-Field monitor in potato?

Early blight (*Alternaria solani*)
Late blight (*Phytophthora infestans*)

Which diseases does KX-Field monitor in sugar beet?

Cercospora leaf spot (*Cercospora beticola*)
Rust (*Uromyces betae*)
Yellow leaf spot (*Stemphylium beticola*)

Which diseases does KX-Field monitor in sunflower?

Blight (*Alternariaster helianthi*)
Powdery mildew (*Golovinomyces cichoracearum*)
Rust (*Puccinia helianthi*)
White mould (*Sclerotinia sclerotiorum*)

How does KX-Field assess the risk of crop diseases?

KX-Field contains a model for each individual crop disease. The daily disease risk is a combination of the risk of **sporulation, dispersion** and **infection**. These three key phases in the disease cycle of many plant pathogens (especially fungal ones), are all affected by weather parameters in a different way for each disease. KX-Field combines weather data with crop growth and soil parameters to predict the likelihood of disease outbreaks, by considering factors such as:

- BBCH stage of the crop
- Soil & crop temperature
- Leaf wetness duration
- Humidity
- Soil moisture
- Wind and rain

KX-Field calculates the disease risk for a normal susceptible crop, as the system does not have knowledge about the varieties you as an individual grow. If you know you have a highly or poorly susceptible crop you may want to act sooner or later to a disease warning.

Does each disease have its own disease model?

Yes , each disease needs a separate model. Both wheat and sugar beet can get powdery mildew, but despite sharing the same disease name, they're caused by different fungal species.

Where do the KX-Field disease models come from?

The models are the result of years of studying literature on disease life cycles in crops. Phytopathological research on the origin of diseases is being conducted all over the world at universities and research institutes. This is done mostly through field trials over several years or in laboratories. These studies are described in the literature and, before publication, reviewed for validity by other scientists. The descriptions can include a complete model or only part of a disease life cycle. In all cases, AppsforAgri creates a model from this variety of information that best describes the effects of weather on a particular disease. For a detailed description of the model background please refer to the KX-Field Appendix.