

Direct Seeding OLD TREND AS THE NEW SOLUTION?

Innovation Maestro TX
Flexible all-rounder

SpotSpraying
4 | What is current status?

Energy and food safety
26 | A chance for farmers

32

ISSUE 26



NEWS

- 4 Maestro TX – Flexible all-rounder
- 6 Maestro ExperienceTour
- 8 HORSCH Practice Camp – Practical training and intensive exchange
- 10 Strip spraying in row crops

PRACTICAL EXPERIENCE

- 11 Placing maize precisely above the liquid manure band: Lohnbetrieb Wehrendt GmbH, DE

AROUND THE WORLD

- 14 Land of contrasts: China

COMPANY INSIGHTS

- 17 Stability through international growth (Cornelia Horsch und Christoph von Starck)
- 20 Solus – The sowing method of the future? Potentials and limits (Philipp Horsch)
- 23 Sowing methods for direct seeding (Michael Horsch)
- 26 SpotSpraying – What is the current status? (Theo Leeb)

FARM REPORT

- 29 Farm in Latvia relies on HORSCH: Eduards Šmits, LT
- 32 Energy and food safety – a chance for farmers, FR
- 36 Longer growing season – new possibilities: Håkon Huseby, NO

INSIDE HORSCH

- 40 Vocational training in Brazil

SERVICE & SALES

- 42 Satisfied customers: Jaraguá Máquinas, BR

FITZ TRAINING CENTRE

- 45 HORSCH Live

Imprint

terraHORSCH is the international customer magazine of HORSCH Maschinen GmbH
Sitzenhof 1, DE-92421 Schwandorf
Phone: +49 9431 7143-0, Fax: +49 9431 7143-9200
terra@horsch.com, www.horsch.com

Responsible for the content: Cornelia Horsch

Edited by: Johannes Hädicke

Articles: Camille Blandin, Sophia Bleyer, Johannes Hädicke, Cornelia Horsch, Nelson Moreira, Theresa Niedermeier, Stephan Keppler, Anda Purvina, Patrícia Stédile, Espen Syljuåsen

Photos: Archives HORSCH, Archives Jaraguá, Alliance BFC, Total Energies, Lohnunternehmen Behrendt GmbH (private), Jean Philippe Delacre (private), Eduards Šmits (private), Anda Purvina, Sylvain Raison (private), Espen Syljuåsen, Håkon Huseby (private), Stephan Keppler

Translations: English: Heike Wolf; French: Stéphane Proust; Polish: Barbara Dudkowska; Russian: Vyacheslav Veklenko; Ukrainian: Halyna Bilchenko; Hungarian: Axial Kft.; Portuguese: Arno Dallmeyer; Czech: Chicory s.r.o.; Slovakian: Marian Kukučka; Serbian: YU-DNI d.o.o.; Croatian: Grapak d.o.o.

terraHORSCH is published twice a year in the following languages: German, English, French, Croatian, Polish, Portuguese, Russian, Serbian, Slovakian, Czech, Ukrainian and Hungarian
The magazine and all its articles and illustrations are protected by copyright. Any utilisation outside the limits fixed by the copyright act is illegal without the approval of the publisher.

Production & Graphic Design:

Beckmann Verlag GmbH & Co KG, Lehrte

Print: Frischmann Druck und Medien GmbH, Amberg

Paper: 120 g/qm Maxi Offset. The paper is certified according to the EU Ecolabel. This label is only granted for products and services whose environmental consequences are considerably lower than those of comparable products. For more details see www.eu-ecolabel.de.

Printing ink: Printing ink QUICKFAST COFREE. Free from mineral oil and cobalt. Moreover, it is certified and recommended for printing according to the „Cradle-to-Cradle“ principle (quasi “from the origin back to the origin”) – an approach that deals with the spreading of continuous and consequent recycling management. For more details see www.c2c-ev.de.

Dear readers



Different topics that have been accompanying us for years are becoming more concrete, more and more established, or normal.

We have been talking about the climate change for years. This year, too, we can feel the consequences: after a good start for winter crops – cool and wet until mid-May – there now is another drought in many regions of Western Europe. In the Corn Belt in the US, the weather pattern is rather similar: cold and wet in late spring and now a continuing drought. Already today we know that there will be yield losses in many regions.

The Ukraine-Russia-War continues without any changes. There is no end in sight. This also will affect the grain harvest.

The climate change forces us to work on rotations and new cultivation systems. Environmentally conscious methods become normal. Farmers are looking for creative solutions to be able to run their farms economically. In the terraHORSCH, we will present you some of these approaches.

Enjoy reading this new issue.

Cordially

A handwritten signature in blue ink, appearing to read 'C. Horsch', written in a cursive style.

Cornelia Horsch

Flexible all-rounder

In the usually short spring season, efficiency and impact are of great importance. To meet these requirements even for smaller structures, HORSCH has developed the Maestro TX, an innovative precision single grain seed drill that stands out due to its versatility and flexibility. Thomas Murr explains the special features of the machine and why it is an “all-rounder”.

ADAPTABILITY

The HORSCH Maestro TX is a compact single grain seed drill with 3-point linkage for universal use. A hydraulic slide telescopic frame is standard equipment. The working widths thus range from 2.60 m to 4.80 m.

With the Maestro 6 TX all common row spacings from 45 cm to 80 cm can be adjusted variably to six rows in 5-cm-steps. In addition, it can work with a row spacing of 37.5 cm or 40 cm. The maximum row spacing for seven rows amounts to 65 cm. When deactivating the middle row of the 7 TX, you can sow conventionally with six rows at a row spacing of 75 and 80 cm.

Thus, in addition to the common single grain crops, the Maestro TX is also ideal for more specific uses, e.g. in the sector of seed breeding or for different row widths within the working width. This versatility allows the farmers to use the machine to full capacity and use it all year long what in turn has a positive effect on the machine costs per hectare.

As an option, the microgranular hopper with a capacity of 20 l can be attached to each row of the Maestro TX. It either distributes the material directly into the seed furrow or by means of a baffle widely across the row. With Section-Control, besides the seed, the microgranule hopper, too,

can be switched off individually at each row. Thus, seed and microgranule are applied precisely and in a cost-saving way.

TECHNOLOGY & SOFTWARE

All this is combined with the already well-known features of the larger HORSCH Maestro lines: high stability and a wide parallelogram connection, AutoForce and high coulter pressure for direct and mulch seeding and the well-proven AirSpeed and (in the future also) AirVac metering system.

As an option, the Maestro TX can be equipped with a 1,300 l fertiliser hopper. The fertiliser is applied with two well-proven HORSCH metering devices at the single disc fertiliser coulters for underground fertilisation. Thus, the machine is equipped with a fertiliser half-width control as standard. This guarantees a targeted and efficient nutrient supply of the crop.

The overpressure system AirSpeed allows for operational speeds of up to 15 km/h with absolute precise placement and an optimum embedding of the grain.

To guarantee a regular sowing quality even in changing conditions, the machine can charge up to 250 kg coulter pressure per row. Due to the integrated weight transfer system a coulter pressure of up to 300 kg per row is possible. It is controlled manually in the cabin or fully automatically with AutoForce.





01

01 Maestro 6 TX sowing maize with a row width of 50 cm.



02

02 Maestro 6 TX without fertiliser equipment.


The TX is the first Maestro to be controlled with the new operating system I-Manager.

The display of this new, state-of-the-art user interface can be configured individually. It offers more variants with regard to the products that are to be applied and allows for an easy reconfiguration of the set row widths. The sowing accuracy is monitored according to the known variables variation coefficient as well as double seed and gaps.

LARGE MARKET

The market for this type of machine in Europe is extremely varied. The Maestro TX will be the most flexible HORSCH single grain seed drill. "With the Maestro TX we want to expand our product portfolio and add new functions to offer also smaller farms a machine of the professional segment", Thomas Murr explains. A compact high-end machine thus meets the existing interest of HORSCH customers.

This year, 20 pre-series machines were tested in Europe. Demonstrations were carried out in France, Germany, Austria, Poland, Hungary, Croatia, Romania and Bulgaria. The objective was to show the Maestro TX to the customers of the main markets and to gather experiences with this type of machine on site.

Three Maestro 7 TX of the pre-series were put to test – two in France and one in Hungary. These are the markets where the "all-rounder" is in great demand due to its wide range of applications. 



CUSTOMER STATEMENT

Médéric (l.) and **Samuel Cardeillac** run a small arable farm in Gers, more precisely in Montréal du Gers. They are always looking for solutions to increase the rentability of their farm. Like many farmers in the south-west of France, they therefore prefer crops with an added value: seed maize, seed beets, popcorn maize, seed rape, green beans, soya and sunflowers.

They tested the Maestro 7 TX and tell us about their experiences:

"In our region, there are more and more heavy storms with very high rainfall. This is why we sowed soybeans direct to minimise erosion. The only seed drill we found that was able to put enough pressure on the seed elements is the Maestro. We had to apply a pressure of 230 kg to make the seed element penetrate our calciferous clay soils with cotton as a previous crop.

This year, sowing conditions were difficult. It was very wet. But we still managed to sow and to close the seed furrow without any previous tillage. The main reason was the finger press wheel which is recommended for direct seeding.

We sowed at a speed of 11 km/h with a spacing of 60 cm and with 450,000 grains per hectare. It took us only 20 minutes to convert the machine from maize to soya. We only had to replace the metering disc and the ejection wheel. The singulator does not have to be adjusted.

A small fly in the ointment: The machine is a little bit heavy. But this is necessary to apply pressure on the stable seed element in direct seed conditions.

As a tractor we used a four-cylinder tractor with 130 hp. This was completely sufficient for the use without fertiliser."

MAESTRO EXPERIENCETOUR

In the past months, all over the world the spring crops maize, sunflowers, beet and beans were sown with the HORSCH Maestro single grain seed drills. Rape will follow in summer. The very wet spring delayed and complicated sowing, especially in Europe and in the East.

In 2019/2020, HORSCH launched the metering systems AirSpeed and AirVac. In the following years, the systems and the machines were optimised further, adapted and developed for different markets.

With the Maestro line, HORSCH covers a wide range of applications and offers a versatile single grain technology for different crops and applications. Basically, the design of the two metering systems are very similar and work according to the same metering principle. They guarantee a precise grain singulation and due to the different metering discs are ideal for all common single grain crops. The AirVac system is based on the principle of vacuum singulation. The AirSpeed system works according to the overpressure principle: the grains are shot into the seed furrow.

To be able to show the different fields of application and the versatility, HORSCH visited different customers all over the world, accompanied their seed drills in the field, asked for their opinion and collected the testimonials of the farmers. The result were a lot of short, interesting videos which will be translated and synchronised in ten languages to make them available to farmers, sales partners, customers and all those who are interested all over the world.

Look beyond one's own nose

"With the HORSCH ExperienceTour, we want to show the machines of our product range, which equipment options are available, in which conditions the machine can cope and that we virtually have something for any farmer all over the world – large and small machines, different metering systems, AutoForce, machines for direct seeding or special methods with the combination of Focus and Maestro", Thomas Murr, responsible for single grain technology in the HORSCH product marketing, explains. This provides the opportunity to look beyond one's own nose. And even if the conditions or applications are different it is possible to learn from each other and to get some new ideas for one's own farm and cultivation system. For the machines may look quite similar in every country of the world, but there are different possibilities for the farms hidden behind this common look.

Why, for example, does one farmer use the vacuum system and another one the shot system? Another one needs special hopper divisions of the fertiliser and seed capacity, and yet another one needs a small, compact, manoeuvrable machine, etc. The videos are to show the possible applications, equipment options, etc. on different farms around the world.

The HORSCH Maestro SV impresses with its universal seed wagon concept and the precise singulation.





The HORSCH Maestro RV can be linked directly to the tractor or to a seed wagon. In the video, Arkadiusz Grzech explains why he chose the combination with the Focus TD.

Practical experiences

Florian Uherek, farmer and contractor from Germany, farms 400 ha and has specialised in row crops. Among other things, he sows sunflowers, maize, soybeans and rape with his Maestro 18 SV. Why did he choose the Maestro SV with a central seed hopper?


Due to the large central seed hopper – especially for large seed quantities when sowing soybeans – efficiency and hectare output of the Maestro SV are excellent. Another asset is the easy handling of the machine. The right sowing disc is quickly inserted, and any further handling can be carried out via the terminal. “This is very easy for the driver and also increases efficiency,” Uherek explains in the video. In addition, he was also impressed by the good placement precision and the excellent accessibility of the machine.

The AutoForce system, an automatic coulter pressure control system for an optimum embedding of the grains in changing sowing and soil conditions, guarantees an even placement depth in all conditions. A “huge advantage” for the contractor whose machine is used in different field conditions.

Arkadiusz Grzech has leased a farm in Poland. He uses the Maestro 12 RV for sowing maize and sugar beet. In addition, he uses the Maestro in the 3-point of his Focus TD. He opted for this combination for several, mainly economic reasons. One aspect was that it allows for carrying out tillage, fertiliser placement and sowing in one pass. “Thus, we can save time, labour and fuel. Another important aspect is the deep placement of the fertiliser.” It can be applied in two ways: via the deep placement at 20 cm by the Focus TD tines or with the underground fertiliser coulters of the Maestro next to the seed furrow together with the seed.

Another advantage for the farmer is that passes can be reduced. This avoids soil compaction after tillage. Moreover,

due to this technology the soil does not dry out. “We save water because the moisture is brought up from the depth. As a result, the seed is placed in a wet soil.”

His summary: “There are very many good reasons to choose this machine!” 



You will find all videos via our homepage, on YouTube or via our QR code.





01 Close-up HORSCH – the advantage of our practice camp: intensive exchange directly at the machines.

02 Practical experiments – the beetroot juice experiment visualised the advantages of the continuous inside cleaning system.

03 Versatile presentations – part of the field tests were both the 3-point and the trailed Leeb models.

HORSCH Practice Camp – Practical training and intensive exchange

HORSCH relies on a strong and positive relationship with its sales partners. Therefore, the annual practice camps are used as an opportunity for an intensive exchange with the sales staff and product managers of the HORSCH sales partners.

In an informal and relaxed atmosphere, we look at the machines and their functions together, work out ideas and discuss about the practical use in the field. The objective is that the sales teams of the sales partners get to know the machines in practice so that they know exactly what they are talking about when they talk to the customers. Meeting at eye level with an open dialogue is the basis of the camps, for this is the only way we can develop together and shape the future of agriculture. We try to convey specialist knowledge and at the same benefit ourselves from the experiences and ideas of the participants. According to our motto: Together for a healthy agriculture.

Our training courses are as different as the seasons and their requirements. In winter, when the weather and the soil conditions do not allow for being out in the field, we meet in

our training centre. Here, the focus is on theoretical knowledge, and we provide more detailed information about our price lists and technical innovations. As soon as vegetation starts again in spring, we go out into the fields where theory meets practice and we can see the machines working. Both in our trainings in winter and in the practice camps we focus on interaction and deal with individual topics and questions. We do not offer front-of-class teaching but rather discuss and talk with our sales partners. This results in a constructive and animate exchange we all can learn from. The numerous ideas and new perspectives help us to constantly improve our machines and, if necessary, to adapt them to the specific market conditions and develop them further. For our sales partners are in direct contact with our customer and know their challenges and requirements.

„LIVING TECHNOLOGY“

At our company headquarters, the Sitzenhof in Schwandorf, we have enough space to test our machines live and show them directly in the field. Thus, the participants can see the machines in action, test them and contribute their questions and ideas right there in the field.

THIS YEAR’S PRACTICE CAMP: CROP CARE TECHNOLOGY

The topic of crop care is very important to us as we as a manufacturer of agricultural machinery have a responsibility for sustainable farming. Our Leeb crop care sprayers, whether the trailed 3-point or the self-propelled sprayers, meet the highest requirements on research, design and development as well as on assembly, service and advice. We constantly depend on the ideas and suggestions of our sales partners and customers. This year’s practice camp was all about the topic crop care technology. The focus was on important technical aspects: the filling area with application-oriented handling and powerful induction tank as well as the standard continuous inside cleaning system and, of course, our well-proven boom control system BoomControl. We were able to test all this in the field in detail and put the machines to the acid test. The HORSCH product marketing team was available with information and for any kind of questions and presented all aspects as well as their function on site. The participants, thus, were able to observe, assess and test the machines directly in the field. The advantages of a continuous inside cleaning system for example was visualised by a practical experiment with beetroot juice. The participants could watch how the juice turned into a trans-

parent liquid during the cleaning process. The discussions and dialogues were marked by a lively exchange and constructive criticism where especially the participants exchanged ideas and shared their experiences. This is what makes up the charm of mixed groups as the momentum from the participants spurs and pushes the whole training.

Our practice camps last two to three days and are intended for small groups of approx. 15 participants depending on the topic with regional and international partners. In addition to a mere technical part and the exchange of knowledge and experience there, of course, are common activities and events. Whether it is karting or a cosy get-together in the evening, the participants can continue to exchange and talk shop. Team building is very important. A personal contact is established, and the sales partner like to use the opportunity to network in a relaxed atmosphere.



It is our objective that the participants of the practice camp feel optimally informed and that they will attend the next trainings, too. This is why we asked some participants to give us their feedback:



Name of the sales manager:
Jan Jansen
Name of the sales partner:
W. Doormann & Kopplin GmbH & Co. KG
Sales area:
Schleswig-Holstein (Plön/Ostholstein/Segeberg/Kiel/Rendsburg/Lübeck/Lauenburg)

How long have you been selling HORSCH machines?

I have been working in sales since December 2022, but I already have experience in the service sector with HORSCH since August 2017.

What did you expect from the training?

I wanted to learn more about the HORSCH Leeb CS, which arguments I can use when talking to a customer and how you practically use the Leeb CS.

What are your impressions, thoughts and experiences now that you are leaving?

I went home from the training with a lot of positive impressions. I am looking forward to which technologies are waiting for us in the future.

Were you satisfied with the training, and would you want to come back?

I was very satisfied with the HORSCH training and will, of course, attend the next trainings.



Name of the sales manager:
Garry Françon
Name of the sales partner:
SAS Manager
Sales area:
Occitania (in the south-west of France)

How long have you been selling HORSCH machines?

For one year

What did you expect from the training?

I expected a high-class, technical training with a lot of details about the product characteristics and strong arguments I can use in sales.

What are your impressions, thoughts and experiences now that you are leaving?

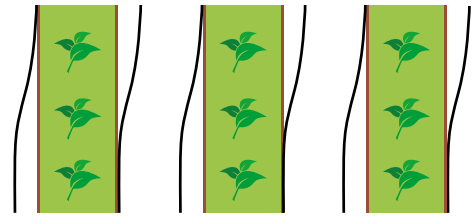
I was very satisfied with the information about the technical details and the key arguments to give the customers a better understanding of the important advantages of the new Leeb CS.

Were you satisfied with the training, and would you want to come back?

Yes, I was very satisfied with this training, and I will, of course, attend the next training.



Herbicide application as strip spraying in sugar beet with a row width of 45 cm carried out by a HORSCH Leeb 12 TD.



Sowing inaccuracies, curves or small boom movements lead to a slightly smaller, continuously straight band-width than the nozzle working width.

Strip spraying in row crops

Strip spraying in row crops is slowly finding its place in practical farming. This method is particularly profitable for sugar beet and potatoes. It is closely observed and much discussed by many practical farmers.

Especially in regions where the fields are level, state-of-the-art RTK track control allows for returning to the same tracks more and more precisely. This still is the biggest challenge with regard to strip spraying with a field sprayer.

To take some workload off the driver when strip spraying, we used the winter months to optimise a camera GPS-based solution even further. With these approaches the steering axle is controlled and the nozzle is kept exactly above the row by means of readjustments. To check the precision of the camera control even in difficult conditions like slopes or heavily curved rows, is part of the joint research project OptiKult we already presented in terraHORSCH.

EXPERIENCES

The experiences of recent years with strip spraying show that you should not consider it to be an isolated system. It rather is another solution to reduce crop care costs. This means: If you decide to apply herbicides in sugar beet by means of strip spraying, it should not become the norm that all herbicide chemicals have to be applied in a strip. In a year like this, the combination of area spraying and strip application of herbicides is rather more interesting. Wet conditions during and after sowing were not the best start for a good and successful early mechanical weed control in sugar beet. In addition, in many regions it was wet and cool. Under these weather conditions, an all-over first herbicide application could achieve a good efficiency. The second and possibly third applications can then be carried out by means of strip application. With regard to the

Band spraying ↔ Strip spraying


Various reasons, e.g. in the sector of registration and licensing, required a more precise differentiation of traditional band spraying installed in hoeing devices and with a sprayer.

Band spraying is assigned to the hoeing technology and the target area distance amounts to a maximum of 25 cm.

Band spraying methods with a target area distance larger than 25 cm are called **strip spraying**.

final herbicide applications, this year it might be enough to only drive between the rows with a hoe. Such a strategy, too, allows for a considerable reduction. Already for the tests of the past years carried out by different test partners, the combination of strip and all-over spraying resulted in clean sugar beet populations. The hoe as the last post-emergence treatment shortly before the rows close can definitely have a positive effect.

CONCLUSION

All options of different, efficient application methods – all-over, strip or in the future spot application – in combination with mechanical weed control should neither be considered nor used as a matter of course. However, in our row crops they can contribute to the reduction of herbicide inputs. The challenge for the future is to optimally include the most appropriate application method into the herbicide strategy. 

The project partners:



Gefördert durch



aufgrund eines Beschlusses des Deutschen Bundestages

Reliable technology: this day, the single grain seed drill from the HORSCH Maestro line is working in the field.



PLACING MAIZE PRECISELY ABOVE THE LIQUID MANURE BAND

The requirements on services provided by contractors increase continuously. The contractor has to react to this with the corresponding technology but also with the willingness to be open to innovative approaches. The contracting company Wehrendt from Waffensen in Lower Saxony opted for this approach – with great success.

Early summer 2023: On the premises of the contracting company Wehrendt from Wassensen in Lower Saxony the machine halls are empty, the staff park however is completely full! Grass harvest is in full swing, liquid manure is spread on the mown fields, the crop care sprayers are working and maize still has to be sown on some customer fields.

The contracting company in the district of Rotenburg/Wümme that was founded by Heiko and Ralf Wehrendt in 1993, provides a wide range of services. "Except for everything to do with potatoes and sugar beet we offer all agricultural services", Lukas Wehrendt explains. The agricultural service

master who runs the company and in some years will take over as managing director, and his employee Janek Frerks have got their hands full with taking calls from customers, scheduling orders and staff. On days like these when they need every employee this task is even carried out in the tractor cabin.

The district of Rotenburg/Wümme is an agricultural region. It is considered to be the epicentre of biogas production. About 150 plants are currently connected to the grid, and the importance of maize is correspondingly high. "We have adapted our contracting services to these requirements." In addition to liquid manure spreading services, sowing and harvesting maize plays a major role for the contractor who



Power and precision: the Wehrendt contracting company appreciates the HORSCH combination.



Agricultural service master and contractor: Lukas Wehrendt from Waffensen near Rotenburg/Wümme.

permanently employs 20 people and about 20 people on a temporary basis. But combining, too, is an important mainstay of sales for the company. Five combines are available for the cereal harvest.

But before the harvest can take place, the seed has to be put into the soil. This also is an important service the Wehrendt contracting company provides.

Precise sowing

A few years ago, the company switched to seeding technology made by HORSCH. "With our previous supplier we more and more had the impression that they did not exhaust all options especially in the seeding sector. As we are a company that again and again takes innovative paths, it was and still is very important to us to rely on technology that offers innovative possibilities", the contractor states. One of these innovative paths is the use of StripTill technology. A method that is quite demanding for the user. However, in the past years, the Wehrendt company has gained a lot of recognition with this method. "In the meantime, we are already using two StripTill machines, both of which are used to full capacity", Janek Frerks adds who among others works in the scheduling department of the company.

The service of spreading liquid manure with the StripTill method is booked until well into May. Most recently with a farmer where feeding rye was harvested on one field which then was prepared for sowing maize.

"The liquid manure bands have been placed and today we are sowing maize", employee Kevin Osmers explains who has already sown about 850 ha of maize this year. He is a trained agricultural services specialist and has been working for the Wehrendt contracting company for three years. His main task in spring is sowing cereals and maize. A field of activity that holds quite some challenges. The sowing density has to be ok, and the grains have to be placed precisely to guarantee optimum starting conditions for the plant.

Optimum compromise

"The working conditions for crop care and the harvest machines are set when sowing. It is now that we already have to pay attention to create optimum conditions for the following working steps", Kevin Osmers emphasises. For today's task, however, he has to adjust himself to the conditions that were set some days before with the StripTill method. "During the liquid manure application, track lines were laid which now are the basis for the track control when sowing maize", Kevin Osmers explains. In addition, the company created an application map to make perfect use of the different soil conditions. In this respect, it is important that the tractor for the application of liquid manure and for the maize seed drill work with the same positioning system.

This day, the single grain seed drill of the HORSCH Maestro line is used. The Maestro RV is combined with a Pronto AS. The 8-row seed drill with a working width of 6 m is an optimum compromise for the contractor who has a lot of customers with rather small fields: on the one hand it is very efficient, on the other hand it is flexible enough to work on complex cut fields. It is equipped with one seed tank per row. In addition to the 3,000 l hopper of the Pronto AS, another 400 l tank is available for fertiliser. Lukas Wehrendt especially appreciates the AirVac metering system which can be used to sow the complete single grain range. The central advantage of the vacuum metering device is: it works with a scraper that does not have to be adjusted. You only have to select the correct metering disc. This allows for going beyond the standard single grain range for maize, sugar beet, sunflowers, soya, and rape in the future.

Kevin Osmers appreciates the combination he has been working with for two years. "The machine is easy to handle and it works reliably", the sowing pro comments. Before he really starts, he checks the position of the maize grains in the soil after the first metres. They are precisely a few centimetres above the liquid manure band.



01



02



03



04



05

To work even more efficiently, the DiscSystem of the machine was equipped with two additional discs that are mounted outside the frame. "This guarantees an optimum seed bed", Kevin Osmers explains.

Defy the dust

To minimise the maintenance effort against the background of the rather dry conditions while sowing, the contracting company had the machine equipped with a central lubrication unit. 53 lubrication spots are connected to the unit. The central lubrication unit guarantees an always sufficient supply with grease and thus prevents dust from getting in. The dense cloud of dust the machines cause this day while sowing maize shows how important this feature is.

After just over an hour, Kevin Osmers has already finished the job on the 3-ha field. There still are two more fields to

01 Difficult conditions: because of the continuous drought there is a lot of dust while sowing maize.

02 They take care of the operational business: Lukas Wehrendt (right) and employee Janek Frerks do the scheduling, but also sit on the tractor themselves when all the customers call at the same time.

03 Prepared for late sowing: The HORSCH maize seed drill is one of the contractor's key machines.

04 Preparations for sowing: employee Kevin Osmers fills the seed tanks.

05 Additional discs: the DiscSystem of the machine has been extended.

sow. He does not have to refill seed. The capacity of the eight seed tanks guarantee that these fields can be sown without stopping. These are the last fields where maize has to be sown this year. Kevin Osmers will clean his HORSCH combination thoroughly and prepare it for the winter. Then he can turn to other tasks.

Land of contrasts

China – a country of impressive size and diversity. This is why agriculture over there also has to face special challenges. 18 % of the world population live in China. China's share in the global arable land, however, only amounts to 9 %. In 2016, HORSCH founded a Chinese branch, the HORSCH Agricultural Machinery CO. LTD.

It is located in Harbin in the north-east of China, right in the middle of the black earth region of the country. From here, the Chinese HORSCH team supports the customers throughout the country with a lot of different conditions and requirements.

Patrick Paziener from the HORSCH service team recently moved to China to support his colleagues on site. He had already worked in China before as an agronomist for a farming and agricultural machinery project in which HORSCH was one of the partners. On the occasion of a visit in Schwandorf, he told terraHORSCH about his work and his impressions.

LOGISTICS AND SUPPORT

In a country of this size, logistics plays a crucial role in making the machines available to the customers. For about 45 days, the machines travel in containers from Germany to China. At the HORSCH site in Harbin they are assembled and then transported to their destination. In addition to the assembly hall, there also is a showroom in Harbin which is used in the off season to train customers and sales partners. At the moment, 13 employees are working at HORSCH China – closely and in a familiar atmosphere. "Of course, there was and still is a certain language barrier", Patrick Paziener comments. "But everyone makes an effort, and this is why communication and

co-operation work well and efficiently. People treat each other particularly politely and with respect. This helps to overcome obstacles and to solve problems. We really work together very successfully."

AGRICULTURE IN CHINA

The size of agricultural farms in China varies considerably. The national average field size is under one hectare. In the region of the HORSCH site there are also farms with an area of over 30,000 ha. They are state-run and compared to the farms in the South and in Central China are characterised by large fields and a high degree of mechanization. The most important crops are rice, wheat, maize and soya, followed by barley, rapeseed, cotton, sugar beet and potatoes. Chinese farmers also grow different fruit and vegetable varieties which cannot be found in any European supermarket.

ADAPTION TO LOCAL REQUIREMENTS

The climate in China is influenced by the monsoon which brings rain in summer. It ranges from an extremely dry desert climate over a winter-cold coniferous climate to a tropical climate. The change in weather with the very cold winters in the north-east of China also was quite a challenge: "Compared to Germany – this results in completely different demands on





01 Mechanical weed control is becoming more and more important in China – here a Transformer VF is in maize.

02 Xiaoqing Lu (second from the right), General Manager of HORSCH China, attaches major importance to communicate the concept HORSCH to the sales partners and customers. In this sector, too, Patrick Paziener (third from the right) will support the colleagues on site.

03 Practical test in the field. Control of the sowing quality of oilseed rape with the Focus TD.

04 In the hall at the HORSCH site in Harbin, the machines are assembled and then transported to the farms of the customers.

man and machine.” The weather, of course, influences crops and cultivation methods. In the black earth region mainly maize, soybeans and sorghum are grown. For this purpose, HORSCH developed the Maestro LV – a seed drill which has been adapted to the local method of sowing on little ridges. This cultivation method has a long tradition and was already used in the Zhou dynasty (1,000 BC!). This historical method, however, has a well-founded agricultural basis: The crops are protected from heavy rain events which regularly occur in summer and the roots do not get “wet feet”. As the crops stand on the ridges, water can drain off and drain away better allowing the soil to heat up faster. With regard to the very cold winters and the short vegetation period in North China, this is an essential advantage. Ridge cultivation provides a certain protection against wind erosion and the drying-out by strong wind. The Maestro LV is the first single grain seed drill that can handle this traditional ridge cultivation and is equipped with an electronic metering system. Thus, you can sow with relatively high operational speeds and excellent accuracy even in difficult conditions. Machines with mechanical metering partly cannot sow at all in wet conditions. This increased efficiency – sowing area per time unit – and shorter idle times for filling due to the larger seed and fertiliser hoppers contribute to helping due to the constant decline of manpower in rural areas. The precise placement also saves seed and thus costs. Thus, farmers can work more efficiently and productively.

In Inner Mongolia, a province in the north-western part of China, where the number of frost-free days ranges between only 95 to 100 days per year, HORSCH seed drills like the Focus TD and the Pronto DC are used for sowing spring wheat, spring barley, spring rapeseed, Lucerne, grass and milk thistle. Milk thistle is an important medical plant which is used in traditional Chinese medicine.

CO-OPERATION

The Chinese HORSCH customers are agricultural farms as well as contractors that work for large farms. The latter often load their machines on trucks and follow the season. They start working in the south and then gradually move to the north. The exchange of knowledge and experience plays a major role in the relationship with the customers. With trainings and advanced training programs HORSCH supports the farmers



with regard to extending their know-how and to learning new methods. They are intensely working on the sales partner network to make sure that the customers get optimum support – also in terms of training.

What Patrick Paziener also notices is that in China tractors are equipped differently than in the Europe or the US. “And there are some customers who carry out modifications to their machines themselves or tinker and weld partly rather creative replacements for wear parts. This, of course, can affect the functionality of the machines.” This is where the Chinese colleagues comes in with an intensive training program. “In the beginning, our customers hardly knew anything about the technology and our agronomic concept. With demonstrations, tests and a lot of events we managed to convince the customers of our machines and of the idea behind it”, Xiaoqing Lu, General Manager HORSCH China, remembers. “It takes perseverance and a lot of patience, but the success confirms our efforts.”



01

01 Presentation of the Pronto DC at a field day in Inner Mongolia.



01

02 The Maestro LV impresses due to its performance and efficiency with regard to sowing maize in northern China.

PROMOTION OF SUSTAINABLE METHODS

Agriculture in China faces various challenges: different climate zones and cultivation methods, but also legal and regulatory guidelines. But it still offers an enormous potential for an efficient agriculture. More sustainable methods and technologies are increasingly promoted and topics like direct seed and mechanical weed control become more and more important. This year, the first 15 Transformer VF have been delivered to China and have already started working. At field days the Avatar SD, a direct seed drill, is presented. There is also constant structural change: the small family farms are discontinued, and more and more large state farms are established.

CHINESE CULTURE AND PEOPLE

Also outside his actual job Patrick experiences a lot of new things. Due to the close co-operation with the Chinese colleagues, he quickly got an impression and a better understanding for the Chinese culture and way of life. "Hospitality is a central value in Chinese society. You frequently are invited to dinner, and these invitations are a demonstration of appreciation and respect towards the guests", he summarises his experiences. Eating is much more than just satisfying your hunger. It is a social event where family and friends gather to spend time together. Chinese cuisine is famous for its versatility, its variety of flavours and the refined preparation methods. The regional variety is reflected in a wide range of flavours and specialties. "In the Chinese language there are

not only words which describe the taste of a dish, but also words for the feeling that a dish resp. the texture of a dish creates in the mouth", Patrick points out the extremely high significance of the eating habits.

PERSPECTIVES

Different conditions require an adaption of the cultivation methods and the technology. With its presence on site, HORSCH is working this highly interesting market. For especially as the ratio of arable land in relation to the population in a global comparison is rather low, efficiency plays an even more important role. In absolute terms, we are talking about 134 million hectares of arable land in China! 🌐

STABILITY THROUGH INTERNATIONAL GROWTH



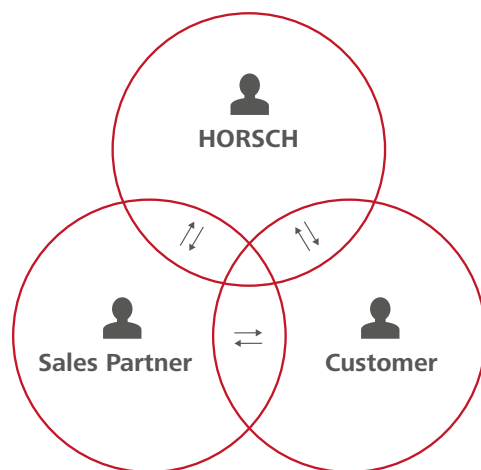
International growth and the development of new markets are an essential part of the objectives of the HORSCH company. Cornelia Horsch and Christoph von Starck, head of sales, tell us which strategies they pursue and why there still is so much more potential.

Cornelia Horsch and head of sales Christoph von Starck are convinced: "There still is a lot of growth potential."

During the past six to eight years, HORSCH has developed from a manufacturer that mainly was active in the EU to a global company that is present on six continents and holds a relevant market share. "We took this step because we agreed that we have to reach a critical sales figure to remain independent in the long run, because we need an enormous financial power to continue to play a leading role with regard to technology and because we want to safeguard ourselves against local market fluctuations. We have built up sales and service structures in all these continents so that we really can work these markets to the full extent", Christoph von Starck explains.

HORSCH TRIANGLE: DIRECTLY AT EYE LEVEL WITH CUSTOMERS AND SALES PARTNERS

The triangle concept HORSCH-sales partner-customer came into being in the mid-1990s. In the mid-1980s until the mid-1990s, HORSCH machines rather were niche products and less interesting for the trade. "At this time, we relied on direct marketing. Thus, we were able to not only sell our machines but also our agronomic concept to the customers", Cornelia Horsch remembers. "In the middle of the 1990s, we started to establish a sales partner structure but kept up the direct contact to our customers. We come from agriculture and talk to the customers at eye level to develop agronomic concepts and machines. This is our passion." Since that time, the professional trade has been supporting HORSCH with regard to



sales, service and market development. The training concept was expanded constantly to meet the technical requirements and the demands of internationalisation. This is why HORSCH attaches major importance to intensive, regular trainings for the sales partners. At the same time, HORSCH established professional sales partners in countries that so far had not been worked very intensively and even in some regions of Germany. Our own sales, service and marketing team were also extended.



HORSCH now also has machines in smaller working widths in its portfolio like the Versa 3 KR for small to medium professional farms.

ESTABLISH A HOME

Today, HORSCH pushes the localisation of production in the large markets to show the customers and the sales partners that the objective is a long-term commitment in the countries. To assure the customers and also the employees of a stable and reliable business relationship, HORSCH started to create its own branches in the main international markets. "This definitely is a very cost-intensive step. But we decided to take it as we consider it fair and necessary to establish a home in the countries where we sell our machines", Cornelia Horsch emphasises. The foundation of a company for example in Canada considerably helped with regard to gaining ground in the country. "We notice that it is important to the customers and that customers and employees actively ask for a presence on site." Thus, it is an essential element for further growth. It simply is attractive for employees to be employed at a company that is based in their own country. "With regard to the current shortage of skilled labour we have to face everywhere, it is an important argument to attract employees. Moreover,

it also is a sign for the government that we do not only want to make a profit in the country, but that we also want to pay taxes and support the supply industry."

Regarding the growth in the different countries, HORSCH has to face various challenges. Among them the adaption of the product range to the agronomic requirements of the individual countries. With the help of the sales team the optimum machine portfolio for the specific requirements has to be found always taking the trends of the individual markets and continents into account. "This high speed of adaptation that is typical for HORSCH helps us enormously to quickly gain market share in new markets. Thus, when entering the market in Brazil or China for example we were able to develop completely new market-ready machines within less than 24 months", Cornelia Horsch explains.

GLOBAL GROWTH

To understand one of the reasons for HORSCH's growth, you have to look at the large arable regions of the world. In the US for example, until two years ago only machines from the HORSCH production in Fargo, North Dakota, were sold. After Lucas Horsch took over the responsibility for this market, he continuously pushes the sales of machines that are produced in Germany and wins new customer which are attracted by machines "Made in Germany".

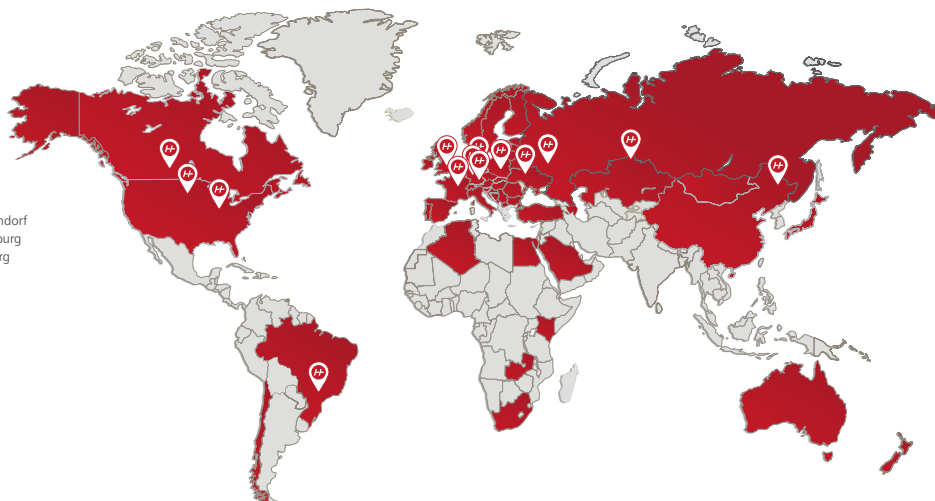
"The Brazilian market turned out to be an ideal market", Cornelia Horsch comments. "With regard to the size and the agronomic methods it is perfectly in line with our machines." This is why at the moment, HORSCH is investing considerably in this market to tap the potential. This includes a machine portfolio that has specifically been developed for Brazil and has been adapted to the local requirements as well as the establishment of a local production for tillage machines, seed drills, single grain seed drills and crop care sprayers.

In Australia, HORSCH also developed an individual machine portfolio for sowing technology and crop care together with the local importer Muddy River. At first, only the south-eastern part of Australia was covered, but now the sales network will be expanded along the whole Australian coastal regions. As

HORSCH International

HORSCH Maschinen GmbH • Schwandorf
 HORSCH Maschinen GmbH • Ronneburg
 HORSCH Industrietechnik • Ronneburg
 HORSCH LEEB Application Systems GmbH • Landau a. d. Isar

HORSCH France • Chateauvillain
 HORSCH Ukraine • Velyka Soltanivka
 HORSCH RUS • Roshchinskij
 HORSCH LLC • Mapleton
 HORSCH UK • Peterborough
 HORSCH do Brasil • Curitiba
 HORSCH China • Harbin
 HORSCH Canada • Saskatoon
 HORSCH Polska • Warszawa
 HORSCH Kasachstan • Petropavlovsk



time and again droughts occur in Australia which sometimes are limited to a certain regions, this strategy helps to separate the growth a little bit from extreme weather events.

A more conservative sales strategy was chosen in China. "Although China is one of the world's biggest producers of wheat and one of the large maize producers, we did not want to take too many risks", von Starck explains. He had already gathered some experiences in China before he started working for HORSCH. "On the one hand we realised that the market was not yet ready for our technology and that on the other there was a high competitive pressure from Western competitors who partly have been in the country for decades. If you keep in mind that China is a very cyclical market, it can quickly turn into a financial adventure if you invest too much money and then hope for a positive future. This is the reason why we started small and financed the growth only with the money we generated by the sales in China."

In the future, the markets on the African continent are to be developed further. While business is developing well for HORSCH in South Africa with the importer TERRATILL and the portfolio will be expanded, the next objective is to work up its way north from South Africa as arable farming is developing there and there is potential for high-quality technology.

PRICE STABILITY

Among the challenges HORSCH had to face in the past three years were the exorbitant price increases of the suppliers combined with instable delivery chains which led to high efficiency losses in production. As a consequence, prices had to be increased again and again and delivery dates had to be postponed. "This, of course, is murder for the trade and – rightly - the farmers' resentment", von Starck admits. As the expectation of further price increases led to machines being ordered by the sales partners to secure a price level, the quantities, however, did not really meet the requirements of the market, HORSCH now wants to do everything to achieve stable prices. "This is why we do not want to simply pass on the current price increases and the problems with the instable delivery chains to the farmers. We will try to compensate for them by an increase in efficiency in the factories. Therefore, we built up a parts stock and established cost reduction projects. We are confident that we will already see the first result this year and that we will be able to keep the prices at a mainly stable level until end of 2024. We hope that thus eventually the overheating of the markets will slowly decrease."

The big growth in the past years could only be realised with high costs. "We are now trying to structure the sales level we have achieved in such a way that we will be able to produce at competitive conditions. To achieve these objectives in the future, sales, R & D and production are co-operating closely. And the network structures, we have been establishing for several years are a great help in this respect", Cornelia Horsch points out.

NEW CUSTOMER SEGMENT

In addition to the growth in new countries, HORSCH also increasingly develops the segment of medium and small farms.



There is also a huge market potential for the new Maestro TX.

"When I joined HORSCH nine years ago, the focus was on farms with 500 and more ha", Christoph von Starck remembers. This has changed considerably and HORSCH offers a complete portfolio in the range of 3 to 6 m working width that is ideal for a professional farm as of 100 ha. Especially the launch of the 6-row Maestro TX, the mechanical seed drill Versa 3 KR and the Leeb 1800 CS with 3-point linkage in the past two years are further growth drivers. Especially in southern Germany, but also in the southern and central countries of Europe there is an enormous market potential for these machines. "We attached major importance to providing our sales partners with a portfolio to have the right HORSCH equipment for this customer segment, too", Cornelia Horsch adds.

FUTURE GROWTH

"We can continue to grow by expanding market shares", von Starck emphasises. "However, the topic of digitalisation, too, plays a role as a growth driver. HorschConnect and the involved application options like for example HorschConnect Telematics provide the opportunity to offer new customer solutions in the professional segment. Thus, we took the first step to make information about the performance parameters of their machines available online to the farmers. The digital sales process, too, becomes more and more important for our growth. However, there still is some homework to do in order to connect the trade more directly to us." With the launch of an online configurator in Germany this year, the sales process will be digitalised. This increases the efficiency of the order process and at the same time reduces the potential for errors so that in the end the customer will get his machine as desired.



Solus – The sowing method of the future? Potentials and limits



The future topics in the seeding sector are mainly centred on placement precision. HORSCH is working on a new seed drill which is to meet current and future requirements. Philipp Horsch explains the special features and potentials of the new narrow seed drill Solus and where the limits are.

One of the future topics that plays a major role in the sector of seeding is precision, i.e. depth, standing area and embedding of the seed. HORSCH has been dealing with and improving these points intensively for many years. Over the years, a better and better placement level of cereals and rape seed has been achieved with disc coulters technology. In the course of time, new challenges were added, like for example the reduction targets in chemical crop care, the discontinuation of agents or the changing climatic framework conditions are things we have to react to.

“The most precise coulters technology we have at our disposal today is the single grain row of our Maestro line”, Philipp Horsch summarises. The precision comes from the combination of a double disc coulters with a lateral depth control at the point where the seed is placed. “We can maintain the depth much better and more constantly if two control wheels do not run behind the row, but directly at the seed disc”, he explains the principle. Moreover, the regular consolidation effect of the two lateral depth control wheels on the left, the right and below the seed furrow creates a perfect, even germination zone for the seed. This and the better depth control are two essential factors for the regular and safe emergence we know from maize seed drills.

To benefit from the precision of a single grain unit, larger row spacings are required. With the Pronto DC row spacings

According to Philipp Horsch, the Solus has the potential to become an important form of sowing in the future.



This is still a construction drawing, but a first prototype of the Solus is already being built.

of 15 cm were established. “But for narrow sowing with single grain units, we are talking about row spacings starting at 22.5 cm. The experiences of the past years showed that a larger row spacing works in many regions from an agronomic point of view and that the yields do not decrease. In this respect, we feed on a lot of knowledge”, Philipp Horsch explains.

BEGINNINGS

Already 17 years ago, HORSCH started to deal more intensively with the topic of singulation. The first system that was built at that time was an overpressure system with a flexible shoot line and a perforated disc. The objective was to singulate and to apply small seeds like cereals and rape as well as the traditional row seed maize, soya, beets and sunflowers. This was when HORSCH started to work with overpressure and shoot systems.

“However, during the development process we decided to start with a mechanical system for the singulation of only maize and sunflowers which at that time we bought from an American manufacturer”, Philipp Horsch describes the development path.

At the same time, HORSCH started to develop and launch the SingularSystem. The core of the development is a metering device that uses centrifugal force to singulate cereals, especially rape and wheat, with a high frequency. To guarantee an optimum embedding of the seed the well-proven TurboDisc double disc coulters were extended by a drop tube, a skid and a catching roller. “We gathered a lot of experience with the SingularSystem which we now benefit from in our new project. We are especially working on the coulters technology so that we are less dependent on perfect seedbed conditions!”

The next big step was the development of the current single grain metering device. HORSCH developed a vacuum and an overpressure metering device on a technically very similar

basis. The AirVac and AirSpeed technology is based on the idea of realising utmost precision with a very low adjustment effort on the one hand and highest possible flexibility with regard to crops on the other hand. “Today we can meter all current single grain crops with utmost precision as well as in addition rape, wheat, rye and barley”, Philipp Horsch specifies the success. “However, due to their considerably higher seed sizes the last crops only make sense with the AirSpeed metering system. Overpressure allows for transporting significantly higher grain frequencies precisely into the seed furrow.”

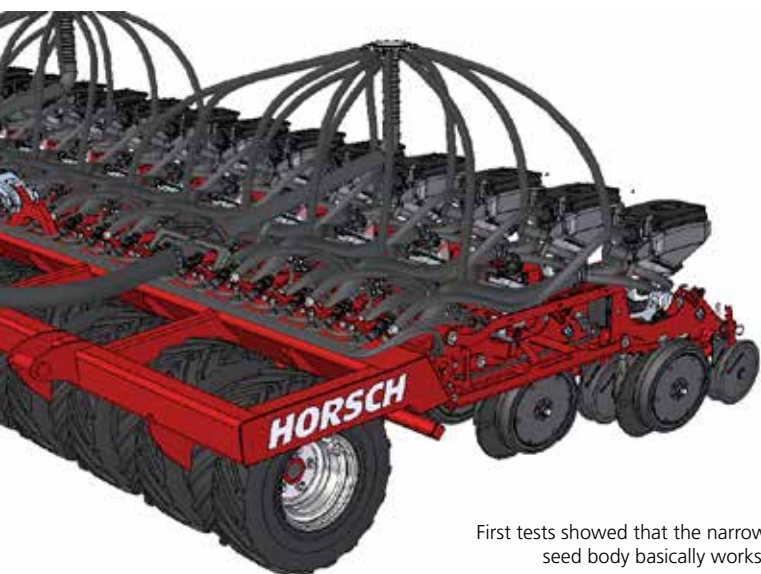
FIRST TESTS

About four years ago, HORSCH carried out first tests with the AirSpeed metering device on the Avatar. They had already gathered a lot of experience in the range of 25 cm row spacing, but with a single disc coulters. Disillusionment came quickly: It was not possible to catch the grains precisely enough behind the single disc coulters as the furrow was not homogeneous enough. The reason was that there was a disc on one side and a skid on the other side. Thus, it was not possible to shoot the grains precisely enough right to the centre below the catching roller.

HORSCH was not satisfied and made further efforts in this direction. “Already at that time, we started to develop a narrow seed body for maize and soybeans for the Chinese market”, Philipp Horsch states. “A slim unit that allowed for row spacings smaller than 25 cm. It has been used as standard in China since 2019.”

SUSTAINABILITY

The next step was to place the AirSpeed metering device on the slim Maestro body and build a machine with a coulters spacing of 22.5 cm. “This follows a logic, decades of logic. New side topics constantly spur the whole matter”, Philipp



First tests showed that the narrow seed body basically works.

Horsch says. The wide row with evenly developed plants and a more regular plant distribution in the standing area in the row can be useful for several future topics at the same time.

Among others mechanical weed control. With wider rows the space between the rows is more easy to hoe. The share of rows per metre working width is less and so is the area that cannot be hoed today. If, in the future, you want to hoe in the row, it can be realised more easily from a technical point of view provided that the plant spacings are regular resp. the space between the plants can be predicted with utmost probability. Camera technology and AI can, thus, provide significantly better results.

An improved aeration of the rows and shorter periods of wet leaves allow for achieving healthier plant populations – an essential point with regard to the reduction of chemical crop care.

In addition, there is the option for a more precise nutrient supply of the plant. Moreover, the band application of herbicides involves further potential for reducing chemical crop care measures.

All in all, it is, of course, always about the clever use of yield reserves in arable farming. If we manage to establish regular, optimally placed populations, this will certainly be another key to higher resp. stable yields.

“Last summer we started to carry out first tests in Germany with all-over sowing”, Philipp Horsch explains. The first tests with a 6 m 3-point tool were very promising. “The new narrow seed body works. Of course, there is some need for adjustment, but basically it works”, Philipp Horsch confirms.

SOLUS – LARGE AREA MACHINE

The name for the new HORSCH large area product is Solus. “With this machine, we want to meet the requirements of the farmers”, Philipp Horsch explains. At the moment a 10.6 m wide, 47-row prototype of the Solus is being built. This year in autumn, the first tests are to be carried out with sowing wheat, rape, rye and barley. Beans and beet will follow

next spring. Based on the experience gathered in these tests HORSCH will decide how to proceed with this line and what has to be adapted.

With the combination of the narrow seed body and the AirSpeed shoot metering device HORSCH is taking a new path that is based on the experiences and components of the past years. The central questions are if this method has what it takes to become a new trend in sowing, where the limits of the machine are and for which conditions it is suitable. “We are dealing intensively with these questions”, Philipp Horsch explains. “You always have to question the whole matter critically”, he emphasises. Late sowing or wet soils for example, can be restrictions for this method. There will again and again be situations where the parallelogram-controlled seed unit will reach its limits.

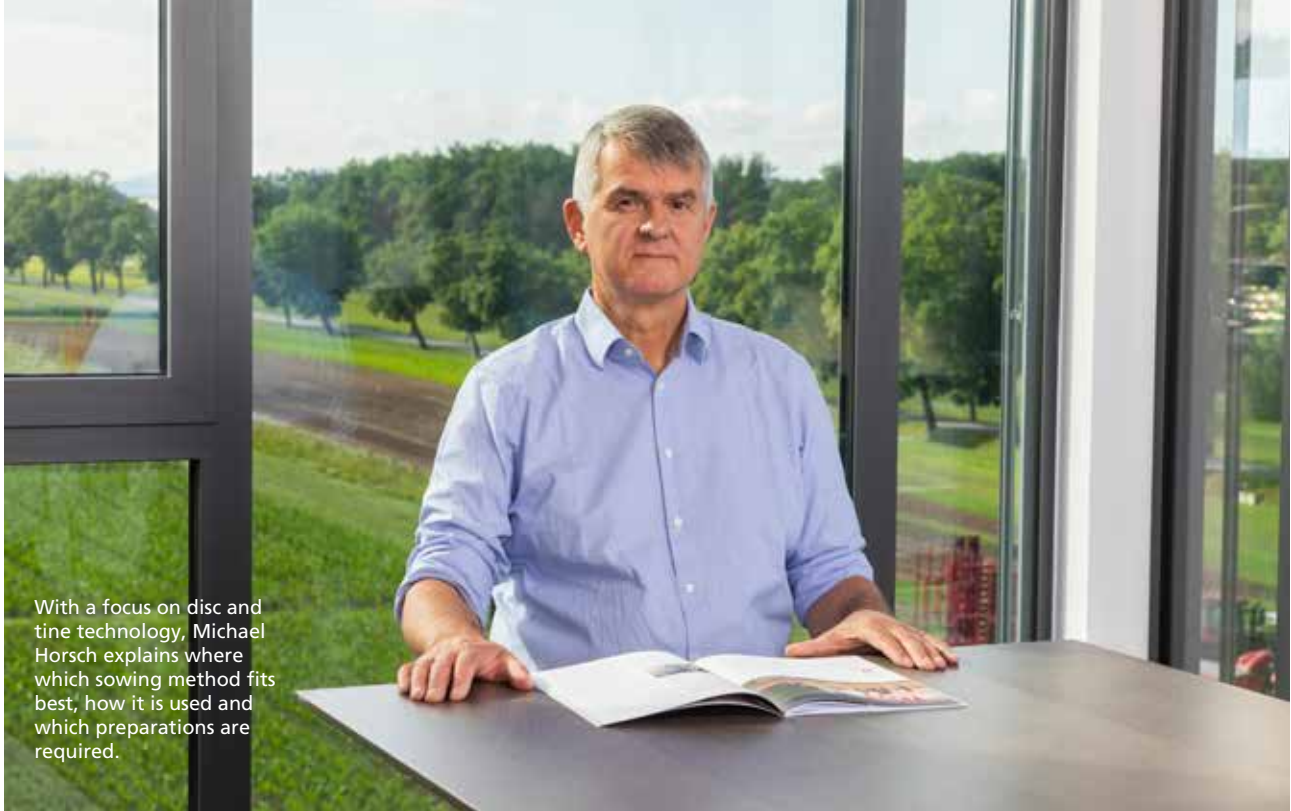
POTENTIALS AND LIMITS

In certain regions and arable conditions, the machine will work very well, in others less so. Because of the weight of the Solus, wet regions are particularly challenging. At good times, it will be possible to work in a highly precise way, but there will also be times when you will need an alternative. “Actually, even machines that we already have today are occasionally too heavy,” Philipp Horsch adds.

On the other hand, he sees great potential in dry regions. With the Solus line, sowing depth for example can be regulated more easily than with the Pronto. This is a huge advantage, especially in view of the future and the changing weather conditions. This guarantees an ideal use of resources such as water or nutrients.

Which markets will be the appropriate ones for the Solus line, remains to be seen. “We know the potentials. And we also know the limits”, Philipp Horsch explains. “We must not be so naïve and claim that this machine is equally suitable for all regions and conditions. But we have to take the specific requirements and conditions of the respective regions into account”. However, he is convinced that the Solus and the combination of narrow seeding and the AirSpeed system has the potential to become an “important form of sowing in the future”. Especially with the changing framework conditions in mind. But it will remain a challenge to react to volatility.

In November, at this year's Agritechnica, the narrow seeding topic as well as the new sowing method with the combination of narrow sowing and the advantages of the AirSpeed metering device which is based on many years of experience and development will be presented at the HORSCH stand. 🌐



With a focus on disc and tine technology, Michael Horsch explains where which sowing method fits best, how it is used and which preparations are required.

Sowing methods for direct seeding

In the last issue of terraHORSCH, Michael Horsch in this article “The fine art of direct seeding” talked about direct seeding as a water-saving method, catch crop cultivation with direct seeding, what effect a covered soil can have and what direct seeding could be like in the future.

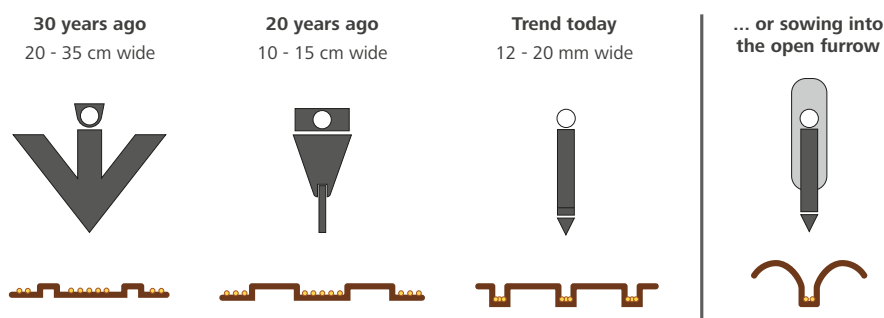
In this follow-up article Michael Horsch among others explains where which sowing method fits best, how it is used, and which preparations are required. The focus will be on the disc and tine technology.

WHICH TECHNOLOGY FITS WHERE?

“From our past we have a lot of experience with tine systems for direct seeding”, Michael Horsch summarises. The Airseeder technology and then the Sprinter line with

the different tools have always been optimised and adapted further over the years. Today, they offer a lot of options – from direct seeding with only little disturbance of the soil to an almost all-over work. Tine technology is used for example in regions where farmers want to sow immediately after the harvest in fresh residues of the previous crop, for example rape or catch crops. The seed tine has a clearing character and leaves a clean seed furrow for a good soil contact of the seed.

History of direct seeding with tines



Another significant advantage in cold regions is the somewhat faster heating of the soil. "For example, in Kazakhstan (trend towards small tines and sowing into the open furrow) farmers very successfully sow with the Sprinter NT. The tine clears the soil and leaves an almost black surface which can heat up faster and guarantees a quick start of the crop in a cold spring", Michael Horsch tells about his experiences.

"In the past 10 years, we also dealt more and more intensely with direct seeding with discs." Especially in regions with a lot of water or in very dry conditions you need a sowing technology that moves considerably less soil than a tine coultter. In Brazil for example, the customers want to sow below the straw of the previous crops or the catch crop. If too much „open soil“ is left behind, the erosion risk increases considerably and soil temperature rises significantly because of the lack of soil cover. From an agronomic point of view, the HORSCH SingleDisc seed coultter has been optimised for as little soil movement as possible and a precise placement of the seed. "The seed coultter of our Avatar opens an extremely small furrow and places the seed very precisely at the bottom of the furrow. The adjustable closing wheel provides the required soil cover."

STRAW – SUPPORT AND CHALLENGE AT THE SAME TIME

"The harvest residues of the previous crop or of a well developed catch crop are a chance and a challenge at the same time." Straw provides nutrients and organic matter and thus is an important building block of humus maintenance and humus production. The residues on the surface are an erosion protection and can cool the soil. "If we manage to achieve an intensive covering with straw mulch between the rows of the new crop, it might help in dry, hot conditions to prevent the soil from heating up even more." The straw layer is a kind of insulation on the soil surface. The air buffers in the straw mulch keep the heat from the soil surface. Especially light straw, e.g. wheat straw, additionally reflects solar radiation. The result is that the soil heats up less. In regions with high temperatures and dark soils the effect can be particularly interesting.

SOWING IN WHEAT STRAW WITH DISC TECHNOLOGY

However, not all straw is the same. You have to differentiate between the different crops that generate different amounts of straw and, of course, the characteristics of the residues. "It always is an enormous challenge if you want to sow in white, i.e. fresh wheat, barley or rye straw. Immediately after the harvest, the straw is very tough and not easy to cut. Sowing with disc technology involves the risk of the straw being pressed into the seed slot. As a result, seed-soil contact and emergence may suffer. "In this case, trash discs are a great help, but only if the row spacing is 25 cm."

In direct seeding, brittle straw is much easier to handle. "If after the harvest there are four to five weeks of sunshine and perhaps a rain shower every now and then, wheat straw for example can be cut considerably easier with a disc and

the risk of the so-called "hairpinning" effect is reduced significantly."

If it is necessary to sow into fresh straw immediately after the harvest, it makes sense to cultivate the residues a little bit beforehand. A solution could be to drive over the field to align the straw and to bend it in advance. The resulting effect is the later the disc gets through more easily and draws less straw into the seed furrow. The Cultro is also very interesting regarding capillarity and water loss. "Even in very dry, dusty conditions you can still move the soil, even if it is only 1 to 2 cm. This is enough to close the capillaries. This is extremely important. For if dry cracks are closed, residual moisture moves below the layer of dust on the surface. If you, thus, draw up moisture from the soil and then sow, there is the chance that the seed will germinate successfully."

To take up the topic of cracks again: If there are cracks in the soil, they will get larger and larger in case of an increasing and continuing drought. The cracks act like a chimney, i.e. water escapes through these cracks and evaporates. This, of course, complicates sowing and germination considerably. "A clayey soil will dry like concrete the longer the sun shines on it." In this case, you have to close the cracks beforehand. Experiences from the past two years show that, in this respect, too, the Cultro is an excellent tool that requires only little effort.

SOWING INTO FRESH WHEAT STRAW WITH TINE TECHNOLOGY

The alternative is to always work with tines if there is white straw. You can see this in France very often. "Over there, farmers equip their Sprinters with narrow tines to sow mainly catch crops, sometimes also rape. For with these narrow tines, straw can easily be removed from the slot."

With catch crops, you do not have to attach major importance to the soil structure. "In this case, it is not about absolute perfection." However, if you want to get a main crop, e.g. rape, into the soil, the soil structure is very important even if the straw is under control. "If for example a lot of wheel tracks have been created in the field during the harvest, direct seeding may work, but you must not be surprised if the plants germinate worse and if the roots do not develop well in the area of the wheel tracks. Especially when combining you clearly see where the wheel tracks were. For in this area, the population is thinner and there may be yield losses."

But you can develop a feeling for a good and correct soil structure. If the clods are porous and the pores are small, even a desiccated soil can take up water and swell. However, if the clods have smooth, sharp edges without pores you know that the soil is compacted. "In this case, it will not become better if it rains. On the contrary. It will even get worse. This is why in regions with direct seeding catch crops more or less play a major role to maintain the structures."

As mentioned in the previous article, for cereals stubble length and straw distribution are important. There can quickly be a problem with mice what Michael Horsch considers to be the biggest problem in direct seeding in Central Europe.



Immediately after the harvest, white straw, i.e. fresh straw, is often very tough and hard to cut. The result: hairpinning.



Sowing with disc technology into larger amounts of straw is a big challenge. Trash discs can help.

ROTATIVE DIRECT SEEDING AND WHY IT MORE AND MORE BECOMES AN ALTERNATIVE IN CENTRAL AND WESTERN EUROPE

Rotative direct seeding is more and more becoming an alternative. The driving factor of rotative direct seeding is, if conditions and soil structure fit, the condition of the residues and the previous crop. Direct seeding can be as good and as productive as sowing after intensive tillage.


“Rotative direct seeding is the alternating, but situation-adapted use of direct seeding from year to year and depending on the crop.” The drivers for this method especially in Europe are three essential factors:

Not every crop rotation is suitable for direct seeding. In the rotations rape-wheat-barley or rape-wheat-wheat that were rather established in the past, it often was not possible to sow the following crop direct and achieve high yields. “We all have been very, very successful with these short rotations for many years. However, today, influenced by several factors like resistances, framework conditions etc, we are now back to broader rotations in many places.” If rotation includes 30 to 40 % of spring crops like maize, soya, sugar beet or sunflowers, cultivation windows for catch crops open up. Or there are crops in the rotation that can be sown direct. “We often observe that our customers with a good catch crop in spring for example sow sugar beet in a perfect soil structure without any preparatory cultivation. So there is no point in creating tracks in the field with a seedbed preparation.”

Another reason for direct seeding are the constantly increasing climate changes. “We notice that there are longer and longer, very hot and dry periods and that we have to sow certain crops in August/September, e.g. rape, catch crops or partly also early-sown wheat or barley. Each cultivation leads to more drying of the soil, less seed-soil contact, more clods and less fine earth etc. In such situations, it is better to leave the straw on the surface, close cracks and pores by a pass with for example the Cultro TC and then sow timely

and with a little bit of moisture in the soil. In other words, sow in conditions where structure and straw are ok, where you can place the seed properly and where a cultivation is not mandatory. In principle: If there are many residues, you have to be more careful with direct seeding than if there are only a few residues like after soya, rape, sunflowers or peas.”

In conditions with a very good soil structure, a broad rotation and a clean harvest resp. with enough time to allow the straw to mellow, rotative direct seeding is also interesting from a financial point of view. Less passes and thus less time, less machines and less diesel combined with an excellent sowing quality can also be an essential factor from an economic point of view.

“The topic of harvest residues, i.e. straw, runs like a common thread through direct seeding”, Michael Horsch sums up. Especially high amounts of cereal straw, mainly wheat followed by barley and rye. Rye is least problematic even with high quantities of straw, followed by barley, and wheat is most difficult. This is not so much due to the quantity as to the C/N ratio in the straw and thus, to the way it decomposes. 

SPOTSPRAYING – WHAT IS THE CURRENT STATUS?

The future framework conditions in crop care provide for a significant reduction. A possible solution: SpotSpraying. Theo Leeb and Josef Stangl tell us what the current status is at HORSCH, which methods there are and why it is mandatory.

Already at the Agritechnica 2019, there were some companies and start-ups that dealt with the topic of camera-based individual plant detection and SpotSpraying and presented respective solutions. The initial euphoria was considerable. For these systems were to allow for a precise application of crop care agents – a requirement especially with regard to the stipulations of the EU for reducing crop care agents. But how well and how precisely does SpotSpraying actually work? To find answers to these questions and to be able to present good, pinpoint solutions, HORSCH, too, did some intensive research.

Promising solutions

“At first glance, the solutions seemed very attractive, interesting and even very market-ready. This is why at that time we got in contact with three companies to see what the status of

the project was and if there was a possibility for co-operation. The focus of one company, however, was rather on fertilisation. So this solution was not that interesting for us”, Theo Leeb comments. But another start-up from France also dealt with the topic “green in green” and “green in brown”. With “green in brown” green corresponds to the plant, regardless if cultivated plant or weed, and brown corresponds to the arable soil. All areas detected as green are sprayed. With the “green in green” principle, individual plants, weed or cultivated plants are detected by the system and sprayed in a targeted way.

“The topic “green in green” is definitely interesting for us, especially for the European market. We debated which would be the obvious application options for this system. And we soon ended up with the topic of removing thistles in wheat by spraying”, Theo Leeb says. This is particularly interesting if thistles are a rotation-related problem. “In wheat, thistles

Offline SpotSpraying during
the second herbicide
measure in sugar beet with
a HORSCH Leeb PT





Theo Leeb



Josef Stangl

can be fought easily, usually come in nests and are easier to detect”, Josef Stangl explains. Thus, thistles would be a typical case for a “green in green” spot application.

Application

“To find out how reliably the thistles are detected and removed from the wheat by spraying, we tested the system of a start-up which had developed and trained an algorithm for this application case.” HORSCH set up and examined large test plots with different thistle populations.

For Theo Leeb, disillusionment came quickly. Though it worked, the results were far from satisfying. “In principle, spotting works. But there are limits. On average, only 60% of the thistles were detected, 40% remained untouched. Given this fact you wonder how to assess this result and if this degree of efficiency is already sufficient. Our decision was: it is not. And it did not improve after we continued to train the model with graphic material and information – the hit rate remained at approx. 60%.” This is still far from market-ready.

Field of application

According to Theo Leeb it is important to consider in which crops, for which kind of application and at what time SpotSpraying really makes sense. What is possible from a technical point of view resp. which restrictions there are has also to be taken into account. “When I hold a speech I like to point out the ratio between the smallest technically possible spot size and the weed population. The smallest spot size approx. amounts to 50 x 50 cm with a standard nozzle size of 50 cm. If the distance between the weeds is within the range of 50 cm, the sprayer will not switch off. This means: spotting only makes sense if the weed population is relatively thin – namely with distances of more than one metre.”

If you take the row crop maize as an example and take a look at the weed distribution, the spacings between the weeds usually are in the range of centimetres, depending on the weather. Spacings of several metres between weeds are rare. Another problem that complicates the situation is that weeds do not stop emerging. “If I treat the visible weeds with a leaf-active herbicide via SpotSpraying today, new weeds will

grow next week. To regulate the weed regrowth and a late weed infestation, you need soil herbicides. If you only rely on leaf-active herbicides, it requires several passes to achieve the same result. In the end, you have treated a larger area.”

The conclusion was that SpotSpraying under these conditions only makes very limited sense. In row crops, you can achieve a “basic protection” by applying soil herbicides on a large area. Later, weed that emerges individually can be removed by means of spotting systems. According to Theo Leeb, this approach can also be transferred to other row crops. “In cereals, however, it becomes more difficult especially if you also take care of grass weeds. For the detection systems, it is extremely hard to tell them from cereals. The detection of black grass in cereals is almost impossible. What I could imagine is the detection of broad-leaved weeds in cereals. For in this case, the plants can be distinguished clearly. But to tell grass from wheat in autumn or in spring – this is not realistic today.” SpotSpraying is only feasible if the weeds can easily be distinguished from the crop, and it only makes sense if weed infestation occurs sporadically or in nests.

SpotSpraying system

There are application cases where spot application is positive from an economic and an ecological point of view. This is why HORSCH's objective is to develop its own SpotSpraying system. “First of all, we checked which technology was behind it – and again we came back to the topics “green in green” and “green in brown”.”

The topic “green in brown” has been on the market for quite some time from different suppliers and is mainly used in the US and Australia in dry regions resp. direct seed regions. Mainly in regions where no or only little tillage is carried out after the harvest. “Due to the drought, there is only little weed emergence of individual plants which then are spotted with glyphosate. From a technological point of view this is rather simple as it is a mere processing of images. The system checks if a pixel is green or brown. If it is green, the nozzle opens and sprays. This can be carried out without artificial intelligence, and it is one of our first objectives as it is the basis for the rest of the process.”



01 Thistle nest in sunflowers (5x5 m)
02 Final treatment in sugar beet with a HORSCH Leeb PT using the SpotSpraying method

AI and camera systems

In parallel, HORSCH works on an artificial intelligence which can detect plants. To train the AI models, appropriate and comprehensive graphic material is required. The basics that an AI requires and what a model looks like were prepared together with the DFKI (Deutsches Institut für künstliche Intelligenz = German Institute for Artificial Intelligence). A multitude of labelled images where sugar beet is distinguished from weed were included in the AI model. "There are two approaches. In one, the individual weeds are detected, in the other one, "only" the cultivated crop is detected. Initially, we focus on the detection of the cultivated plant by the AI. To achieve the highest possible detection safety requires a lot of images. The graphic material has to include all relevant growth stages at different lighting conditions for the future time of use. A good detection performance requires continuous retraining. "Sugar beet was the test crop we trained the system for. For the beet is not treated and everything else that is green is weed and is sprayed."


Two methods

Beside the "green in green" and "green in brown" differentiation, SpotSpraying can also be divided into two different methods. For the online method the camera is permanently installed on the crop care sprayer. Detection, analysis and application are carried out during the pass in one work process. In the offline method, the image is recorded beforehand by means of a drone. In the next step, the image data is analysed and a geo-referenced map with the exact weed locations is prepared.

These maps are then loaded to the terminal and processed by the sprayer as application spots. According to Josef Stangl, the time between drone flight and application should not be too long. Despite RTK, the map management still is a challenge. An important advantage of this system is that you know in advance how much spraying mixture you need. Moreover, this version is relatively low priced if you want to enter the sector of SpotSpraying. If you compare both systems, Josef Stangl speculates that the online method will establish itself due to the easier handling.

Current situation

"SpotSpraying will never hit 100 % of the weeds", Theo Leeb and Josef Stangl agree. Some plants will not be detected by the camera, others will slip through the detection model. Thus, the degree of efficiency for SpotSpraying is somewhat less than for an all-over application. "There is still a long way to go. Row crops like sugar beet, maize, soya and sunflowers, perhaps also rape, are ideal for starting with this technology. In these crops, the technology can recognise a pattern and thus detect the cultivation plant more easily. Weed can be identified better. Especially weeds that come in nests like our root weeds can be located relatively reliably in row crops. To achieve a reduction especially in the sector of herbicides it is a must to say: I do no longer spray the whole field", Josef Stangl explains.

The objective is to have a guided "green in brown" system for traditional direct seed region in the foreseeable future. Moreover, HORSCH continues to work in the sector of "green in green" for individual plant detection in row crops to make use of the saving potential compared to the field sprayer. The fact that in seven years an agent reduction of 50 % has to be achieved, can be a motivator in this respect. 



The HORSCH Leeb 12 TD increases efficiency and at the same time saves resources. The extremely precise application also meets the increasing environmental requirements.

Farm in Latvia relies on HORSCH

Eduards Šmits actually studied economics. However, he decided against a career in the financial sector and has now been managing the Pīlādži farm for almost 30 years.

Currently, over 700 ha are cultivated on the arable farm. The main crops are wheat, rape, beans and peas. The soils at the site in the municipality of Lutrini in the Saldus district of western Latvia in the historic Courland region vary greatly – sand, clay, peat, sandy loam. Within one single field the soil can vary considerably, from peat to loam and with sand in the middle.

THE BEGINNINGS OF THE FARM

Eduards Šmits' parents started farming in the early 1990s. Unlike most farmers, they were only offered the land on a leasehold basis. There was no inherited land that could have been reclaimed after the country's independence. At that time, Eduards was still at school. Together with his three siblings, he had to help a lot on the farm. "I founded Pīlādži in 1996, shortly before I graduated from the Agricultural University of Latvia in Jelgava where I studied economics," Eduards Šmits remembers.

As at the beginning the farm was still too small to generate significant profits, Eduards still had another full-time job. "At that time, I called farming my "extreme hobby" because all my free time and money went into the development of the farm," the farmer says.

The turning point came when the farm grew and it became increasingly difficult to reconcile the full-time job and farming: "I had to decide what I wanted to do. Farming was not yet profitable at that time, so it was not easy. But I still decided in favour of the farm. So I have been a full-time farmer since 2005."

EXPERIENCES WITH FIELD BEANS

Beans have been grown on the farm for quite some time. Eduards Šmits is proud of his experiences: "I already had beans in my rotation before they became a trend. So I have already learned some additional tricks. From an economic point of view, it may not be the top crop, but I like the agronomic effects. With regard to sowing, I noticed that given the drought in spring which limits development direct seed may be advantageous. Two years ago, we started to grow peas. They are easier to handle and do not require so much crop care. The harvest, however, can be more difficult as the peas lie flat on the ground after rain and storm in summer. The irregular germination, too, caused by drought in spring, makes harvesting more difficult. I hope that direct seed will help us in this respect, too."

By now the two legumes bean and pea now make up one fifth of the rotation. One reason is to extend the harvest period. This year, only peas were sown to reduce the crop care costs.

FIRST ENCOUNTER WITH HORSCH

Most of the machines on the Pīlādži farm are from HORSCH. Eduards Šmits explains why this technology prevails on his field in the Courland: "I heard about HORSCH from German farmers who have farms in Latvia. In 2007, during a trade fair in Riga we configured a Sprinter with 6 m working width together with the regional HORSCH sales manager. At that time, I farmed 370 hectares, and the machine actually was a little bit oversized. But I still bought it as right from the start we relied on larger, wider and more effective machines to get our tasks done faster and more efficiently. One of my main reasons to buy the Sprinter were the coulters which were to provide the work quality required for our varying soils. With the Sprinter we successfully sowed cereals and rape until 2015. Though it did not always work perfectly", Eduards Šmits comments on his decision.

FOCUS FOR RAPESEED, PRONTO FOR CEREALS

In 2011, the farm bought a HORSCH DuoDrill to be mounted on the Joker CT for sowing rape. The plan was to sow rapeseed during tillage.

"But this method was not very precise. So I looked for another solution and found it with the Focus TD. Since 2017, I have been using the Focus 4 TD for sowing rape. In spring, it is also used to sow legumes."

In the farmer's opinion the Focus is the optimum solution for rape, even if there sometimes are problems with straw. The reasons, however, rather are the cutting height and the chaffing quality. Although the Focus has been designed for StripTill without tillage, minimum tillage might be necessary in case of lodged grain. "In our first year with the Focus we were not aware of the influence of the chaffing and distribution quality of the straw. You have to keep an eye on that, otherwise the machine can get clogged. In 2018, there were little straw residues on the field. And the Focus worked perfectly", the farmer confirms.

Eduards Šmits equipped his Focus with self-made cutting discs in the front to see if this might be an option for his fields if conditions were not optimum. An option that HORSCH found interesting, too, and developed further for the Focus. The tests are already in full swing.

In 2015, the farm bought a HORSCH Pronto to carry out sowing quickly and efficiently after tillage. Here, too, the well-proven principle – seedbed preparation, consolidation and exact sowing was absolutely convincing.



A SPRAYER TO INCREASE EFFICIENCY

A brand-new machine in the field of Eduards Šmits is the HORSCH Leeb 12 TD with a tank capacity of 12,000 l and 36 m boom width. "We prepare the spraying mixture on our premises. To optimize the workflow, we went for a large trailed sprayer. Again it might be a little large for our farm but it increases our efficiency and at the same time saves resources. We also want to apply liquid fertiliser with the sprayer. Thus, application is cheaper and more precise which also meets the increasing environmental requirements", the farmer explains.

WITH HORSCH AND WITHOUT A PLOUGH

"We have been cultivating our fields without a plough for nine years – one of the reasons why they are so even. We sow rape with the StripTill method with the Focus TD. Before sowing cereals, we use the Terrano FX to work shallowly and intensively and then we sow with Pronto", Eduards Šmits explains.

For the farmer, one of the main reasons for cultivation without a plough is the short window that in the Baltic States can be used for sowing after the harvest in spring. "Moreover, ploughing is very cost-intensive and time-consuming. Thus, not using a plough only has advantages for me. And the HORSCH machines have been designed exactly for this purpose. So it was very easy to take the decision for this kind of cultivation system", the farmer argues.

DIRECT SEEDING WITH THE AVATAR

The HORSCH Avatar 6.16 SD is another new machine on the Pīlādži farm. Eduards Šmits explains what convinced him of the machine: "In spring 2021, I made a comparison of four seed drills on a loamy field. Among them the Avatar. The results were more or less the same,

Eduards Šmits has opted for minimum tillage without a plough for his farm. And the results are more than satisfactory.



01 With the Focus 4 TD, Eduards Šmits sows rape with the StripTill method and also legumes in the spring.

02 Since 2015, the farm has been using a HORSCH 6 DC Pronto to carry out sowing quickly and efficiently.

03 Before sowing cereals, the Terrano FX carries out a shallow and intensive tillage.



the performance of the machines to get the work done in the optimum time window and the optimum quality. If the fields get larger, we will need more powerful machines again”, Eduards Šmits summarises. Although he now spends less time on the tractor, he still tests every machine himself to be able to assess the handling and the concept behind it.

The improvements with regard to the tillage methods have already achieved the first positive results. Since the Pīlādži farm has been converting to minimum tillage, the organic matter has increased and earthworms can be seen more often. “Soil health improved considerably. The yields, however, remained constant. Last year, I even had to decrease the yield – because of the fertiliser prices. But this also reduces the risk of lodged grain”, the farmer tells us and continues: “In the future, we will head more towards minimum tillage and direct seed. The other methods will remain secondary or will be used additionally. With regard to technology, too, I see a trend towards direct seed and strip tillage. With direct seed less weed germinates, and it improves soil health. And it is in line with my philosophy: less interference with soil life, less CO2 emissions.”

but the Avatar convinced me due to its easy operation and handling. Moreover, like for all the other HORSCH seed drills, the horsepower requirement is very low. I need less fuel and a smaller tractor is enough. The daily maintenance work, too, is carried out quickly – another time-saver. All this makes HORSCH stand out.”

With the new machine, the farmer wants to gather experiences with regard to sowing various crops with direct seed as well as after tillage. For the purchase of a 12 m Avatar has already been planned.

LIMING

In the past years, the farm limed in a targeted way to improve fertility and the soil structure. About 12 years ago, all fields were limed on principle. Now a little input is applied before beans and peas. And also the new fields get their share. “As the lime producer is located nearby in Sātiņi, I can save the transport costs. I noticed that after liming the yields and the soils structure are better”, Eduards Šmits confirms.

FUTURE: OPTIMISATION

And what is planned for the future at Pīlādži? Definitely a further improvement of the tillage methods and a structural conversion of the fields. Neighbouring land will be bought, fields that are further away will be sold. This optimisation process already is in full swing. “The fields are in line with



After a heavy rainfall, water stress returned more quickly on the reference plot than on the plot under the roof.

ENERGY AND FOOD SAFETY – A CHANCE FOR FARMERS

The current situation forces the European countries to reconsider their energy mix. In France as well as in Germany the motto is: turning away from gas and oil to become independent with regard to energy but also to CO2 neutrality. However, the additional costs for technology and the lack of qualified labour must not be ignored.

In this context, agrivoltaics is particularly promising. terraHORSCH talked to people who are actively involved in this change: Christian Huyghe, chairman of the national research, innovation and training centre for agrivoltaics, the two farmers Jean Philippe Delacre and Sylvain Raison, Pierre Détain, responsible for the development of renewable energies at Dijon Céréales, et Paul Buffler, contact for the agrivoltaics sector at the co-operative Alliance de coopératives Bourgogne Franche-Comté (BFC)

Promising

“In the sector of renewable energies, solar energy is clearly at the top.”, Christian Huyghe says. “In 2007, when I was chairman of the research centre in Lusignan, the efficiency of the modules of solar energy to electricity was 11 %. Today the rate amounts to 22 % which corresponds to an efficiency of about 100 %. And it is likely to increase even further. Although there currently still is a problem with the alternatives, it is one of the most promising sources of energy due to its availability. The main concern at the moment is that the energy usually is not consumed at the time it is produced. Originally, the EDF (Electricité de France, the French power company) introduced peak and off-peak hours to shift the consumption of nuclear power to the night. With solar modules, however, we will produce more electricity during the day. Exactly the other way round.

Depending on which photovoltaic system is built on one hectare, up to 1,000 MW/h of electricity can be generated per year. A nuclear power plant produces 400,000 MW/h per year. To build a nuclear power plant you need an area of more than 120 ha. On this area, 120,000 MW/h per year can be generated by means of photovoltaics alone. The land that is tied up compared to nuclear power ultimately is not that much.

If we replaced all fossile and nuclear energy with photovoltaic modules, we would need 1.1 million ha. This seems unimaginable. France alone has 27,814,000 ha of agricultural land. This corresponds to only 3,5 % of the total agricultural land.

But let’s not get carried away: around 1800, the whole energy that was used was of agricultural origin. This required 1/3 of the agricultural land. At that time, people heated less, travelled less and still so much land was used.”

Of course, photovoltaics is not the only energy source for the future. E-fuels which were recently developed by Porsche based on green and blue hydrogen, also are an interesting example. Agrivoltaics is one of the building blocks for Europe’s energy independence as is the promise of rebalancing agricultural incomes.

Agrivoltaics: comparison of the projects

There are two types of projects. We will present two customers who opted for two completely different versions.

In 2022, Sylvain Raison went for a photovoltaic roof. 5,500 modules were installed on an area of 3 ha in Amance in the department Haute Saône – right in the middle of his 850-ha-farm. With a height of 5 m and a post spacing of 27 m, the system can produce 0.85 MW at its peak and was connected to the grid in 2023. The modules capture 60 % of the light and follow the course of the sun from east to west by means of motors. Different weather scenarios can be programmed. For example, if it rains, the modules first tilt by 45° and are thus washed. Then they fold in completely so that the water is distributed evenly on the field. The maintenance of the ropes the modules are suspended with are carried out by a company that actually is specialised in cable cars. This can be done from outside the plots, i.e. without affecting



Sylvain Raison is taking part in the photovoltaic roof project in the Haute-Saône department.

the crops. If a motor fails, the power company waits until the development of the crops is finished before intervening with a working platform. The failure of some motors does not affect the final power production.

In 2021, Jean-Philippe Delacre, a farmer in Chanay in the department Côte d’Or, opted for vertical modules with a spacing of 12 m so that he can still use his two Joker 8 RT and the Terrano 8 FM as usual. The modules produce 0.237 MW per ha at their peak and face in a north-south direction. Due to the vertical orientation, they produce less power but they are cheaper to set up and require less maintenance. Jean-Philippe Delacre adds: “While traditional south-facing photovoltaic modules with an inclination of 35 % produce electricity according to the Gaussian curve, the advantage of these modules is that they produce according to an M curve. They are more productive at the traditional consumption times, i.e. in the morning and in the evening. This eliminates some of the storage problems as the electricity is consumed immediately.” He is testing two brands of these two-sided modules with different characteristics.

So far, the dust that is created by various operations in the field does not stick to the modules and does not reduce the efficiency of the system.

Both projects are promoted, developed and sponsored by a consortium consisting of Alliance BFC and the power suppliers Total Energies (Jean-Philippe Delacre) and TSE (Sylvain Raison). No public funds are requested for the construction of the plants. The fixed costs for planning and connection are the same for both projects. The power company is responsible for the preliminary design, planning, installation, connection, maintenance and recycling. "This is very reassuring", both



Jean-Philippe Delacre from Chanay in the Côte d'Or department opted for vertical modules.

farmers confirm.

Both farmers are paid either per MW or per ha which results in an annual average of 1,500 to 1,800 € per ha. If you smooth the market prices for wheat over a period of ten years, you get an average of 180 € per t. On clay-lime soils the yields for conventional cultivation amount to around 7 t per ha, i.e. 1,260 € per year. If you smooth the yields with the traditional rotation wheat/rape/barley, you will notice that the yield that is generated from energy production on average corresponds to that of the crop on site.

Ultimately, you get very close to the wind power model but with a better reversibility. There is less concrete on the soil and in terms of recycling organisation gets better and better.

And what about agronomy?

Sylvain Raison first sowed soya. The first results are already promising although the soil still was very compacted at the time of sowing. In this context, Sylvain Raison emphasis: "At a depth of 30 cm, the soil temperature was 3° lower than in the reference fields."

Pierre Détain also argues in favour of the photovoltaic roof: "The tensiometric probes showed that after heavy rainfall the reference plot returned to water stress more quickly than the test plot. This, of course, is ideal during long dry periods. Evapotranspiration, too, seems

The modules are arranged every 12 metres and allow for cultivation strips of 8 metres.



to be lower under the photovoltaic roof. In total, there was a difference of 27 degree-days. For soya under the roof, this corresponds to a shift of the development stage of two days. This is not significant as the harvest date was not postponed. But it still raises new questions: The data collected may look quite different in spring. Will there be disadvantages when sowing in spring under the shade roof? Will we have to postpone sowing?"

After the system was set up, soil profiles were established. They showed that the repeated driving on the field with the machines led to compactions in the first horizon (0 – 20 cm). Nevertheless, the soybeans that were sown after the installation works had been finished developed very well and the achieved yields were similar in the area below the modules and in the reference field. "The meadow that was established during the construction works limited compaction and made it easier to move the machines. We will recommend to our customers that they establish a meadow before the construction works start to reduce compaction", Pierre Détain explains.

In Christian Huyghe's opinion the photovoltaic roof is also interesting for crops that need a lot of water in summer: grass in regions with sheep farming or lucerne. "The publication of Sylvain Edouard (EDF) showed that the biomass production of lucerne can be increased by 10 %. Why? If there are modules, there is shading and you can reduce evapotranspiration while at the same time maintaining a similar amount of rainfall. The plant gets less quickly into water stress. This is less interesting for wheat as it has already reached its final development stage when the modules generate the maximum production amount."

For Jean-Philippe Delacre, however, the opposite is the case. Paul Buffler explains: "Between the modules, we noticed a temperature increase of 1.5°. This might have a significant consequence on the warming of the soils at the time of spring sowing. In the first test year, there was a little increase of the annual average of yield, protein and specific weight. But this can result in a real additional value if it is repeated in the long term." The fact alone that the photovoltaic project does not affect yields and quality is positive. Jean-Philippe Delacre adds: „Intuitively, it is a little bit like agroforestry, only immediately



Soy was the first crop to be tested under the roof.


ready for operation. The modules have a wind protection effect. This is useful to reduce the effects of frost and evapotranspiration. But without the problem of the tree roots which is a limiting factor for water management." In addition, there are the covered strips under the modules. They can be used to carry out biodiversity tests. "There are many more insects like ladybirds which can help with regard to pest control. But this still has to be scientifically confirmed", Paul Buffler adds.

Moreover, tests are carried out with regard to the reflectivity of the soils and crops under the modules as well as to the crops that are best adapted to the climate change. Jean-Philippe Delacre read the reports of the IPCC (Intergovernmental Panel on Climate Change) and explains that the "biotope of plant species is moving 200 km from the South towards the North". This is why this year he is testing lavender, thyme, rosemary and savory between the modules.

Which agronomic results can be expected? The year 2023 will show it.

Bring the farmers back into the debate

Both projects are very innovative, but still have to be validated from an agronomic and energetic point of view. What about the sheep farming projects with ground modules? Are they rejected more often by the government? We cannot say for sure as France still imports 55% of its sheep meat and also has a deficit in poultry farming. In this respect, too, photovoltaic modules can be quite interesting. The more so as every year 30,000 ha of poorer soils can no longer be used for agriculture. And this would be a nice way to make sure that the agricultural use can be kept up. No matter how you twist and turn the matter: Everyone involved is a winner: society due to the independence of energy, environment by the reduction of the CO2 emission, the farmers due to the

new source of income and the protection of the crops and the power companies. They ALL are winners if and only if the farmers are well aware of the challenges that are going to happen on their fields. The projects are extremely profitable for the owners of the land. It is high time that the farmers get involved in these discussions and claim these projects for themselves. Perhaps all this can be decided under the patronage of the co-operatives. If farmers join forces and use the energy production as a complement to crop production, they might have a chance to gain weight, secure their income and benefit from economies of scale. However, you have to keep in mind that France and Europe cannot rely on one and the same energy. The mix has to be balanced! 

Longer growing season – new possibilities

Håkon Huseby and his sons Kristian and Knut Arne notice it clearly: the growing season in Norway is getting longer. This opens up new opportunities with regard to crop production.

I took over the farm in 1988 when my father died. Since then, the growing season has become longer: one more week in spring and two more weeks in autumn”, Håkon Huseby says. Together with his wife Ragna Kirkeby he manages the respective family farms Kjølstad and Skoftestad in Ås, a municipality half an hour south of the capital Oslo. The farms are mere arable farms as it is common in this area. In Norway, only 3 % of the land is cultivated. In Denmark, the neighbouring country in the south it is more than 60 %! “The agricultural area in Norway amounts to approx. one million hectares. 70% of it are only suitable for the cultivation of grass. The remaining area is mainly used for cereals and oil crops. These also are our main crops. Step by step we established a more and more stable and more and more varied rotation”, Håkon Huseby states.

VARIED ROTATION

Today, there is a seven-year rotation on both farms. In the first year, they grow winter barley as a previous crop for winter rapeseed which in turn is an excellent previous crop for winter wheat in the third year. As soon as the wheat has been threshed and also after winter barley in the fourth year, catch crops are sown. In the fifth year, they cultivate field beans and in the sixth year, winter wheat again and catch crops. Rotation ends with oats in year seven. “With the winter barley we have enough time to sow winter rapeseed every year. This is the key for us in a way. In our region, rapeseed has to be sown at the beginning of August. And usually, we manage to keep that date as we normally thresh winter barley in the last week of July”, Håkon Huseby explains.

Håkon Huseby with his sons Kristian and Knut Arne Kirkeby Huseby (from left to right) who have now taken over crop production at Kjølstad Drift.





In 2019, the Huseby family bought the first Avatar in Norway. The photo shows it in action during its first season.



Winter barley was threshed on 3rd August 2021. At the same time, the first winter rape of the season was sown – for the first time with the HORSCH Focus.

Winter barley is grown rather rarely in Norway, but the Huseby family has been including it in their rotation for already a long time. “It is not common in Norway to sow in autumn as the plants often do not survive the winter. But there are constantly new varieties. It simply is about finding the most resistant variety. We already started ten years ago to import the hardest varieties from Sweden and Denmark. In autumn, we used Yara Mila (NPK 8-10.5-20) for fertilisation and at the same time sprayed the population against hibernating fungi. This always worked well for us. However, you clearly depend on good sowing conditions. Winter barley should be sown until 15th September at the latest. But the optimum time would be earlier, around the 20th August, if the weather conditions allow for it. If you sow winter barley into wet soil, the results will be rather poor”, the farmer knows from experience.

CONSERVATION FARMING

Nine years ago, spring rapeseed was taken out of the rotation and replaced by winter rapeseed. In Norway, oil crops that are sown in spring often face major problems with gloss beetle and cabbage moth. Rapeseed that is sown in autumn has already developed further and this problem is avoided. “Since we have been stopping growing summer rapeseed, we have not used any pesticides at all.”

Another change with regard to the cultivation method is that tillage was reduced step by step. Most of the fields are now sown with a direct seed drill. “We cultivate according to the principle of conservation farming. Our objectives are a continuous plant cover and minimum resp. reduced tillage or, even better, direct seed. And our good yields show that this new strategy is successful”, Håkon Huseby confirms.

SUCCESSFUL WITH DIRECT SEEDING

In 2001, he stopped ploughing and bought the first HORSCH Terrano 6 FG in Norway instead. For a few years he used the Terrano after a shallow tillage pass with the Joker directly after com-

bing. In 2010, he bought a Pronto: “We were very satisfied with this combination. But we still carried out some tests with regard to direct seeding with the Pronto.”

However, they noticed that harrowing encouraged weed germination. Inspired by the longtime membership in the Foreningen for Reduceret Jordbearbejdning FRDK (Association for reduced tillage) in Denmark and due to the subsidies for reduced tillage, they soon put a real direct seed drill on their wish list. “With direct seeding and good previous crops you can achieve excellent results even without tillage.”

After the hot, dry summer of 2018, their confidence into the system was once more confirmed. The average yields in the region amounted to two tons but the Huseby family harvested more than four tons – without irrigation. “Every kind of tillage extracts water from the soil. Another advantage of direct seed is that there is no risk of incrustations or surface runoff.”

LARGER ROW SPACING

Previously, a row spacing of 12.5 cm was common. With the Pronto it was increased to 15 cm and after that, with the first HORSCH Avatar in Norway, to 16.7. “I really trust the Avatar. It places the seed extremely precisely and hardly touches the soil.”

The direct seed drill was delivered in autumn 2019. In summer 2021, they bought a second-hand Focus 4 TD from Denmark. “With Avatar and Focus you actually do not need any preparatory tillage. Our plan is to carry out tillage only every ten years – when we spread sludge. Apart from that, we only sow direct. At the moment we sow winter rapeseed with the Focus. In a three-year trial with the Norsk institutt for bioøkonomi NIBIO (Norwegian Institute for Bioeconomics) we also tested sowing winter wheat with a row spacing of 28.7 cm. I guessed that we would lose 500 to 1,000 kg in yield. But the figures from the first year are absolutely surprising. The field sown directly with the Focus was the field with the highest

About Kjølstad Drift:

440 hectares crop production.
150 hectares are owned, the rest is rented.

Rotation

Year 1: Winter barley
Year 2: Winter oilseed rape
Year 3: Winter wheat followed by catch crop
Year 4: Winter barley followed by catch crop
Year 5: Beans with white clover
Year 6: Winter wheat followed by catch crop
Year 7: Oats

Yields in 10 years average

8,000 kg/ha Winter wheat
4,200 kg/ha Spring beans
7,000 kg/ha Winter barley
4,000 kg/ha Winter oilseed rape
6,500 kg/ha Spring barley
6,500 kg/ha Spring oats



In summer 2019, the Huseby family bought a second-hand HORSCH Focus 4 TD from Denmark. They retrofitted a slug pellet spreader.

Winter wheat sown directly after rapeseed, spring 2023.



Winter wheat "Informer" directly sown in autumn 2022 after beans as part of the Pro-Høst project. The Husebys' farm is one of three test farms. This project is run by the Institute for Bioeconomic Research (NIBIO). The aim is to produce more robust winter wheat more safely and in better quality. Different seed drills and sowing methods are tested as well as two different sowing times in autumn.

yield – over 12 t/ha! Therefore, I am not afraid of working with a larger row spacing. But is clear that we still have to learn a lot. If you for example sow spring wheat on a level field in hard, heavy clay soil, the results could be completely different. In this case, 12.5 cm would be better. But with our cultivation strategy with rotations and catch crops we are not afraid to increase the row spacing."

USEFUL LESSONS FROM REFERENCE FIELDS

The main catch crops grown on the farm are forage vetch, oil radish and honeysuckle. But in co-operation with the Norwegian Agricultural Advisory Service (NLR) the Huseby family also tests other mixtures and cultivation methods. "Our farm is located near the Oslo Fjord where water quality ranks first for the authorities. Therefore, we get subsidies for the cultivation of catch crops and for minimum tillage. But to see how important catch crops are for a high yield, is motivation enough. On fields with medium to good catch crops we can save 1/3 of fertiliser in the following spring", Håkon Huseby confirms.

With up to 10 t or more winter wheat the large amount of straw residues might cause problems. But in this respect, too, the catch crops have a positive effect. "Any kind of reduced tillage starts with the combine. The straw has to be cut properly and distributed regularly over the whole width of the header. Last year, we harvested almost 11 t of winter wheat – and, of course, a corresponding amount of straw remained on the surface. Without the catch crops the decomposition

would have taken very long as we saw on the reference fields. No matter which field test you carry out, reference fields are extremely important."

EARTHWORMS INCREASE THE AMOUNT OF AIR IN THE SOIL

Håkon Huseby is always looking for knowledge and inspiration – locally but also abroad. His sons Kristian and Knut Arne also keep with this principle. "It may seem silly to invest so much time in own trials but I wanted to show my sons that farming consists of ups and downs – and regardless of the result: you always gain experience. Moreover, it is exciting, and it is fun to learn more. And we have to get better year by year. In autumn 2014, we went to Denmark to learn more about catch crops. One of the most important things we learned was to use the spade! Danish farmers attach major importance to a healthy soil. A good rotation provides a healthy soil with a lot of earthworms. This was a useful lesson!"

Once home from Denmark, the Huseby immediately put their ideas into practice and the spade has become a regular partner in the fields. "The number of earthworms depends on the tillage method. Earthworms do neither like the plough nor the harrow. In conservation farming where the straw is always left on the surface, there are significantly more earthworms. Especially the large ones, that dig vertically. Earthworms do not cause any operating costs, but they guarantee an optimum drainage and bring air into the soil. After a few successful



Håkon Huseby is a passionate oilseed rape farmer. He has succeeded to harvest up to 5 tons per hectare.



Beans „Daisy“, 5th July 2021. The plants at the left are stronger and the roots are better developed. They were sown with the HORSCH Focus. The plants at the right were sown with the HORSCH Avatar.

years with catch crops and direct seed on rented land we often notice that the water in the ditches drains better.”

Another positive effect of the catch crops is that nutrients are taken up and are stored for the next season. “Good catch crops replace high amounts of fertiliser. In Danish field tests with barley, a maximum yield was achieved with only 80 kg N. We apply a small amount of glyphosate after each catch crop. If you have a seed drill that can place the seed in a clean soil at a depth of 3 to 4 cm, I see no reason for an intensive tillage. We save a lot of expensive diesel, and we get subsidies for direct seed and catch crops. Since we bought the Avatar, our yields have not decreased compared to the time when we still worked with the plough and tillage. It is entirely possible to achieve high yields with a direct seed drill”, Håkon Huseby confirms.

DRAIN OWN AND RENTED LAND

In the regions where the Husebys live, the annual rainfall amounts to 800 to 900 mm. In intensive rain periods there is a lot of rainfall, however, there also are long periods without any rain. “When I was young, we went skiing every year before Christmas. The winters were hard and long, and there was snow from December all through the long winter. The climate has changed, and the weather is getting milder and milder. This winter, it was colder in March than in January, and the snow was washed away by rain several times. Thus, the soil is more exposed, and this is the reason why we find conservation farming so interesting. It gives us a good feeling if the fields are either covered with catch crops or if winter crops have already been sown without any previous tillage. The soil remains on the field.”

Despite catch crops and a varied rotation – the basis for high yields has to be given. The Husebys invested considerable sums in drainages and liming. “Good draining is very important. Our objective is to drain 10 ha per year. One year we

even drained 77 ha of rented land! The ditch spacing amounts to six to seven metres.”

OBJECTIVE: HIGH PH VALUE

The soils are very variable, and you can even find different types of soil in one field – from sand to stiff clay. With regard to the pH value, the Husebys have to take the differences within one field into account. To achieve the same pH value in a field, they have been applying lime via GPS signals for years. “Our aim is a pH value between 6.7 and 7.0. It is better to apply small amounts of lime more frequently. Especially in conservation farming where there is a lot of fine earth and organic matter on the surface.”

Compared to Håkon Huseby’s early years as a farmer the strategy regarding pH value has changed significantly: “The right pH value has always been important to us, but we have changed our strategy quite often. In the 80s, 6 was fine. Today, Swedish field tests show that highest yields are achieved at 7.2. So I think our aim of 7.0 is ok. Considering today’s fertiliser prices, it becomes more and more important to make optimum use of the expensive nutrients. With a pH value of 6.0 it is said that only half of the applied phosphorus is used. You always have to keep the costs in mind. And though it is expensive to apply lime, it is even more expensive not to!”



Vocational training in Brazil

HORSCH attaches great importance to the training of young people. At the HORSCH site in Brazil, too, the training of apprentices is scheduled to start this year. Anton Grauvogl, head of training, together with four apprentices flew to Brazil to prepare a training plan and to support the Brazilian colleagues on site. He and Stefan Vorwerk, COO in Curitiba, told terraHORSCH how they developed a training plan and what vocational training will be like at the HORSCH site in Brazil.



After the arrival in Curitiba the German guests met the team of HORSCH do Brazil to get to know each other.

a large number, this was not a simple decision.

terraHORSCH: How did you make your choice?

Anton Grauvogl: We decided to arrange a competition among the apprentices. Anyone who felt like it could apply for the project. The form of application was up to the apprentices. In writing, with video or podcast – everything was possible. In total, we received 17 applications from 24 participants. They partly were so incredibly good that it was extremely difficult to choose only one. So we thought about taking more than one apprentice with us. After Cornelia Horsch gave her ok, we started to select the participants. Together with Stefan in Brazil we finally settled on four people: one of our industrial management assistants from the third year of apprenticeship, and three mechatronics engineers from the second and third year of apprenticeship.

On 14th January we headed to Munich airport by train and flew via Madrid to Sao Paulo and from there to Curitiba.

terraHORSCH: What were your tasks on site in Brazil?

Anton Grauvogl: We had a very intensive working week. We had to develop a concept and a strategy how to put it into practice. First, we set up a draft what the job profile would be like in Brazil, in which sectors we most urgently need employees and which skills are important, which competences, skills, abilities and knowledge we have to convey to our apprentices. It all was very complex, but our apprentices were not

terraHORSCH: Together with the apprentices, HORSCH is running a project to integrate a vocational training system according to the German example in Brazil. How did this come about?

Stefan Vorwerk: In Brazil, there is no vocational training as we know it from Germany. The training mainly is carried out in technical schools and, as in many other countries in the world, only provides theoretical knowledge. You then have a theoretical training with a certificate, but only little practical knowledge or none at all. This is not advantageous if you want to start a professional career. For HORSCH the practical orientation is very important. Moreover, we want to

encourage the strengths and the personality development of our apprentices.

Anton Grauvogl: Last year, Stefan contacted me and asked: “We would like to train apprentices. Can’t you come over to develop a strategy together?” He went to Brazil eight years ago to build up and manage our site. A lot has happened since that time and HORSCH do Brasil grows continuously. To get well-trained young people, Stefan came up with the idea to offer them vocational training. I immediately liked the idea and in the course of our further conversation we decided that an apprentice should come with me to Brazil. But as we have 140 apprentices in Germany, we wondered who I should take with me. With such



01

put off, they rolled up their sleeves and got to work. Kudos to the young people! They mainly had to communicate in English. And they really did a great job.

Lorena, the industrial management assistant, dealt with the organisational issues and with topics like the HORSCH Check-in Days which always take place in Germany at the start of the apprenticeship. We agreed to organise this in Curitiba, too, in a slightly adapted way. For these days are very helpful at the start of an apprenticeship. The newcomers get a lot of information, and they can get to know each other and the company right at the beginning. The other three apprentices deal with the topics from the industrial-technical sector, and they are working out the details at the moment. They will determine the skills and qualifications that have to be conveyed by the respective department – so they are very close to our products.

terraHORSCH: And what will the vocational training you developed be like?

Anton Grauvogl: Because of the conditions in Brazil, we were aware of the fact that we will not be able to copy the German vocational training system one-to-one, but we will be close to it. We studied the conditions on site and talked a lot to Stefan and the colleagues in Curitiba. In Brazil, a normal vocational training takes two years. And we, too, will basically offer a two-year apprenticeship.

Stefan Vorwerk: Our concept provides for a mix of several job profiles. In Brazil, we really need employees in the sectors welding and assembly. This is why we will create something new from the job profiles of a production mechanic, our assembly specialist, a construction mechanic, the metal and welding specialist, and of a mechatronics engineer whose job profile includes many features from the electric-electronic sector. The result will be something like a HORSCH Assembly Specialist. The certificate will be issued by HORSCH. Those who perform well will

be allowed to add a third year to their training so that they can graduate as a mechatronics engineer according to the German example.

Anton Grauvogl: The theoretical lessons will be carried together with SENAI, a large training institution that runs a training centre in Curitiba similar to the German vocational schools. We will prepare the content for the vocational training in the specialist departments from Germany, translate it to English and then forward it to the Brazilian colleagues so that they can translate it to Portuguese. However, we also consider offering the apprentices in Curitiba English courses right from the start.

terraHORSCH: Is it possible to put this concept into practice in Brazil?

Anton Grauvogl: Yes, there also are chambers of foreign trade and co-operations similar to the German chambers of industry and commerce. We were allowed to visit Bosch Curitiba. They do it the same way. This confirmed our conviction that we are on a good way. They also work with apprentice projects like we do at our German sites. Of course, the apprentices will work quite traditionally in the production department to learn everything they have to know about the production of our machines. And they will get theoretical lessons. But in my opinion, they can develop many additional skills with these projects. It simply is important to have confidence in the young people and to show this right from the beginning, to meet at eye level and especially, to make them do things themselves without predefining everything. And the projects always have a practical reference to the vocational training.

We want to include the topic of personality development into the vocational training of the young people right from the beginning. Of course, we need the practical side that is part of the job profile as they have to fulfil their tasks within the company, but in our quickly



02

01 In Brazil, the HORSCH apprentices and the team got down to work immediately and developed a plan for a vocational training at the site in Brazil..

02 The apprentices also got a taste of what production is like in Brazil – here on a HORSCH Maestro Kompass.

changing times this is no longer enough. Our apprentices have to learn to think in an outcome-oriented way so that they can efficiently meet the challenges and changes of everyday life. Therefore, they have to understand that it is quite normal to leave one's comfort zone time and again and that they must not build up limiting mental walls in their head which then do not leave any room for changes. This is the attitude we want to convey.

Stefan Vorwerk: For us, it was very important to get the support from Germany. Toni has been working with the apprentices for so long and he knows what is important to develop a successful training and to prepare the young people in an optimum way for their professional life. Moreover, we attached great importance to including the apprentices from Germany. They are right in the middle of their vocational training and have many ideas to support us. In addition, the apprentices can connect, and we can create and encourage an active exchange. Thus, we can learn together and from each other and we can offer the best possible vocational training.

terraHORSCH: What are the next steps in Brazil? When do the first apprentices start their vocational training?

Stefan Vorwerk: The plan is to start at the beginning of July 2023 with the first ten apprentices. We have an incredibly high number of interested people only from the families of our HORSCH employees. Next year we want to train 20 young people and the year after that 40. This is, of course, a huge challenge and we will have to adapt the training concept at a spanking pace. But we will manage. The attitude to work in Brazil in general is a „Let's tackle it“ mentality. There is no hesitating, they simply get started. 🌐



01

SATISFIED CUSTOMERS

The dealer Jaraguá Máquinas in Brazil relies on two trump cards: HORSCH machines and a unique customer support.

Within 50 years, Brazil has transformed from a food importer to a global exporter of grains, fibres and animal protein. In several areas, for example coffee, Brazil is the world's leading producer. This is the result of a combination of investments in technology, increased knowledge of the soil and state-of-the-art farming methods which allow for the cultivation of the Brazilian savannah.

According to Embrapa, a Brazilian agricultural and livestock research company, Brazil produced 46 million tons of cereals in the past. For the cultivation year 2022/2023 the national supply company Conab expects a production of 300 million tons – an increase of more than 500 % in five decades. The figures only reflect cereal production. Fruit, vegetable and other crops are not included. Brazil, thus, is the fourth largest

exporter of agricultural products worldwide, right behind the EU, USA and China.

Against the background of this development, HORSCH entered the Brazilian market at exactly the right time. The solutions offered by the manufacturer were decisive for the progress in arable farming, as they made all work more efficient. The machines optimised the required time, the sowing itself and the application of fertiliser and in addition increased yield. A visionary entrepreneur quickly managed to combine these two aspects: a flourishing agriculture in Brazil and the state-of-the-art technology of the German company. "My father has always been looking for new ideas, other farming methods and new fields of activity. For us, it was clear that we had to adapt the portfolio of our agricultural machinery trading company in Luís Eduardo Magalhães in western Bahia." During his numerous trips, he got to know HORSCH and the



01 Fabio Martins, Traugott Horsch, Osmar Martins and Marcelo Martins (from left to right) at the opening of the HORSCH plant in Curitiba.

02 Fabio Martins (2nd from the right), Managing Director of Jaraguá, attaches great importance to training. Therefore, the introductory speech at the driver training courses is always held by the boss himself.

03 The Jaraguá and HORSCH stand at the Bahia Farm Show 2022.

04 Rosimar Júnior (middle), product specialist at Jaraguá Máquinas, at one of the regular driver training courses.

05 Jaraguá Máquinas with its headquarters in Luis Eduardo Magalhães, Bahia, is an exclusive, authorised HORSCH dealer.

products and quickly realised that HORSCH did not only have the right machines, but that the business model matched his own convictions," Fábio Martins, Managing Director of the HORSCH exclusive dealer Jaraguá Máquinas and son of the company founder Osmar Martins, remembers.

How it all began

The company Jaraguá Máquinas was founded in Paranaíba, Mato Grosso do Sul, in 1964. Initially, the company dealt with the trade of agricultural products. In 1991, Osmar Martins bought the shares of his other partners. At that time, the small company has already expanded its line of business and sold agricultural machinery. Osmar's focus always was on the customer. And he attached major importance to tackling the challenges the farmers had to face. The soil is their means of existence. This was true in 1964 and it still is today.

"This is how we were brought up. And I think that the farmers see us in a different light when we arrive on their premises – as a team and with dirty boots. You can see immediately that we do not want to sit on the porch and make small talk. We go out into the field together to understand how the machines are used. This is what we have in common with the Horsch family – despite their high positions in the company they are not afraid of getting dirty in the field if it helps to understand the requirements of the customers. This is why our relationship is far more than a mere business relationship. There is a special connection. We work in exactly the same way. And the farmers notice it", Fábio emphasises.

Jaraguá Máquinas is a family-run company that is managed by Osmar and his sons Fábio and Marcelo Martins. The company works in the Matopiba region. The sales area covers parts of the federal states of Maranhão, Tocantins, Piauí and the Western part of Bahia. Last season, about 34.6 million tons of cereals were produced in this region on an area of 9.3 million hectares. The company's headquarters are located in Luís Eduardo Magalhães, Bahia, with branches in Uruçuí (Piauí), Palmas (Tocantins) and Balsas (Maranhão). 60 people are employed at Jaraguá, 30 of them in the service and spare parts sector and the rest in sales and administration.

Due to its company structure, Jaraguá can quickly react to the requests of the customers: "As a family business we are very close both to our team as well as to the customer. This is why we attach major importance to offering the customer an added value in every respect – and this is what the HORSCH



01 The concept for success: trusting and committed co-operation at eye level. HORSCH and Jaraguá have a common goal: added value for the customer.

02 Fabio Martins always makes time for the customers – here during the Bahia Farm Show 2022.



products we sell do too. Something should change to the better for the farmers. We do not want to do what everyone else does. With regard to sales, we strongly rely on demonstrations to show the customers what HORSCH has to offer and how the machines differ from other machines. This allows for intensely addressing all the questions of our customer. We can explain everything in their own conditions, in their own environment. And they can assess the performance directly on their farms. We do not only want to sell machines, we want to offer the customers the best solutions so that they are able to do their job in an optimum way. Our sales team is highly skilled and optimally trained with regard to the technology. Our objective is to build up a stable and permanent business relationship. And it works. The customers keep coming back”, Fábio Martins confirms.

The service and the spare parts department work in exactly the same way. The focus always is on preventive measures. And, of course, everything is done to support the customers whenever they need help. “Due to the geographical size of the country, it is enormously important in Brazil to have a well-stocked spare parts warehouse to guarantee a quick service. This accelerates logistics and complements the spare part deliveries from the HORSCH branch. Thus, our customers are always supplied quickly and in an optimum way”, Fábio points out.

Continuous training


Jaraguá invests a lot in the training sector. They take place on the premises of the farmers to provide them with detailed information about the machines and the optimum workflow. This guarantees that the machines are used correctly and that the farmers and drivers in case of maintenance or minor issues

know exactly what to do and do not have to interrupt their workflow considerably. As such a training takes place at least once a year, it is no problem if a driver leaves the farm and is replaced by a new one. The new driver quite simply will be trained in the same way and thus, utmost efficiency with regard to the use of the machines is guaranteed. “We have already trained more than 800 people”, Fábio Martins explains.

In addition, training courses are held for the dealers by HORSCH do Brasil – online and in presence, seminars for the sales and the service team. “Our calendar is pretty full with a lot of modules and different certification levels. Everyone who works for us attends this programme”, the managing director assures.

Measures like preventive training, intensive sales consulting and meeting the requirements of the customers are not only normal business practice for Jaraguá Máquinas but also part of the marketing strategy of the company. The participation in trade fairs – five will take place this year – and the use of digital marketing tools like social networks also are part of it. According to Martins, Jaraguá constantly shares tutorials, marketing and promotional content in the social media platforms. This, too, is another important channel to interact with the customers.

“We time and again organise trips to the HORSCH sites in Brazil and in Europe. We want our customers to be in contact with HORSCH and to get to know the factories and the team. And, of course, the company founders so that they get a feeling for what makes HORSCH tick. This is why we spare no money and no effort for these trips. In addition, we organise events like “Campo em Ação” last year – practical field days that take place in Luís Eduardo Magalhães. They include speeches and we demonstrate the machines in the field. With such campaigns we were already able to gain quite a lot of HORSCH fans. Some owners of the largest HORSCH machinery worldwide belong to our sales area”, he proudly states.

Jaraguá constantly and intensively works on increasing the brand awareness. Fábio Martins thinks that HORSCH will expand its product range in Brazil with machines that are in line with the local agricultural structures. Always, of course, under the aspects of stability, innovation and practicality. “We are really happy that the new factory has been opened. It will increase production capacity. The demand for sprayers increases constantly and I think we will soon see more autonomous machines in the field”, Fabio says. Jaraguá works in a specific and large market segment and HORSCH provides the appropriate, state-of-the-art technology for professional farmers. “We have a large range of products and work in the best economic sector of Brazil – agriculture. This is why we will always find our place in the market. This is our opinion as a dealer”, Fábio Martins summarises. 

According to Christoph Amslinger catch crops can be one building block in an economically interesting rotation with stable yields.



HORSCH Live

In December 2022, HORSCH Live entered the third round. This time, the event series was not limited to one week but provided interesting professional speeches of different speakers until mid-February 2023. The focus was mainly on the entity of soil and plant. This article will summarise the speeches about catch crops, leaf fertilisation and liming.

Catch crops

In his HORSCH Live speech “Catch crops – successful cultivation regarding nutrient and water management” (date: 5th December 2022) Christoph Amslinger, crop production consultant of the Hanse Agro GmbH, explained that catch crop cultivation accomplishes so much more than just the compliance with the greening and that the correct cultivation and the integration into the rotation are crucial for the success of catch crops.

CROP PRODUCTION OBJECTIVES

One crop production objective of catch crop cultivation is the improvement of soil fertility. To have food for the macro- and micro-organisms in the soil, we try to get a larger pore vol-

ume but also a better infiltration as well as to include organic matter. Nutrient transformation also improves groundwater protection and nutrient efficiency.

Erosion protection, too, plays a major role. “The soil is the capital of every farmer”, Amslinger says. Therefore, when growing catch crops, we try to reduce the soil loss caused by wind and water. To prevent grass and weeds from emerging, we use the shadowing and the competition of the catch crops but also the segregation of the root exudates. To build up humus, a second objective of catch crop cultivation, surface and subsurface plant biomass is integrated into the soil. “To what extent this biomass is used resp. into which humus pool

In the future, the climate changes will require stable cultivation systems. The successful establishment of catch crops can be a contribution.



it will be included, mainly depends on the C/N ratio." To fight nematodes, phytosanitary aspects are important, too.

ESTABLISHMENT

When establishing catch crops, many farmers among others wonder how to determine the right time for sowing. According to Amslinger one important factor is the time when the previous crop was harvested. "There is for example a difference if you grow GPS cereals which normally are harvested at the beginning of July or if we talk about late wheat that in the North of Germany will be harvested in August." But also the choice of the catch crop components, the site characteristics and how the catch crop is to be used are decisive factors. You have to ask yourself what you want to achieve – just a little covering of the soil to reduce erosion or if you try to create a huge biomass growth which is to build up humus in the soil or which will be used for cuttings.

To establish a catch crop, you can use different sowing methods. On the one hand ploughing allows for sowing the following crop directly or in mulch seed, provides a homogeneous catch crop population and allows for using soil water from deeper layers. "The disadvantage is that there is no time to incorporate harvest residues [...] and you, thus, produce a straw mat. Moreover, the risk of erosion increases." And so does the risk of desiccation.

Mulch seed is another option. It allows for incorporating organic fertiliser, repairing compaction and using the straw mulch as an erosion protection. For this method you should allow some extra time to guarantee a safe emergence of volunteer crops.

In case of direct seed, you sow directly into the stubble after the harvest of the previous crop has been finished. "Thus, we achieve a head start for the catch crop compared to the volunteer crops or the weed seeds. Moreover, it is a very water-saving method. Especially in seasons with dry summers like in 2022 this is an important argument." In Amslinger's opinion the disadvantage of this method is the special technology that is required to achieve an appropriate emergence.

CONSEQUENCES ON THE WATER BALANCE

The germination water requirement depends on the seed size, husks, seed coats as well as on the seed ingredients. "The higher the germination water requirement, the higher the requirements on the seedbed." Oil radish for example requires less germination water and can thus also be established if the seedbed is bad. The germination water requirement of a field bean is very high, the requirements on the seedbed are correspondingly high.

Catch crops are often said to withdraw water that later on lacks elsewhere. An Austrian study shows that especially in dry years (2004) the loss of water in complete fallow is higher than with catch crops. "Moreover, catch crops build up biomass in a very water-efficient way. In autumn, it first needs water. The soil water content decreases considerably compared to complete fallow. Already in December/January the tide turns and there is constantly more water available with catch crops. This is due to a higher infiltration output which helps to refill

the soil supplies during the winter. The mulch layer prevents a non-productive evaporation in spring."

NUTRIENT MANAGEMENT

When talking about nutrients, farmers often wonder whether or not they should fertilise the catch crops. "We tried to classify this on the basis of different scenarios resp. sowing methods." When sowing after a plough or if the straw is removed, often no fertilisation is required. If the straw remains on the field, you possibly might have to fertilise an additional 30 to 60 kg N/ha within the scope of the statutory rules.

For mulch seed, we examined two different scenarios for stubble cultivation. In the first case it was very dry at the time of stubble cultivation or the stubbles had not yet been touched. "If the straw was removed, there is no additional N requirement. If the straw remains on the field, the nitrogen requirement of the catch crop coincides with the nitrogen requirement for the straw degradation and a straw compensation fertilisation is required." In the second scenario, it was very wet during stubble cultivation. Thus, the rotting process started earlier and the course of the N dynamics in the soil was more regular. Thus, the catch crop does not suffer from an extreme nitrogen loss. In this case, an additional fertilisation is not necessary says Amslinger. With the direct seed method, the straw is on top, but as there is no tillage the mineralisation potential is lower, and you have to consider the N values in the soil. "If they are significantly beyond 50 kg, you do not have to fertilise. If they are considerably lower, a compensating fertilisation should be carried out."

YIELD CONSEQUENCES ON THE FOLLOWING CROP

"In years with high yields without any weather extremes especially sugar beet on fallow land (without catch crop cultivation) reacts with better yields. The higher the yield potential, the better was the yield result for sugar beet in optimum conditions after complete fallow compared to catch crops. For maize or spring crops there are no significant differences." In summary, it became evident that in stress years higher yields were achieved more reliably with catch crop cultivation than without the cultivation of catch crops.

In Amslinger's opinion it is obvious that the climate changes will require stable cultivation systems in the future. To make sure that the catch crops can do their bit in this respect, their establishment has to be successful. A special focus has to be on the right sowing systems to guarantee the water supply and the associated safe emergence of the catch crop. With regard to nutrients, too, farmers should keep an eye on the catch crop to make sure it helps to keep the nutrients in the system and with the right management place it at the disposal of the following crop at the right time. Catch crops do not always lead to higher yields in sugar beet as a following crop but they can contribute significantly to a climate-resilient and stable cultivation system. Thus, catch crops can be a building block in an economically interesting rotation with stable yields. "Catch crops are part of the solution and not the problem."

Liming

Max Schmidt is an independent lime and soil specialist. Moreover, he is a lecturer at the University of Applied Sciences Weihenstephan-Triesdorf in Triesdorf as well as a consultant of the DLG (German Agricultural Society) academy. In his HORSCH Live speech "Liming – the first step towards safe yields" (date: 12th December 2022) he talks about the role of lime for soil functionality and stability and about the resulting yield effect in farming.

According to Schmidt, an important question is what the plant needs from the soil. There are four important factors: enough root area, water and nutrients as well as oxygen for root respiration. "In summary, the plant needs a well rooted soil with a balanced water nutrient and air supply."

"The predominantly young soils which developed after the last ice age contain a lot of valuable minerals like for example quartz, but also primary and secondary silicates like mica, feldspars and clay minerals which have an important function with regards to the storage of nutrients", Schmidt explains. In Germany, the arable land mainly consists of mineral soils the biggest part of which consists of the mineral components sand, silt and clay as well as humus which among others contains carbon and nitrogen. The humus content of our soils ranges between 1 and 4%. Moreover, another important part are the colloids, also called exchanger. These are clay minerals



Max Schmidt points out: "If the lime disappears from the soil, this quickly leads to acidification processes."

and humic substances which are smaller than 0.002 mm. Their ratio in the soil is between 5 and 50%. Colloids are negatively charged and, thus, can store basic cations in an exchangeable way.

But what makes up an optimum soil? According to Schmidt, our best soils are the luvisol soils consisting of loess with a lime content of approx. 20 to 30%. Loess is a limey fine soil material which developed from stones that were grinded by glaciers. "These soils are base- and nutrient-rich, they are deep, and the air and water circuit is optimum." They consist of 50 to 55% inherent parts and of 45 to 50% pore volume. The soil pores are very important for the functionality of the soil, for they deviate water, make it available to the plant and aerate the soil.

If the lime disappears from the soil, this quickly results in acidification processes. This leads to negative consequences like for example clay shifting. I.e. with pH values below 6.8 the clay minerals in the soil become instable, are shifted to deeper layers with the seepage water, and the result is a dwindling mellowness of the soils. The clay shifting can lead to compactions of the subsoil leading to a waterlogged site. Thus, the soil deteriorates and worse forms of humus like rotting humus and raw humus develop which partly are hydrophobic. "If the soils more or less are in the process of self-destruction, clay minerals are destroyed, too. And the result are completely different soil structures." According to Schmidt, all this leads to a degradation of the soil.

"All these processes essentially are related to the decalcification of the soils and to the concomitant acidification processes. On light soils, these acidification processes take place faster than on heavy soils as heavy soils are more intensely buffered." These processes are something natural and take place without human help. Fertilisation influences the base content of the soils. The consequence of high fertiliser inputs of nitrates and chlorides is that the soils become over-fertilised. Or if potash is used as a fertiliser, the anions in the soil are washed out as they cannot be bonded.

If exchangers resp. humus are degraded or washed out, the plant quickly shows deficiency symptoms and thus shoot und root damages. "The plant cannot develop any root mass in an acid soil und suffers from a lack of calcium. Calcium is an essential nutrient for the development of fine roots, shoots and young sprouts." If the pH value differs too much from the site optimum, the nutrient availability for the plant is limited in case of stressful conditions. Toxic elements can become available to the plant and can then be absorbed. The pH value is one of the first parameters which should be considered for a safe yield.

With regard to lime supply, the situation in Germany is alarming.

What do we have to optimise to achieve soils that provide safe yields? We have to take measures to improve the lime supply. Moreover, we have to build up a supply especially of bivalent cations to maintain the soil structure resp. the soil stability. There is one basic principle: "An optimum lime

supply is indispensable for a sustainable use of the land in a humid climate.”

When asked if it makes sense to react with liming to an intensive rainfall event, Schmidt answers: “Yes. In certain crops it may definitely make sense.” But experience also showed that on some sites the soils have become more stable by reducing the extreme potash fertilisation. In case of rape, it might be helpful to optimise the environment and to stabilise the soil to get the silting problem under control at short notice.

Surveys with regard to the conditions of the soil in Germany show that a large-scale recovery liming would be

necessary in the country. “We simply have to rethink. Analyses about liming in Bavaria show that farmers invest less than an average of 25.00 € per year in liming. [...] Humus alone will not sort the problem and a humus enrichment of the soil will only work if there are sound lime conditions in the soil. This is the only way to generate stable humus in the soil. So we have to push both. We need the humus, and we need the calcium to bring on an aggregation in the soils. Therefore, we have to optimise the base saturation of the soils. This is a measure that is affordable and very economic.”

Leaf fertilisation

In his speech “Leaf fertilisation” (date: 30th January 2023), Henning Jaworski (head of the technical management department at Lebosol Dünger GmbH) deals with the question how it can contribute in view of the occurring weather extremes and what role the element silicon can play in this respect.

There always have been plants and weather extremes. Over millions of years, plants learned to adapt to weather extremes, to conserve their species and to develop further. Within the scope of the climate change, crops get damaged among others because of extreme temperatures combined with dry periods and unforeseen frost events but also with radiation, i.e. a sunburn of the plant. According to Jaworski, we can also observe that the winters become more rain-laden und significantly more humid. “For the crops, this means that they probably only gain momentum rather late in spring as the soils are too wet and as a consequence heat up more slowly.” Another trend that can be observed are more frequent and more secular heat waves in summer. The consequence of a distinct drought is that the nutrient availability for the plant is limited. Moreover, a quick temperature increase accelerates the plant development what in turn results in a postponement and a significant shortening of the development phases. The timespan for a sufficiently good root development is shortened extremely. In such a situation, the plant with its not sufficiently developed roots can take up nutrients via the soil only to a limited extent. In this case, there has to be a little boost via the leaf to supply the plant sufficiently with the required nutrients.

NUTRIENT SUPPLY OF THE PLANTS

A good phosphate supply of the plant is crucial for a good root development. Phosphor provides the energy for the root growth and encourages the regeneration of roots. Thus, the water and nutrient supplies in the soil can be used much better. “After a wet winter, a cold spring and a subsequent slow heating of the soil you could, at the start of the vegetation, carry out the first measure as a leaf fertilisation with phosphor and amino acids.” Thus, the basic supply of the plant is guaranteed, and it is encouraged to develop roots so that it can access water and nutrients even in difficult times.

Jaworski explains that potassium is another element for the drought regulation of the plant. “Potassium is the element that keeps up the turgor. The result is that the transpiration coefficient resp. the non-productive water consumption decreases.” Thus, the plant can better deal with droughts. Trials showed that the plants require a regular potassium flow over the whole season. Thus, the plants better cope with stressful situations.

But boron, too, plays an important role with regard to the water supply of the plants and the root development. We noticed that the potassium uptake of plants that were supplied with enough boron was better. Cereals for example do not require much boron. “The requirement amounts to 50 to 150 g for a yield target of 8 to 9 tons of wheat.” In the trial, an input of a total of 130 g boron in cereals in 2022 achieved a surplus of 7 decitons. The third element that demonstrably plays an important role with regard to the regulation of the water supply of a plant is manganese. Plants with a good manganese supply also consume less water than plants with a lack of manganese.

RADIATION STRESS

The second part of the speech was not only about plant stress caused by heat and drought but also about abiotic radiation stress. Sensitive crops are damaged by solar radiation, the plant virtually gets a sunburn. Within the scope of this too high energy radiation, the plants react in such a way that they produce to many radical oxygen products. These are for example hydrogen peroxide and/or ozone. As more is produced than degraded, cells are destroyed.

So according to Jaworski, you have to find out how to avoid oxidative stress. Among others, antioxidants (radical scavengers) protect plants from radiation stress by giving one of their electrons to the free radicals. Thus, the plant cell remains protected. In this process, the element manganese plays an important role again as well as for example zinc. For the latter sort of detoxicates the oxygen radicals. A third protection option is provided by amino acids which help to build up sinapin acid esters which in turn form a protection inside the plant that does not let the sunlight pass to such a high extent.




Henning Jaworski's summary is: We should provide balanced and good nutrition conditions for the plants by means of an early and repeated application of leaf fertilisation so that they can survive probable stress phases without major damage.

SILICIUM

Silicon is no essential nutrient and thus is not classified as a plant nutrient but as a useful element. It is not considered to be a bio stimulant. The question, of course, is: Where does it fit in? What can we do with this element and especially how can it be useful? Silicon strengthens the tissue and reinforces the cell wall of the plant. It also supports the plant with regard to the regulation of the water supply. Moreover, it encourages the formation of sugar and thus increases root activity. The plant becomes more resistant to mycosis and unalluring to insects. In some crops, for example salad, it also increases the transport and storage stability. "Silicon encourages the phosphorus, potassium and calcium uptake. This also leads to a balance of the elements, i.e. no element is taken up excessively."

If silicon is applied as a leaf fertiliser, the formulation is crucial. For only stabilised ortho silicic acids can be taken up via the leaf.

Jaworski's summary is that plants inevitably are at the mercy of stress phases like cold, heat, drought or radiation. Even if every year is different, we have to create a balanced and good nutritional condition for the plants by means of an early, targeted and repeated application of leaf fertilisers to help them survive possible stress phases without major damage. With regard to the dosage, it is the requirement of the crop that is crucial. The characteristics of the soil (e.g. pH value, nutrient content, water-holding capacity etc.) and things like the susceptibility of the cultivated crop to a lack of nutrients should also be taken into account. To make sure that plants can accomplish an extra performance in relation to their adaptability to different stress factors, you have to be prepared to fertilise more than is required. 



You missed a speech or a discussion?
They are still available after the event.



Fatis 7 AS
HORSCH



 **HORSCH**

#FUTUREGROUND

PREPARE THE SOIL FOR HIGH YIELD POTENTIAL: **FOCUS TD**

The **HORSCH Focus** combines many passes in one machine and thus is very cost-saving and efficient. High output and a lot of equipment options are characteristic for this product. **HORSCH.COM**

- Targeted soil loosening below the seed rows
- Exact fertiliser depot placement in the root area in up to two horizons
- Precise seed placement due to the TurboDisc or the optional TurboEdge seed coulters
- Standard double hopper, can be extended to three components for maximum flexibility

TOGETHER FOR A HEALTHY AGRICULTURE.



► Scan code for more information