

Lentil cultivation and cleaning on the farm - EIP-AGRI Rhizo-Linse project

Lentils return to the Heckengäu region

Lentils are among the oldest crop plants in Central European agriculture and were once a popular food in ancient Egypt, Persia and Mesopotamia. The legume was widespread in Germany until the mid-20th century, but has since disappeared completely from farmers' fields. Over the past decade, lentils have reappeared as a crop grown locally and are cultivated in harmony with nature. Five partners have joined forces in the Rhizo-Linse project to focus on improving and assessing growing conditions in the field in cooperation with local farmers. Lentil farmer Helmut Kayser is one of the farmers involved. His goal is to double his lentil cultivation area this year.

Lentils are a high-quality food, much loved by Swabians. They are packed with nutrients and have a high protein and fibre content. This undemanding legume grows on poor soils and in unfavourable climates and can thrive without fertiliser. Lentil plants do not fare well on fertile soils, as they are slow-growing and can quickly become overgrown with faster growing plants. They are also susceptible to fungal infections under wet conditions and are not very weed-tolerant, meaning that they do not produce a reasonable yield whenever weeds are present. Lentil plants need a companion crop to help them grow upright and achieve stability. In the so-called 'Rhizo-bacteria based optimisation of lentil cultivation taking into account bioeconomic value creation' project, the aim is to strengthen the Heckengäu lentils' defense system by developing a biological vaccine using rhizobium bacteria. It is hoped to increase the lentil yield and thus make lentils more attractive for more farmers. The researchers also hope that the project will enable Swabian Alb farmers to extend crop rotation on their fields in the long term. The project also assesses the bioeconomic potential of lentil cultivation.

From Le Puy lentils to Heckengäu lentils



Heckengäu lentil plants (light green) with oats as a companion crop (dark green) were unable to thrive in optimal conditions in 2020 and 2021 due to bad weather.

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Helmut Kayser is one of the practitioners in the project. He owns ten hectares of farmland and 20 hectares of grassland in Gäufelden, which he runs as a sideline. His day job is managing an equestrian centre with 25 horses where he also gives riding lessons. Six years ago, when he was working as a crop production advisor at the state-run Agricultural Office, he was approached by the district farmers' association and asked whether he wanted to participate in lentil field tests. As he had been looking for a niche product, he agreed to take part and started growing lentils alongside wheat, spelt, malting barley and oats. The lentils he uses originally came from Le Puy in France but have now been re-named Heckengäu lentils after the local region where they are now grown. "The name was chosen in consultation with other farmers in the region," says Kayser. "In the past, a lot of lentils were grown in this area." Last year, Kayser cultivated lentils on a 2.5-hectare plot, and is now planning to extend this to 5 hectares. "I have been trying for the last six summers to improve lentil cultivation. Lentils are plants that always have surprises in store every year."

The lentil harvest stands and falls with the weather conditions and the companion crops used. Linseed dodder and pea plants are well suited as companion plants, but barley and oats less so. Last year when it rained almost non-stop in May and June, the oats were too strong and overgrew the lentils. Moreover, the plants were so wet that threshing was impossible. "The lentils started turning mouldy while they were still in the field. I lost around 1.5 hectares of lentils."

Drying and cleaning lentils: a science in itself

The lentil plants are harvested with a combine harvester. They are then threshed together with the companion crop and weeds. Everything is then dried and separated. It is important to dry lentils immediately after harvesting. However, lentils mature unevenly on the plant, so this is quite a challenge. "While the top pods may be overripe, the ones at the bottom might still be green," says Kayser.

Normally, threshing is done when the lentils have a residual moisture of 20 percent. They are then dried for around a week under a fan generating a warm air stream of around 30 to 35 °C. This works quite well. Kayser converted two farm wagons for drying the lentils on specially placed sieves through which air flows upwards. The lentils' final moisture content should not exceed nine percent. Last year, the air humidity was too high and Kayser was unable to get the residual moisture below 50 percent. He tried without success to dry the lentils using heat. "As soon as temperatures go above 40° C, the lentil protein breaks down and the taste changes," he says.

Drying is followed by cleaning. This is the hardest part and is quite time-consuming. Losses occur due to seeds that have already sprouted or become fungal. Kayser cleans his lentils himself, but does not have his own cleaning plant. So he drives 300 to 400 kg of lentils divided into smaller loads to a farmer 20 km away, stands at his machine for half a day and thoroughly cleans his lentils. First, the combined cleaning system blows dust and fine grains (e.g. linseed dodder) through sieves using an air stream. Vibrating sieves then remove the coarser fractions (barley, oats) – this is where the companion crop is mostly shaken out. The subsequent sieves have round holes the size of the lentils, through which the lentils fall into a grader, which is a kind of drum that works like a gravity separator. This complex cleaning step leads to a pure lentil fraction.

If the result is still not satisfactory, the lentils need to be transferred into a colour sorter, an expensive machine located in a grain mill not far away. This machine has sensors that detect the lentils; those that do not match in colour are shot out via an air stream. The heterogeneity of the lentils can pose quite a problem; this can considerably reduce the yield and lead to huge losses. "The farmers prefer to be able to clean the lentils without a colour sorter, as it usually removes lentils that are otherwise edible," says Kayser.

Not every companion crop can be used efficiently

It takes two to three hours to clean 100 kg of lentils as two to three passages are usually required before a satisfactory result is obtained. Weed and weed seeds are removed during this process, composted and eventually end up back in the field.

There are various different ways of putting the companion crops to good use: Kayser used linseed dodder as a companion plant, but did not do very much with it. He pressed it into oil, but this is a complex process and is not worth the effort considering the low quantity it produces, much lower than the quantity of oil produced from rapeseed. "In addition, linseed dodder oil is very high quality, but turns rancid very quickly, and so cannot be stored for long," Kayser says. Kayser has plans to use linseed dodder again as companion crop this year, but making oil from it will no longer be an option. He intends to use peas as a second companion crop. The type of peas used are not suitable for human consumption, but can be used as cattle feed.

Kayser's lentil yield varies between 150 and 800 kg per hectare; he sells his lentils only in the local area. He has built a small packing station for this and manages to pack and label about 100 kg of lentils in bags in three hours. He sells part of the harvest in his neighbour's farm shop, the rest through a local garden centre and to a high-class restaurant. And it goes without saying that the short distances from the producer to the consumer reduce transport costs.

Since lentil harvest yields in Germany are too low and the technical effort involved far too high, lentil cultivation is not worthwhile on a large scale. Lentils are rather a niche product and regional specialty. Despite all this Kayser still sees lentil cultivation as very promising for the future. He believes that lentils have many advantages: they grow without herbicides and so come with a nature conservation benefit as plants that were once rare start to appear on farmland again. This will also attract new fauna. The rhizobia contribute to greater amounts of nitrogen accumulating in the soil, from which subsequent crops benefit. Considering the vast increase in the price of fertiliser, farmers can consider themselves lucky that the lentils they grow collect nitrogen themselves and so create good growing soil for subsequent crops, wheat for example. Kayser



Helmut Kayser bags his lentil harvest at the specially created packing station.
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The ready-packed, local and natural product: Heckengäu lentils can now be sold in the farm shop.

© Helmut Kayser

believes this could lead to excellent opportunities, and maybe enable farmers to use each other's land. Furthermore, lentils have a long storage life, they retain their quality for several years. "People are also eating less and less meat and need a substitute protein and energy source," he points out. "Lentils are a good plant-based source of protein and energy."

The project will run from March 2019 to early 2022 under the European Agricultural Productivity and Sustainability Innovation Partnership (EIP-AGRI). It will be given a total of €655,500 from the European Agricultural Fund for Rural Development (EAFRD) and the Baden-Württemberg Ministry of Rural Affairs, Food and Consumer Protection.

Article

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2nd article in the EIP-AGRI project "Rhizo-Linse"

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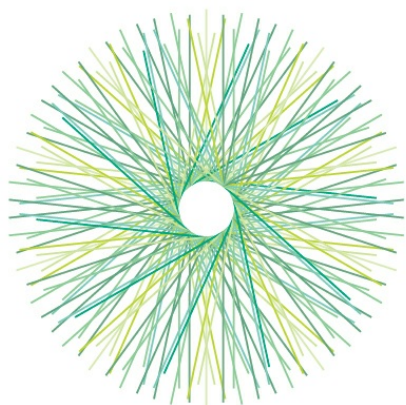
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