

The Food Value Chain of Lupin in Belgium

CROPDIVA – 5.1

Deliverable Information

Title	The Food Value Chain of Lupin in Belgium
Deliverable number	5.1
WP number	5
Author(s)	Margo Degieter, Simoun Rainier Luis Bayudan, Xavier Gellynck
Lead beneficiary	WBF
Type	R: Document, report
Dissemination Level	PU: Public
Due date	June 2022

History of Changes

Version 1.0	Final version (June 2022)
-------------	---------------------------



TABLE OF CONTENT

1.	The value chain of lupin in Belgium	3
1.1	Lupines in Belgium	3
1.2	Results	4
1.2.1	Description of the lupine value chain	4
1.2.2	Overview of the interviews completed	4
1.2.3	Input suppliers	5
1.2.4	Farmers Associations	5
1.2.5	Processing firm	5
1.2.6	Retailing	6
1.3	Discussion	6
1.3.1	Past challenges & successes of the value chain	6
1.3.2	Current and foreseen challenges and chances of the value chain	6
1.3.3	Limitations	7
1.4	Synthesis	7
	References	8

1. THE VALUE CHAIN OF LUPIN IN BELGIUM

1.1 Lupines in Belgium

Lupines (*Lupinus spp.*) are legumes that are less commonly produced in Europe, but are gaining popularity among various producers (Lucas et al., 2015). In terms of the functional benefits of lupines, they are known to be high potential substitutes for the more available legumes such as soy since lupines also have high protein amounts. Moreover, lupines contribute to the maintenance of soil ecosystems by acting as nitrogen fixers, allowing balanced soil quality to be maintained (Gresta et al., 2017).

However, despite these beneficial properties of lupines, the crop is known to contain toxic metabolites which can endanger health, but these are more pronounced in the wild varieties of the crop. Some of the more well-known metabolites are called alkaloids, and these are concentrated in the leaves of the plant (Gresta et al., 2017). Fortunately, multiple lupine varieties have been selectively bred to minimize the contents of these alkaloids, and to minimize the level of food safety risks as well. Nevertheless, the crop remains a viable choice for growing legumes, since they are highly resistant to environmental shocks, and they are able to efficiently maximize nutrients from the soil (Cowling et al., 1997).

In Belgium, lupines are not widely produced, and production quantities are highly dismal and concentrated only among certain producers (FAOSTAT, 2019). In fact, aside from the mainstream varieties of crops, the total production area of lupines averaged around 1.2 ha in Flanders, for 2016 (Timmermans & Van Bellegem, 2021). The significantly low yields of lupine in Belgium, and generally in some European areas, is usually attributed to the relatively small production areas and interest for the crop, thus keeping away large-scale commercial production (Lucas et al., 2015).

Finally, lupines are mainly produced and sold for use as agricultural feed and in addition to livestock fodder, but lupines can also be consumed in human diets. Lupines are often dried and milled into lupine flour, and this flour has been used in a wide variety of bakery applications such as breads and pastries. The flour can also be used in the preparation of pasta, as it has an inherently yellow color, and its high protein content makes it a viable substitute for wheat flour (Lucas et al., 2015). Although production of lupines is not yet mainstream in the European and more so in the Belgian market, examining further the valorization potential of this crop can provide a highly dependable alternative to legume planting in the region.

1.2 Results

1.2.1 Description of the lupine value chain

The value chain for lupines in Belgium is very underdeveloped. Currently, there is no cultivation of lupines on a commercial scale. However, there are a few processors that use lupines in food or feed products. The lupines used for these purposes are imported from other countries. As far as we know there are only two food companies processing lupines for food. The first company uses lupines in plant-based meat-replacements. Their lupine-based products are sold to small, organic food stores. The second company adds pieces of lupine to a bread-mix. On the other hand, lupine is also used to produce feed ingredients. To our knowledge, there is only one processing company that is producing lupine-based feed ingredients. The feed ingredients are sold to feed companies throughout Europe. The value chain of lupine in Belgium is shown in Figure 1.

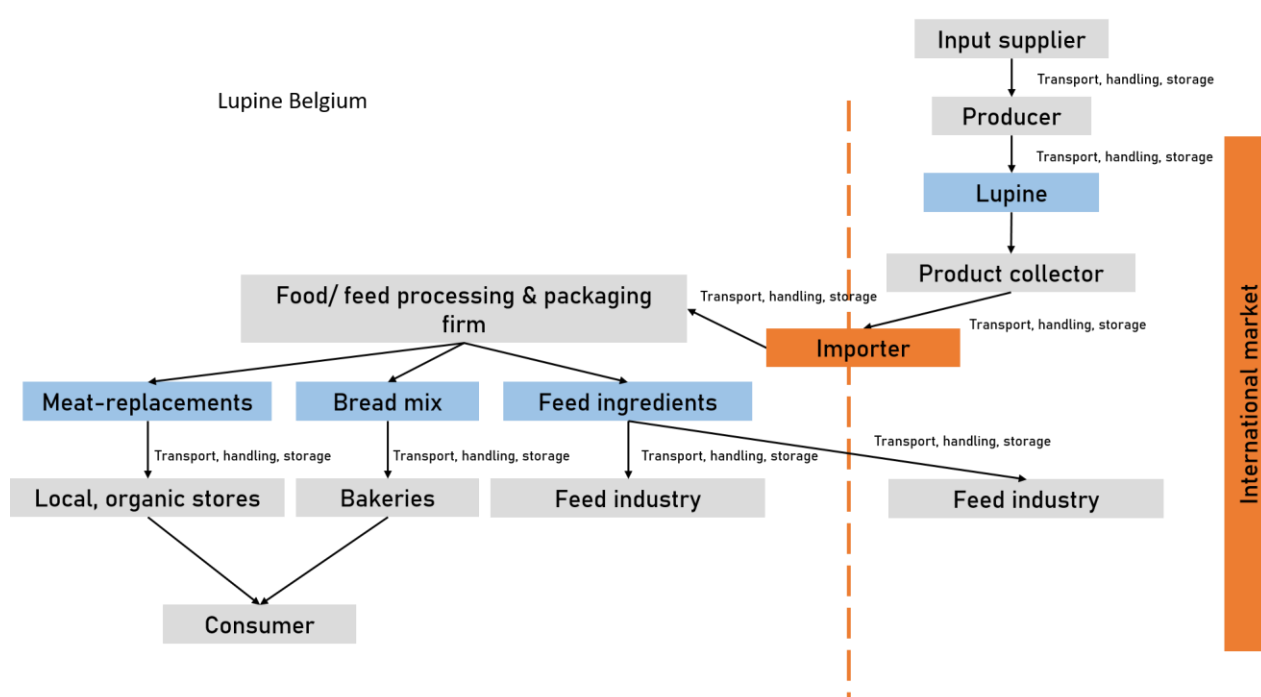


Figure 1: Lupine value chain in Belgium

1.2.2 Overview of the interviews completed

In total 7 interviews took place in order to map the value chain for lupine. Five processors were interviewed, consisting of two processors who use lupine for food, 1 processor who uses lupine for feed and 2 processors who are currently not using lupines in their production chain. Furthermore, a Belgian farmers association and a research institute were interviewed to gain some additional insights into the lupine value chain. The overview of the different interviews is listed in Table 1.

Table 1: Overview of the interviews completed

VC actor	Farmers Association	Research institute	Processor
Number of interviews	1	1	5

1.2.3 Input suppliers

Lupine is only cultivated on a very small scale. Seeds are imported from countries that have a more developed value chain for lupines (e.g. France and Germany).

1.2.4 Farmers Associations

According to the farmers organisation Boerenbond, there is no producer registered to produce Lupines in Belgium. Currently, it can be found in small batches and on research-oriented test fields.

1.2.5 Processing firm

Lupines are both used in the food and feed industry. The use of lupines in the Belgian food industry is very limited and novel. To our knowledge, there are only two companies processing lupines for food. The first company produces one bread mix with small pieces of lupines. The second company, an organic brand that is producing plant-based meat-replacements, has recently started using lupines in only a small selection of their products. Next to lupines, they also use soy, wheat and hemp. The use of lupines in food products can have multiple advantages. The protein profile is beneficial for humans. Furthermore, lupines might be a possible alternative for soy to which some people might be allergic, and which can have a negative connotation to some consumers. Lupines are often seen as a more local crop, even though there is no cultivation in Belgium. Despite the advantages, there are also some disadvantages related to the use of lupines in meat-replacements. Consumers are not familiar with this crop which leads to a low acceptability of lupine-based food products and thus low sales. The company sells their products to small, local, organic food stores.

The use of lupine in the Belgian feed industry is also limited. Only one company that produces lupine-based feed ingredients and materials was found. The company imports lupines mainly from Australia, due to its good and stable nutritional quality compared to lupines from other origins. In the past lupines have also been imported from other countries, including for example Poland, whenever there were problems with the Australian lupine market. Lupines are bought from grain traders and arrive in Europe by boat. The processing (cleaning, breaking, dehulling, toasting, drying and cooling) of lupines is done by the company itself. The feed ingredients are then sold to feed companies in Europe. One of the most important reasons to use lupines in feed products is its low iron and high protein content. A high iron content in feed leads to a deeper red colour of the final meat product, which for some types of meat is undesired. Currently there are some issues related to price volatility of lupines and issues related to the logistics. The company tries to tackle these issues by negotiating with the suppliers and by having the capacity to store surpluses of the raw materials.

Some Belgian milling firms mentioned that they don't want to include lupines in their processing facility since lupines are a listed allergen. Including lupines in their production would lead to additional work and costs for maintaining the allergen safety for other lupine-free products.

1.2.6 Retailing

Lupines-based food products are very rare in Belgian retail. Only small, organic food stores are selling the lupine-based meat-replacements.

1.3 Discussion

1.3.1 Past challenges & successes of the value chain

The value chain of lupine in Belgium is very underdeveloped. At the moment there are only small-scale producers and a limited number of processors. The processing industry has only recently started to include lupines in their food and feed products. As a result of the novel lupine chain in Belgium, no conclusions can be drawn from the past.

1.3.2 Current and foreseen challenges and chances of the value chain

Belgian consumers are not yet familiar with lupine, which leads to a low acceptance. If the demand does not increase, and the cultivation risk for farmers stays high, the value chain will not further develop. A possible solution to improve consumers' acceptability of lupine is to raise their awareness related to the environmental and health benefits of consuming lupine. This could be done by developing appropriate marketing strategies for the final products. Besides the efforts of the processing industry, the government could also contribute to raising awareness. A clear communication of the benefits related to eating plant-based and the high environmental impact of animal protein could further push consumers into choosing more sustainable food options. Furthermore, the cultivation of lupines in Belgium is almost non-existent, which leads to the import of lupine. Investing more in research to find better varieties suitable for Belgium would lead to a higher local production. This would also improve the environmental burden and thus potentially lead to a higher demand from environment-conscious consumers. Finally, farmers are reluctant to start cultivating lupine due to its risky nature compared to more established crops. Better varieties would also decrease the risks for farmers. Furthermore, technical support and more access to information related to lupine production could improve the willingness to grow lupine.

Table 2: Main challenges of the Belgian lupine value chain

VC actor	3-5 main challenges (order: most important first)	Strategies undertaken/to undertake	Potential & benefits for the actor in the VC chain
Processor	1. Consumer demand of lupine-based products is low	1. Raise awareness regarding the environmental and health benefits of lupine	1. If consumer acceptability increases, the demand for lupine- based products will rise

Seed supplier	2. Almost no existing cultivation of lupine in Belgium	2. More research to find better varieties	2. More biodiversity, sustainable crops
farmer	3. The cultivation of lupine is risky	3. More research to find better varieties, more technical support for farmers, better access to information	3. More biodiversity, positive effect on the land and subsequent crops

1.3.3 Limitations

A very limited amount of interviews were conducted due to the limited amount of Belgian stakeholders in the lupine value chain.

1.4 Synthesis

The value chain for lupine is very limited. Lupines are not grown in Belgium on a commercial scale due to the high risks compared to other crops. More research and better support for farmers could tackle this issue. The number of companies processing lupines for food or feed products is limited as well. Consumers are unfamiliar with lupine which leads to low acceptability of lupine-based products. Good marketing strategies could raise awareness of the environmental and health benefits of consuming lupines. Once the demand for lupine-based products will increase, the value chain will automatically further develop. It can be concluded that there is a huge potential for lupine-based products produced with local lupine, if an appropriate marketing strategy is applied, since competition is still very limited. The production and processing of alternative protein is much more developed in our neighbouring countries, which proves the high potential of lupine in West-European countries.

REFERENCES

- Cowling A., Buirchell B., Tapia, M. (1998). Lupin. *Lupinus L.* Promoting the conservation and use of underutilized and neglected crops. 23. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute: Rome, Italy.
- FAOSTAT. (2019). Food and Agriculture Organization Statistical Database: Rome
- Gresta, F., Wink, M., Prins, U., Abberton, M., Capraro, J., Scarafoni, A., & Hill, G. (2017). Lupins in European cropping systems. In D. Murphy-Bokern, F. L. Stoddard, & C. A. Watson (Eds.), *Legumes in cropping systems* (pp. 88–108). CABI.
<https://doi.org/10.1079/9781780644981.0088>
- Lucas, M. M., Stoddard, F., Annicchiarico, P., Frias, J., Martinez-Villaluenga, C., Sussmann, D., Duranti, M., Seger, A., Zander, P., & Pueyo, J. (2015). The future of lupin as a protein crop in Europe. *Frontiers in Plant Science*, 6.
<https://www.frontiersin.org/article/10.3389/fpls.2015.00705>
- Timmermans I. & Van Bellegem L. (2021). *De biologische landbouw in 2020, Departement Landbouw en Visserij, Brussel*.
[https://www.bioforum.be/sites/default/files/2021-07/20210705%20Biorapport 2020 .pdf](https://www.bioforum.be/sites/default/files/2021-07/20210705%20Biorapport%202020.pdf)