

The Food Value Chain of Hulles Barley in Czechia CROPDIVA – 5.1

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1. THE VALUE CHAIN OF HULL-LESS BARLEY IN THE CZECH REPUBLIC

1.1 Hull-less Barley in the Czech Republic

Hull-less Barley represents in the context of Czech agriculture a minor crop. Barley in general takes up around 25% (8,6% winter barley and 16,3% spring barley) of land dedicated to production of cereals in the Czech Republic. However, hull-less barley is not recognized by official statistics and therefore there is no exact information on land usage, production and trade of hull-less barley in the Czech Republic (MZE 2020).

This situation suggests that hull-less barley is not a part of mainstream agricultural production. Food products made of hull-less barley represent a very tiny niche market and the entire value chain is in very early stage of development.

Currently there are two varieties of hull-less barley that have originated in the Czech Republic. Both of them come from Zemědělský výzkumný ústav Kroměříž, s.r.o. (Agricultural research institute Kroměříž, Ltd.) that also a property rights owner to these varieties. The first one (*AF Lucius*) was registered in 2009 and the second one (*AF Cesar*) was registered in 2014 VUKROM (2022).

The research institute is a key actor on the level of breeding. At the same time, the institute initiated or was directly engaged in several project that were aimed on production of food products using hull-less barley. This includes production of (1) bread, (2) pot barley and (3) extruded crisp bread. None of these products was successful in sense of mainstreaming the product. All of them have been offered only in limited scale. At this moment there is no a single food product that would be based on Czech varieties of hull-less barley and successfully selling.

Despite the low proliferation of the hull-less barley in the Czech Republic, the case can provide useful look at common barriers that prevent upscaling of underutilized crops.

1.2 Overview of the interviews completed

Primary data for the case study was collected through semi-standardized interviews with selected actors on each level of the value chain. Actors were sampled purposefully in order to collect the most relevant information on their experience and practices.

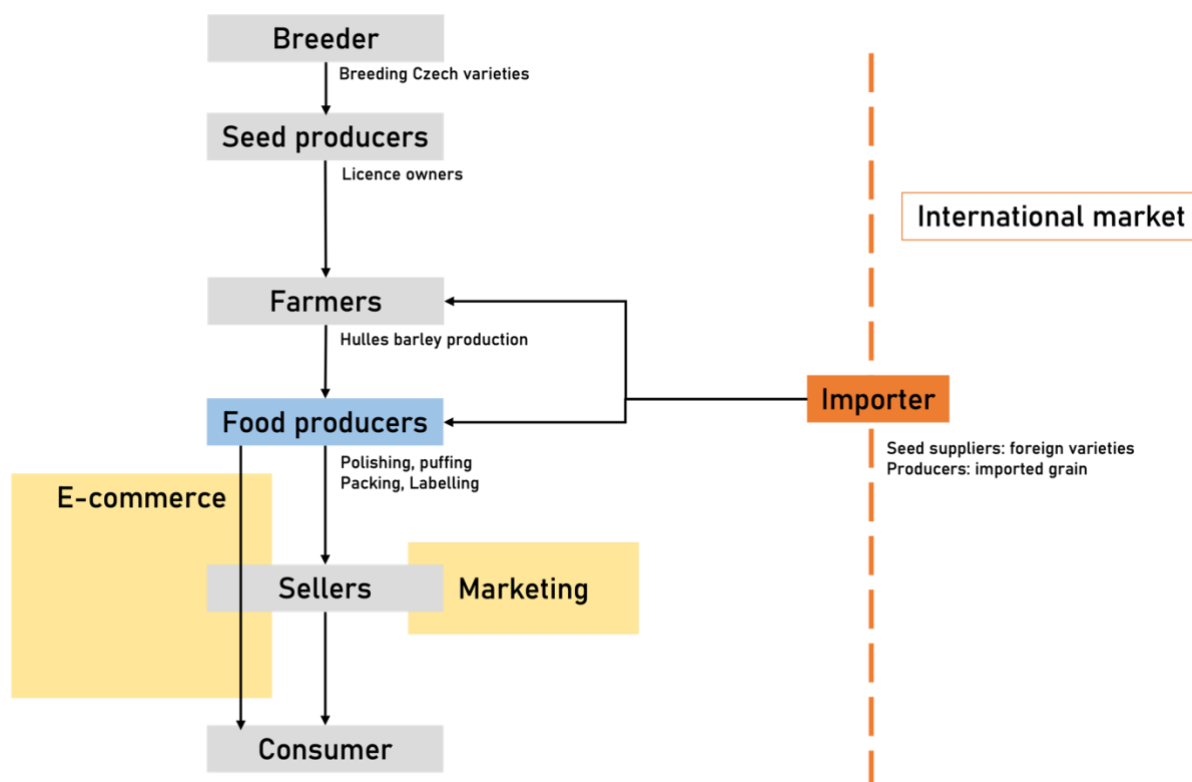
There were interviewed 13 actors on different levels of the value chain. Interviews were conducted face to face or over telephone. This specifically included: 1 researcher, 3 breeders, 1 seed trader, 2 farmers, 4 processors and 2 retailers. Some actors were engaged in more than one process of the value chain. Overall there were interviewed 13 actors in 9 organization. With respect to the extent of the study, the sample provided a baseline for generating saturated explanation of the case.

VC actor	Input supplier	Producer	Collector	Processor	Retailer
Number of interviews	5	2	0	4	2

1.3 Results

1.3.1 Description of the hull-less barley value chain

The value chain for hull-less barley currently includes large gap between breeding and processing. This situation results from the fact that Czech varieties of hull-less barley originated in the research institute without a direct link with producers and processors. The new varieties of hull-less barley were produced as an outcome of a research programme carried out in the research institute. The research institute attempted several times to transfer the hull-less barley varieties in practice, i.e. launch new food products made of hull-less barley. This included (1) bread, (2) extruded crisp bread and (3) pot barley.



1.3.2 Researcher, breeders, seed producers

The first level of the VC includes research and breeding activities. In case of the studied VC these processes are conducted by a single actor that has got unique position in the Czech Republic. The Agricultural Research Institute Kroměříž (VÚKROM) has conducted a long-term research focused on new varieties of hull-less barley. VÚKROM produced and successfully registered two varieties – *AF Lucius* and *AF Cesar*.

The first variety *Lucius* was registered in 2009. It is suitable for organic agriculture. Main usage of this hull-less barley variety is for food production, but it is possible to use it as a feed as well. The second variety *Cesar* was registered in 2014. This variety is more suitable for conventional agriculture. The main usage of this variety is in food production.

The both varieties include a high share of proteins and high share of beta-glucans (i.e. a specific form of a soluble dietary fiber that is linked to many potential health benefits) (Vaculová, 2015). These varieties have been introduced as cereal that 'will be used for production of healthy foods' (Bouma, 2014).

VÚKROM is owner the licences to both varieties of the hull-less barley. Licence agreement has been signed with two companies. However, it was mentioned during the interviews with the VÚKROM representatives that cooperation with those companies exists only on a formal level. The research institute was not able to intensify the cooperation. The research institute expect the private companies (i.e. the licence owners) to integrate further activities along the VC. They would like them not only to trade the seeds, but also invest more in promoting the new varieties of hull-less barley and/or support development of new food products.

VC capacities and organization

Key actor in the area of breeding has repeatedly attempted several times to organize further activities in area of production, trade and food processing. However, their capacities are quite limited due to the resources and official mission of the research institute. These attempts were made within several research project that enabled opening collaboration with seed producers, farmers, food processors and food producers. Such collaboration was limited by the duration of a given research project and typically resulted in a prototype food product.

Research on hull-less barley in the Czech Republic has been concentrated in the VÚKROM. There is no information that research on hull-less barley would be carried out at other research institutes and agricultural universities.

Market conditions

Seeds of the hull-less barley are offered by one of the largest organic agricultural enterprises in the Czech Republic PRO-BIO. This company is owner of the licence and therefore sell hull-less barley seeds to farmers. The company is also agricultural producer, food processor, trader and food producer. Demand for hull-less barley seeds in the Czech Republic is very low.

1.3.3 Producers

Number of hull-less barley producers in the Czech Republic is extremely low. Despite the positive aspects related to healthy benefits, the hull-less barley is not grown by farmers. Main reason, from the farmers' point of view, is the alternative costs. It is less risky and more profitable to focus on

conventional cereals, such as wheat. What a more the available Czech varieties of hull-less barley give lower yields than German varieties of this crop.

During the field work, we have managed to interview only one company that produces hull-less barley.

1.3.4 Food processors and food producers

We are not aware of a food processing activities that would use hull-less barley. It is possible to analyse previous attempts that indicate a potential of this crop.

BETABread. In the past the research institute cooperated with food processing company that processed hull-less barley in mills for flour production. The flour was used in unique bakery products, such as 'BETABread with barley' (Borová, 2015). Main goal was to produce a mix of flours that would allow to prepare dough and bake bread in classic way, but with enhanced healthy benefits due to hull-less barley. The flour mixture included 20% of hull-less barley. Bread dough prepared from this mixture could be processed manually or with the use of machines. It was indicated that such bread included 6% of fibre and 1 gram of beta-glucans per portion (125 grams).

Pot Barley. Another example of processing hull-less barley for food products was 'Pot Barley'. This products was introduced as an outcome of a research project coordinated by the research institute VÚKROM. Pot Barley was introduced in 2018. Pot barley are basically groat that are specifically made of variety *AF Cesar*. The groat have a lighter colour (than typical barley groat), require less time of cooking and have an improved taste. The grains are lightly polished to preserve specific nutritional qualities. Main feature of the hull-less barley groat is the high amount of fibre and high amount of beta-glucans and . The 'Pot Barley' was presented at a national agricultural exhibition in 2018 as a 'super-food' and was awarded prize (AVO 2018). The product was available only to demonstrate an outcome of the given research project. The consortium of research partners was not able to find a company that would be interested in launching this product in a large scale.

Crisp Bread represents another tangible food product that reflect positive dietary features of the hull-less barley. The crisp bread is based on a technology of puffed bakery (moisture cereals are fed into expansion machine that includes high temperature and make grains puff). Crisp bread is made of different cereals and is highly popular among customers oriented on healthy life-style. The research institute VÚKROM entered into cooperation with a producer to test a potential usage of hull-less barley in this area. The processing company proved that it was possible to produce a puffed bread of organic hull-less barley. According to the interviews, the producer was willing to launch such product in a large scale and export it abroad. However, there was a lack of organic producers in the Czech Republic that would be able to produce and deliver hull-less barley cereals in adequate quality and quantity.

1.3.5 Food sellers

At this moment there are no commercial sellers that would offer food products made of hull-less barley. The previous attempts included BETABread, Barley Pot and puffed bread. As was explained above those food products were associated with research projects that were coordinated by the research institute. Their purpose was to demonstrate potentials of the hull-less barley varieties, however, transfer of these products into commercial area was not successful.

It is also possible to find offers of hull-less barley groat (whole grains for cooking), but origin of this product is unknown. It is assumed that this is hull-less barley groat are just imported to the Czech Republic and packed.

1.4 Discussion

Hull-less barley can be considered a typical example of a minor crop in the Czech context. A potential of this crops (as well as food products made of this crop) is in a sharp contrast with utilization of this crop in agriculture.

Researchers and breeders managed to register two varieties with excellent potential in human diets. Products of hull-less barley represent the so-called functional food. The hull-less varieties of barley are per se whole grain cereals. Gentle polishing of the grain surface enable to keep the main dietary potential of the grain. This includes a relatively high share of fibre and particularly beta-glucans.

In the Czech context a VC for hull-less barley and its products does not exist in stable form. The main reason is that the initiative for utilization of hull-less barley originates mainly from the level of breeding. The long-term research activities of the research institute VÚKROM resulted in registration of two varieties and several attempts to demonstrate their potentials in the area of food processing and food production. However, those attempts resulted only on demonstration of possible products. Their production and marketing was never scaled up on a larger level.

According to the interviews conducted in the research institute VÚKROM, there is no demand for hull-less barley on the side of farmers. However, the main reason is that there is not demand for products made of hull-less barley in general.

Food products made of hull-less barley have unique qualities that need to be recognized by consumers in order to purchase them. Health benefits of beta-glucans include a promising potential, however, consumers do not have a knowledge to appraise those qualities at all. Launching a new product and support it with a promotion campaign that would explain and convince consumers about positive impacts on health require large investments.

Czech market is fairly small. Numerous studies show that Czech consumers are very sensitive to price of food products. Food products associated with hull-less barley, namely the beta-glucans, represent a typical example of a credence goods (Nelson 1970). These products include qualities that cannot be verified by senses. Customers thus need a specific information about the quality to determine a worth of such product. One can assume that Czech consumers do not have a needed knowledge to appreciate the quality of such products, select them (among other possibilities) and pay premium prices for them.

Our empirical study of the hull-less barley value chain show a certain potential for producing food products made of hull-less barley for the export. However, supply of the hull-less barley among producers is too small for such production and export, particularly in organic quality, that would be demanded for such purpose.

Paradoxically, the consumers' demand on domestic market is too small for farmers to produce hull-less barley. At the same time, an international demand is too high, therefore domestic farmers are not able to respond to it. The values chain as such does not therefore exist in a coherent form.

1.4.1 Past challenges & successes of the value chain

Breeding

Research organization VÚKROM developed two original varieties of Hulled Barley. The first one was appropriate for cultivation on organic farms, the second one then conventional farms. Registration of these two varieties is an outcome of a long-term research activities. The registered varieties have excellent potential for producing the so-called functional food. It is one of the successes of this VC.

The available varieties of hull-less have lower yields in comparison to other varieties of hull-less barley from Germany. At the same time, yields of the hull-less barley provide lower yields than a mainstream spring barley. In order to make the hull-less barley attractive to farmers (who prefer crops with the high yields) it is needed to communicate unique features of this crop. It is not possible to compete in quantity of production.

Food production

Hull-less barley has got unique qualities with potential health benefits. Previous research projects demonstrate that it is possible to process hull-less barley and produce food products with unique qualities. This can be considered a success of the value chain. This experience also point out two challenges that crucial for further development of the value chain: (1) organization of the value chain and (2) promotion of the unique qualities related to food products made of hull-less barley.

1.4.2 Current and foreseen challenges and chances of the value chain

Organization of the value chain

Exploration of the current VC for hull-less barley in the Czech Republic suggest that hull-less barley as well as the food products made of this crop represent a tiny niche market. Value chain at this moment does form a coherent system that would link actors on each level in optimal way. Main reason is that the main initiative for developing such valuation originates from the level of research and breeding. There is no market for hull-less barley products on the side of consumers, therefore food producers are not motivated to produce such products and do not demand hull-less barley grains from farmers. Owner of the registration (i.e. the research institute) does not have a capacity to transfer their 'technology' to practice and turn it into a tangible food products.

Hull-less barley and food products made of this crop will most likely remain a niche product for some period of time. If such product shall become successful, it needs to be managed in a specific way. One of the key conditions is to support cooperation between actors (namely farmers and food producers) and at the same time support marketing of these products.

Promotion of the unique qualities related to food products

Functional food products operate on a very competitive market. Unique selling proposition of the hull-less barley (resp. food products) is the amount of beta-glucans. If processors and consumers are not capable of distinguishing these qualities, there is no reason to buy hull-less barley. It can be easily substituted by spring barley that offers higher yields and also a higher profitability.

In order to appreciate unique qualities of hull-less barley, consumers need to be knowledgeable about their qualities and believe in positive impacts on health. This is a typical example of the so-called credence goods (see above in Discussion section) that requires consumers to know about and trust specific qualities of products. Positive impacts of beta-glucans are per se 'invisible'.

Promoting the qualities of hull-less barley will be difficult because it is related to contested meanings of 'human health' and 'healthy products'. However, promoting the qualities of hull-less and potential impacts on human health is the only possibility how to create a market for these products.

VC actor	3-5 main challenges (order: most important first)	Strategies undertaken/to undertake	Potential & benefits for the actor in the VC chain	Remarks & implications
Breeders	<ol style="list-style-type: none"> 1. Increase yields of the Czech varieties 2. Promote specific qualities of hull-less barley (to farmers and processors) 3. Support cooperation with other actors in VC 	<ol style="list-style-type: none"> 1. No strategy at this moment 2. New cooperation with seed traders 3. New demonstration and collaboration projects 	<ol style="list-style-type: none"> 1. Hull-less barley become more competitive in comparison to other cereals 2. Higher potential for acknowledging specific qualities of hull-less barley 3. Increased demand for hull-less barley seeds 	
Farmers	<ol style="list-style-type: none"> 1. Acknowledge potential of hull-less barley for food products 2. Support cooperation with other actors in VC 	<ol style="list-style-type: none"> 1. Information campaigns for farmers 2. New demonstration and collaboration projects 	<ol style="list-style-type: none"> 1. Higher potential for acknowledging specific qualities of hull-less barley 2. Increased demand for hull-less barley grains 	
Food producers	<ol style="list-style-type: none"> 1. Acknowledge potential of hull-less barley for food products 2. Innovative food products 3. Marketing of the new food products 	<ol style="list-style-type: none"> 1. New demonstration and collaboration projects 	<ol style="list-style-type: none"> 1. Higher potential for acknowledging specific qualities of hull-less barley 2. Increased supply of hull-less barley grains 	
Food Sellers	<ol style="list-style-type: none"> 1. Provide more information to consumers (education) 2. Marketing of the new food products 	<ol style="list-style-type: none"> 1. Investment in marketing 	<ol style="list-style-type: none"> 1. Increased consumers' demand for hull-less barley food products 	

1.4.3 Limitations

The empirical study has followed a general guidelines prepared for the CROPDIVA project, Task 5.1. The case study research (Yin 2009) applied in this specific task is based on qualitative approach in

social sciences. Main goal of the study is to provide a specific insights into relations, actors and their practices within the selected value chain. Main limitations are derived from the basic features of this type of research. Findings from the study can be generalized for understanding other cases that function in the same or similar context.

1.5 Synthesis

The value chain for hull-less barley is not fully integrated. Hull-less barley represent a minor crop that has been promoted through breeding activities of a research institute. Previous attempts to utilize hull-less barley in food processing and food production was not very successful. None of the food products have become a mainstream. At this moment there is no consumers' market for food products made of hull-less barley. Main reason is that consumers (as well as other actors within the values chain) do not appraise unique features of the hull-less barley and their potential for healthy lifestyle. Under this condition food producers are not motivated to develop and sell products based on hull-less barley, which undermines demand for hull-less barley on the level of primary production. Despite the potential of hull-less barley in human diets, information for consumers are not available.

ANNEX



Figure 1 BETAbread with barley (Source: Borová, 2015)



Figure 2 Pot Barley (Source: AVO 2018)

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