The Food Value Chain of Oat in Austria

CROPDIVA – 5.1

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ABBREVIATIONS

AGES	Austrian Agency for Health and Food Safety (Österreichische Agentur für Gesundheit und Ernährungssicherheit GmbH)
BAES	Bundesamt für Ernährungssicherheit (Federal Office for Food Safety)
BMLRT	Federal Ministry Republic of Austria Agriculture, Regions and Tourism (Bundesministerium Landwirtschaft, Regionen und Tourismus)
dt	deciton(s), $^{1}/_{10}$ of a metric ton
ha	hectare(s)
VC	value chain
VCA	value chain analysis

1. THE VALUE CHAIN OF OAT IN AUSTRIA

1.1 Oats in Austria

In Austria there are three oat cereal varieties listed for admission: Winter Oats (*Avena sativa L.),* Spring Oats (*Avena sativa L.*) and Naked Oats (*Avena nuda L.*) (BAES, 2022). Oats are cultivated almost exclusively as summer crops. In the stocked summer range, currently only yellow oats are represented. However, the scepticism often expressed by practitioners towards white oat varieties is not justified. Winter oats were registered for the first time in 2001. Winter oats show a higher yield potential due to the longer growing season. However, frost tolerance is lower compared to other winter cereals. Winter damage is a major reason for the yield fluctuations.

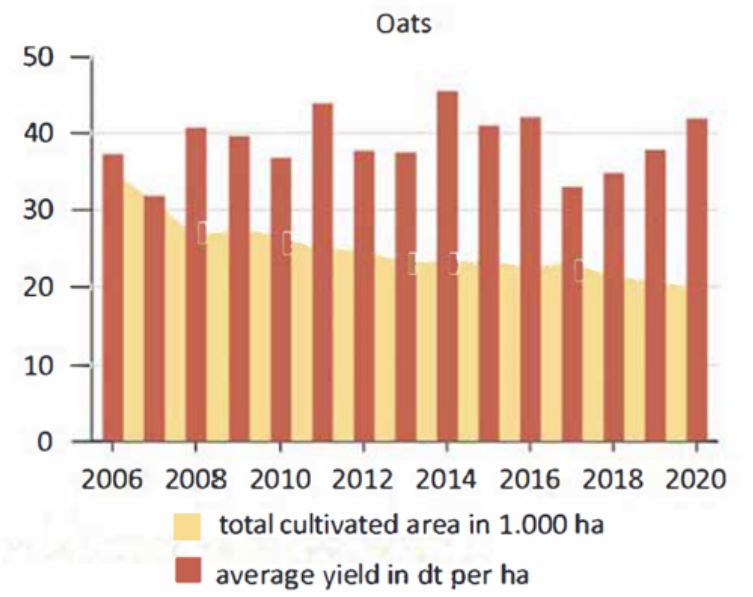

Figure 1. Oats: Total cultivated area and average yield (Statistik Austria, 2021)

In 2020, oats covered a total cultivated area of 20,135 ha and yielded in total 84,461 tons. In 1990, the cultivated area was three times higher (62,000 ha), revealing a massive decrease in cultivated area over the past 30 years. The average yield in 2020 accounted for 41,9 decitons (dt) per hectare (Statistik Austria, 2021). The naked oats yield only 50 to 65% of the yield from newer varieties – namely yellow or white oat. Especially organic farms grow naked oats for marketing oat kernels directly. Green oats have some importance for cattle farms and Biogas producers. About 830 ha of seed multiplication were recognized in 2020 (Austrian Federal Office for Food Safety (BAES), n.d.). Hulled oats and quality forage oats are produced mainly in the “Waldviertel” region which is located in Lower Austria (half of the total acreage of oat is located in Lower Austria) because of prevailing conditions such as sufficient and well-distributed water supply, cool temperature and adequate soils(Bio Austria, n.d.). Green oats – which is used, for example, as a cover crop for clover, clover-grass, or reseeding of permanent grassland –still have a certain importance in ruminant feeding (Austrian Federal Office for Food Safety (BAES), n.d.).

Within the last 20 years, the cultivated area of organically grown oats has doubled. However, 8.682 ha is a small acreage compared to wheat production. 40% of the total cultivated area with oats is organic (8.700 ha out of 20.000 ha) (BMLRT, 2021).

The self-sufficiency rate of oats is calculated at 86% (Statistik Austria, 2021). In the period 2019/2020 a total of 90,000 tons of oats were consumed of which two thirds (60,000 t) were used as animal feed,

and one third was used for food (25,000 t) and other purposes. Oats are mainly used on-farm, a small proportion of animal feed oats are being sold on the market. Fodder oats are mainly used in cattle breeding and for horses.
Industrial oats (hulled oats) must first be dehulled (hulled). The kernels are processed into oat flakes, oat flour, oat groats, edible bran, oat drinks, etc. The average consumption of oats per capita and year for foodstuffs is 1.3 to 1.5 kg or 1.6 to 2.0 kg of raw material. Small quantities of oats are also used as an ingredient in high-fiber breads and pastries and for alcohol production (oat brandy).

1.2 Overview of the interviews completed

The interview partners in the Austrian Oat value chain have been collected over internet desk research, review of professional, technical articles, search of business directories, and requests to associations of the Austrian agriculture (for example BioAustria, the largest association of organic farmers in Austria, or the Austrian Chamber of Agriculture, the largest governmental extension service in Austria). Furthermore, the interview partners indicated relevant interview partners in the Oat value chain. Dependent on their activity and engagement with other CROPDIVA crops some interview partners – seed suppliers, processors, wholesalers or retailers – have been interviewed also to other CROPDIVA crops. One interview partner has been interviewed about two different levels in the value chain (Oat and other CROPDIVA crops), because he was engaged with business activities in both of them.

Table 1. Overview of the number of interviews performed for each VC actor.

VC actors	Number of interviews
Seed supplier, seed multiplier	4(1 via telephone)
Seed wholesaler	1
Producer (farmer)	3
Wholesaler	1
Food processor	6
Wholesaler	2
Retailer (directly to endconsumer)	1

Table 1 shows that 18 interviews have been made, 17 of them via Zoom video conferences and one by telephone (1 interview partner was processor and producer/farmer and has been counted in each of this functions). There is a distinct wholesaler level between each of the main stages of the VC; we succeeded in identifying and recruiting a wholesaler at each of these in-between stages of the VC. Interviews were made on each level of the value chain. No interviews have been made in the oat feed value chain.

1.3 Results: Oat as food

1.3.1 Description of the oat food value chain

The Austrian oat value chain is multi-layered and even more complex compared to other CROPDIVA crops, because of a relatively large variety of oat food products in Austrian and the various ways (seeds, oat, oat products) oat is taking from supplier as well as demand side. Most of the seeds are imported from German growers. For decades, oat was neglected by the food sector in Austria as a healthy food alternative. Therefore, the number of Austria growers reduced to actually only one significant company. To some extent, available oat varieties are cultivated and propagated by a few Austrian farmers.

Variety specific propagation and production is taking place in Austria and on the international market. Apparently, there seems to be no huge interest of large Austrian seed multipliers to breed, advance, and propagate new oat varieties (the main reason for that seems to be too low prices and low yields per hectare).
Therefore, Austrian farmers obtain the seeds from seed producers or wholesalers from Germany, or from Austrian seed propagators. Farmers sell the harvested oat either directly to food processors from the first or second stage or to a wholesaler. The food products made from or with ingredients of oat (in particular oat flakes, but also cereals, muesli bars, oat milk and yoghurt, spicey sauces, etc.) are sold from the food processor via wholesalers, retailers, or gastronomy to the consumer. Some food processors also sell directly to consumers. Retailers encompass a variety of outlets such as supermarkets, bakeries, drug stores, health food stores, or (organic) specialist stores.

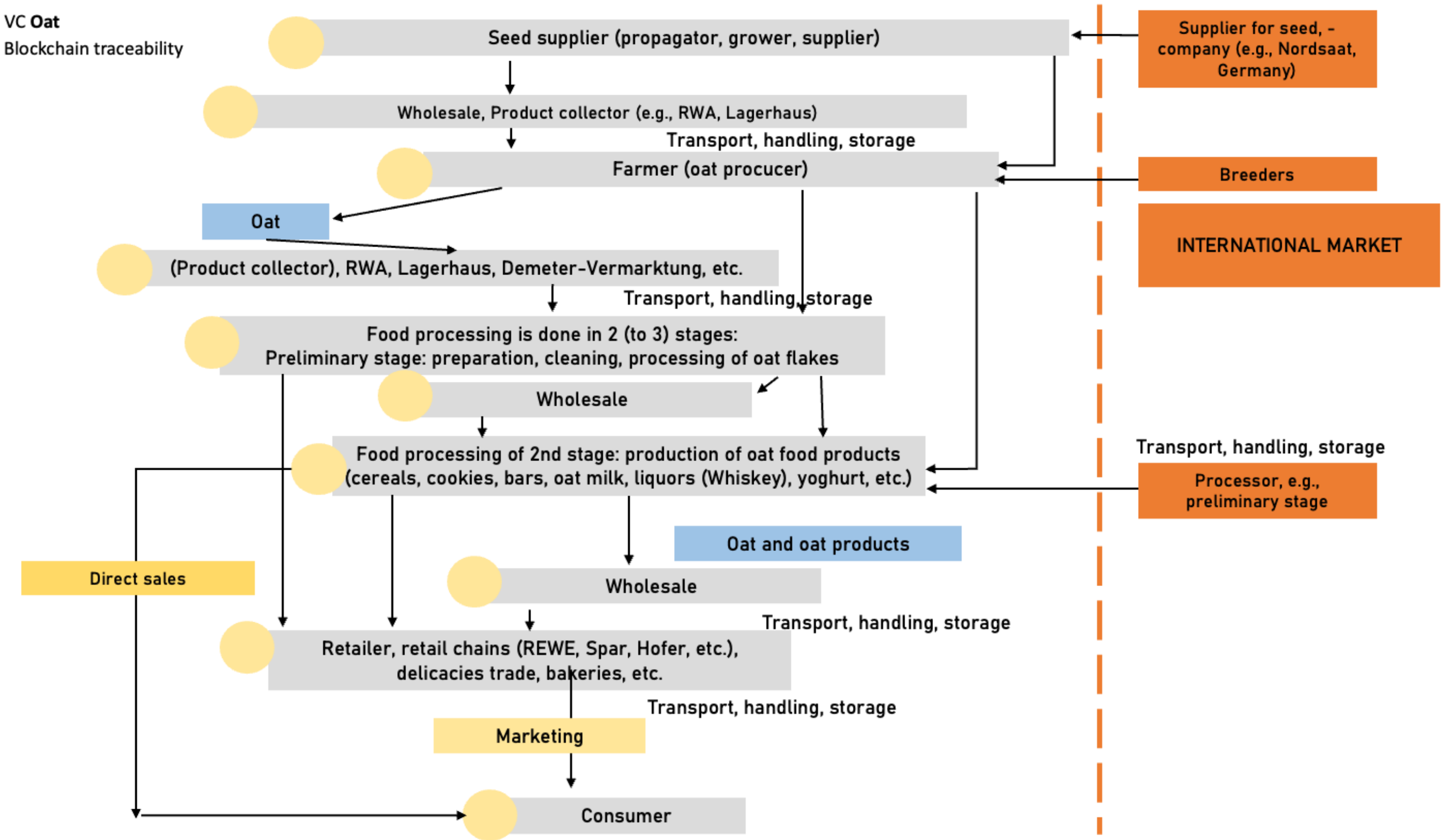

Figure 2. Austrian oat food value chain map

1.3.2 Input suppliers (growers, propagators, suppliers)

Actually, there is only one professional grower in Austria that is relevant (Edelhof). This company started in 1903 with breeding rye. In the 1920ies, it started breeding oat varieties. There are a few small Austrian farmers breeding oat as well, but overall, these farms are not market relevant. Confirming the breeders, most of oat (about 90%) is used for feedstuff. The growers in Austria get the basic seeds from a German seed supplier (Nordsaat), from the UK and CZ.
The idea to sell oat is not new as oat seeds are produced for a long time and oat is an “old” product. The smaller seed producers started with small batches, and continuously increased production as the market accepted the product. Market trends such as veganism, less meat consumption promoted the acceptance significantly. Confirming the market relevant seed producer, market entry is no problem but

availability is an issue as oat acreage decreased (only about 20,000 ha left). As most of the oat is cultivated for feed, demand decreased as horse husbandry decreased as well. And, it was mentioned that, for instance, in Scandinavian countries oat flakes have are much important as breakfast cereals which pushes the market significantly.

VC capacities and organization

Vertical and diagonal linkages: The most important vertical linkage is a German company (Nordsaat), but also UK and CZ seed companies are relevant. Procurement is not problematic. There most important horizontal linkages reported are the one with the biggest agricultural component supplier (RWA Lagerhaus). The smaller seed companies sell their products mainly to wholesalers, small batches are going directly to other farmers. In general, wholesalers (in particular RWA) are the dominating partner in selling the products.

Knowledge and technology of actors: Suppliers had access to knowledge from expertise of the University of Natural Resources and Life Sciences, Vienna. Other sources of information are international congresses, Internet forums and other online support, expertise coming from other farmers, trial and error on own farms, technical articles in professional journals, and last but no least discussion with market partners within the VC.

Entry barriers: There are no major entry barriers. Initial problems might occur as with any new crop when starting cultivation. Also, if a company decides to leave the market again, there are no huge barriers. However, the main supplier has an official order to maintain oat breeding and is also part of an agricultural school of Lower Austria. For this company, it would be difficult to stop breeding oat and the interviewee also sees a positive market trend for oat food.

Resource and infrastructure

Inputs availability: In general, the seed producers reported problems with recruiting employees, it is difficult to find highly motivated people with good skills. Further, one company reported problems in getting inoculants from a foreign company as supply chains were disrupted. But in general, the interviewees reported no significant issues.

Existing and required infrastructure: Oat is an old product, infrastructure (technology, equipment and machines) is not an issue.

Logistical issues: The production is mainly taken care of by the wholesalers, delivery by seed producers themselves and collection by farmers were also reported.

Volume & capacity of processing facilities: For the following years the capacities will rather not be increased. The interviewees estimated no significant boost in the demand, so the actual production seems to be sufficient. Further, limited access to qualified labour force seems to be an obstacle. Storage is also a limiting factor as oat needs a lot of storage space.

Market conditions

Market trends and demand: In Austria, market participants ignored oat as a food product in the past. This also influenced prices and income opportunities negatively. There are too few seed producers in Austria, breeding progress is limited, in particular in comparison to other crops which results in limited incentives for farmers to grow oat. Altogether, progress will only be achieved if demand for oat in the market grows. However, confirming the interviewees there are too many alternatives available and, in general, oat is not really considered to be a niche product even though oat food products do not have the same importance in Austria compared to Scandinavian countries.

Oat is gaining market relevance due to trends such as veganism, vegetarianism, less meat consumption, growing health and environmental consciousness, etc. Food processors are therefore required to develop new food innovations with oat. Further, higher expenses in advertising and PR are considered to help developing the market for oat products, also to inform consumers about the health benefits of oat and to create a USP for oat products. Oat contains gluten, this might influence positioning strategies for oat products.

In general, the interviewees described the relations to their customers (mainly wholesalers were mentioned) as stable, friendly, and trustworthy. Critical issues that were mentioned is negotiating power of the Austrian food trade sector (the big three are controlling almost 90% of all food sales to the Austrian consumer). Seeds are imported mainly from Germany, one interviewee reported to import them from all over the EU. Two of the three suppliers also export their products.

The interviewees consider that the health and fitness trend positively influence marketing of oat food products; oat therefore could become a lifestyle product supporting market trends in connection with less meat consumption and vegetarianism, veganism. Some of them even invest into market research, but also scientific forums, newspapers, direct information of other business partners, specialist journals, etc. help them to understand consumer behaviour and the food trends in the market. Therefore, suppliers consider the market to grow further in the future, also in the long run.

Marketing: The benefits and added values for the farmers are in connection to the fact that demand from the retail sector increases (oat flakes, oat milk, cereals, muesli bars, etc.). Oat is also beneficial for crop rotation. However, actually prices and crop yields are too low. Yields are also depending on water supply which is becoming a significant issue due to climate change. If rainfall is too low, seeds are small; if too much rain falls, fungus infestation might be an issue. Therefore, interviewees reported quality problems which occur from time to time. Storage is also problematic: if too much seed is on the market, quality suffers due to long storage time.

Distribution channels: The most important sales channels are wholesalers. A challenge is the price for oats, none of the interviewees seems to be satisfied, price calculation is dominated by the most important client in the market (RWA) (dependency on only one client is also one of the most weaknesses or threats). One interviewee mentioned, however, that the price calculation is in accordance with consumer demand and therefore he adds a markup if appropriate.

An important strength is seen in a broad diversity of varieties (however, this is also considered to be a limiting factor because farmers don't always accept new breeds), high flexibility and short reaction to market trends, the capacity to process bigger volumes of seeds, closeness to farmers, long lasting customer relations, and that the market is more or less an important one. A weakness is in the high cost for maintenance and cleaning and, as mentioned before, dependency on only one significant client.

The interviewees communicate with their clients via various communication channels: word of mouth, personal contacts, specialised trade shows, presentations, but also social media is part of the communication strategy of one interviewee. Two of the three interviewees rather rely on classical forms of communication with clients.

Framework conditions

Regulatory & institutional environment: The biggest limiting factor which was mentioned by only one interviewee is that oat contains gluten. This makes marketing as a healthy product somewhat more difficult. The other two interviewees didn't mention any regulatory and institutional issues. Concerning certification, only one interviewee mentioned sort of a quality control scheme. Actually, certification is considered to be to cost and time consuming with too few benefits. Therefore, no further activities to get certified for oat were mentioned.

Role of public sector (support, policies, etc.): In order to promote oat, scientific based health claims would be beneficial for the market, e.g., oat helps to decrease circulatory problems. Specific promotions for alternative crops could be helpful as well, but the most important issue are better price levels for oat because this is the biggest incentive for farmers to cultivate oat (which, of course, would help the suppliers as well). For this purpose, the food processing industry is an important player in this respect. If they are interested in oat food products, the market will boost. The public sector, however, is

considered to be not important – at max an indirect role as a funding authority in the agricultural sector was mentioned.
Two of the three interviewees said they make use of consulting of the representative organizations (and are quite satisfied with it). In particular the chamber of agriculture was mentioned. One interviewee considered professional consultants as less satisfying.

1.3.3 Producers (farmer)

In total, we interviewed three farmers who are producing oats. Seeds for that are purchased directly of breeders (national or from Germany and Czech Republic) or indirectly via wholesale. All three are cultivating quality oats for food processing as prices are higher for it (naked oats). One of the three farmers also produces refined food products (whiskey), the whole harvest of oats is dedicated to that and no oats is marketed externally. Other downstream clients the farmers mentioned are mills which produce oat flakes and the organic association collecting the organic oats and further selling it to the food industry.

VC capacities and organization
<u>Vertical and diagonal linkages:</u> Important suppliers are local traders of agricultural inputs, and seed companies from Austria (also, a Czech breeder was mentioned). One farmer mentioned that he re-cultivates the imported oat seeds. One farmer mentioned some problems concerning the time lag between ordering and delivery. But in general, the cooperation works without problems.
Most important buyers of the harvested oats are mills, processors, an organic association. However, as mentioned above, one farmer only produces for his own needs. Concerning marketing, cooperation with a producer organisation, with an organic association and another professional food organisation were mentioned (also, whereas most of cleaning, drying, storage is done on farms, one farmer reported that parts of the subsequent processing such as cleaning is outsourced).
Altogether, two farmers reported diagonal cooperations (via producer organizations to prevent price dumping) and one vertical linkages with food processors.
<u>Knowledge and technology of actors:</u> The knowledge to cultivate oats came from former generations (grandparents), from agricultural schools, exchange of experience with colleagues, and trial and error. In general, oats is considered to be an easy crop. It is undemanding, also in view of fertilizing and soil. Weed growth and pest infestation were mentioned as possible challenges, also that a lot of water should be provided with sufficient soil humidity to guarantee satisfying yields.
<u>Entry barriers:</u> All interviewees mentioned the benefits of oats in view of soil quality and crop rotation. It is also considered to be less overbred and therefore more suitable for organic farming. Therefore, it is not difficult to cultivate oats, fertilizers are less important and market entry is quite easy. As oat food is considered to have a certain importance in the food market; it was not difficult to get into the market, at least for oats itself. Therefore, the interviewed farmers have been producing oats for more than 20 to 25 years. Market entry for refined products is much more demanding (e.g., oat whiskey: in the beginning, product acceptance was low, there was a certain prejudice against oats as an appropriate raw material for high quality whiskey).
The most important challenge in producing oats is the price level for oats which is – in comparison with other crops such as wheat – too low. Even though oats seem to be an undemanding crop in production, the limited market for oat food products, the specific taste of it (which might be an incentive as well) were mentioned as reasons why oats is still a niche product. From the farmers point of view lower yields per hectare in connection with rather low market prices are unfavourable.

Resource and infrastructure

Inputs availability: The interviewed farms didn't report any issues with the purchase of seeds; only the high prices for seeds seems to be an issue.

Existing and required infrastructure: Technology is not an issue when producing oats. No specific agricultural machines are needed. This makes it easier to leave the market and switch to other crops as well as machinery can be used for producing other corps as well.

Logistical issues: Deliveries are done via the own vehicle fleet, and collection by the customer. The farmer who is processing oats to also dispatches the refined food (parcel shipping).

Volume & capacity of processing facilities: The capacity of existing infrastructure of farmers is sufficient to produce more if demand would rise; in this respect, the responses of the interviewed farmers are not uniform. Two want or would increase production (in particular oat for food processing), one doesn't.

Market conditions

A main trigger of marketing oats are the health benefits of this crop. It is of high nutritional value, it is healthy and offers an additional taste to the usual crops people are consuming nowadays (wheat or rye). It is an original and traditional crop, regional production and sustainability might be further arguments. And, it is more or less an undemanding crop where no or only little chemical influence is necessary and which is not demanding the best soil quality. However, the most limiting factor are – as mentioned above several times – the unsatisfying prices farmers get for oats (although one farmer reported that the situation slightly improved over the past few years).

Market trends and demand: The health trend supports oat sales, also the trend of consumers' demand for regional food and more sustainable food. Farmers see demand slightly but constantly increasing because of higher consumer awareness for a healthy diet. Health consciousness and environmental awareness of consumers are positive for the market. Negative are high quality standards that are required by customers being reinforced every year.

Marketing: The main benefit of oat food products is their healthiness (if not allergic against gluten) and consumers see it as a regional and sustainable crop. Customer relations are long term oriented, all interviewed farmers mentioned that.

In general, farmers are not content with the achieved price for oats. The price is derived in different ways: one farmer negotiated with his clients; another one mentioned a pooling price procedure where in fact the marketer determines the price. The third one is distributing only the refined product, so other consideration for price calculations will be relevant (gross margin based on his production costs). The latter is more or less independent for the price level of the raw product oats.

Distribution channels: Farmers sell either directly to the food processor or, in the case of processed oat product, to consumers (parcel shipments).

Framework conditions

Regulatory & institutional environment: One farmer mentioned that the quality requirements of purchasers are constantly growing and it gets more and more difficult to meet them. It was also mentioned, that if nitrogen utilisation, application of fertilisers, etc. would be limited by public authorities, this would help oats production because the crop is quite undemanding compared to other crops. Also, equal and fair prices should be guaranteed, even coupling with the price of wheat was mentioned. All interviewed farmers are certified, one mentioned a quality certificate, one an organic one and one was not quite specific. No further certificated are intended in the near future.

Role of public sector (support, policies, etc.): Confirming the interviewed farmers, the public sector is not really relevant for oat producing farmers. The farmers are getting support from the chamber and private consulting companies and are quite satisfied with it.

1.3.4 Wholesalers

We interviewed four wholesalers (selling seeds, oats from farmers, oat flakes and other processed food). The following interpretation of the results only refers to oat and oat food products. Within the wholesale, oat is a long existing product. However, recently customers, e.g., bakeries and pastry shops, demanded more oats. Also, it was mentioned that oats have a number of health benefits.

In general, the wholesalers identify a number of market chances for oats as there is a general tendency towards meat alternatives. The market can be considered to be an established one, oat has quite a positive image and marketing for oat food products is working. Purley Austrian oat food products are available. Altogether, the wholesalers identified oat not to be a typical niche product. Large fluctuations in harvested quantities (with fluctuating prices as well) and the difficulties to motivate farmers to cultivate oats was considered as obstacles in further establishing oats in the food value chain. It depends on demand and there are in fact a lot of substitute products in the market available. To further promote the application of oats in the food value chain, marketing activities such as advertising, increasing the number of available oat food products, application of other communication strategies such as influencer marketing, information campaigns, creating unique selling propositions (USP) would be helpful. Concerning the interviewed wholesalers, drivers are mainly the food retail sector and branded food companies.

VC capacities and organization

Vertical and diagonal linkages: Important linkages exist with Austrian farmers delivering oats, mills (oat flakes) from Austria (e.g. Rupp; Strobl) and Germany; producers of oat drinks (e.g. Natumi; Völkl), muesli and cereals (Nestlberger, Austria; Sielberger, Germany); producers of oat flour (Alpro, Belgium). Important customers are farmers (for one of the wholesalers distributing agricultural demand to farmers), food processors in Austria (e.g., for muesli), organic retailers, bakeries (e.g., Anker, Guschlbauer) and pastry shops.

Resource and infrastructure

Inputs availability: The most important cost factors are transport and logistic costs. Staff costs were mentioned once. Costs could be lowered over higher volume of sales, leading to higher efficiency. However, it was also mentioned once that the cost for infrastructure is other-directed and not really controllable.

Market conditions

Market trends and demand: Wholesalers are aware of the most important lifestyle trends, which are in connection with a change in nutrition patterns (less meat, sustainability, health consciousness). Also, regional food and veganism were mentioned. The wholesalers use a broad spectrum of market research (talks with customers, suppliers; social media; own research; fairs). In the long run, demand is expected to raise slightly within the next years because oat can be considered to be a healthy product. Concerning one interviewee, it is even possible that availability of sufficient quantities might become a topic in the future.

Marketing: Oat food products are considered to meet basic consumer trends mentioned above. Further, it has positive side effects for the agricultural sector. It is a well-established food product with a high potential for consumers willing to change their nutritional patterns.

The wholesalers use various ways to address their customers: word of mouth, classic media, online marketing (newsletter), customer relationship management, their website, fairs and events for marketing communications. They are satisfied concerning price levels but emphasized that it is mandatory that farmers get the price they need. Price levels are considered to be quite stable over time,

and are not the most important purchase criterion. Prices themselves are rather not influenceable by wholesalers. They are fixed based on market prices and in accordance with business partners.
Distribution channels: The main distribution channel for the agricultural wholesaler is direct delivery to farmers and to food processors. The other wholesalers are delivering to food processors, retailers (incl. organic stores, health food stores), and gastronomy (25%). Bakeries and pastry shops are of special importance. Raising energy cost and price fluctuations are causing some problems (the wholesalers are usually using their own logistic to distribute the products to customers).

Framework conditions
Regulatory & institutional environment: In general, there are no regulatory barriers for the oats market; regulations from the EU (limits, ingredients) were mentioned once. Confirming one interviewed wholesaler, the adaption of the EU regulations could support the development of the oats market.
Role of public sector (support, policies, etc.): The public sector doesn't play a significant role. In general, the interviewed wholesalers are willing to accept support from chambers, management consulting, associations, etc. and were quite satisfied with it in the past. They didn't use it a lot in the past, one even mentioned that knowledge transfer is rather reverse, from wholesalers to other partners in the value chain.

1.3.5 Food processors

We interviewed six food processors. The produced products ranged from Oat Whiskey (see above), spicey sauces, oat flakes, oat drinks and milk (incl. café latte, yoghurt containing oat), to muesli and muesli bars. In general, most of the food processors work with processed oats (oat flakes for muesli, oat drinks, muesli bars).
Confirming the interviewees, they generated their product ideas mainly based on general trends in consumer behaviour, in particular, the increasing demand for plant-based product alternatives.

VC capacities and organization
Vertical, horizontal and diagonal linkages: The provenience of the oats for processing the food is quite heterogeneous. One producer processes oat only from the own harvesting (Whiskey), another one gets the oats directly from farmers. The other food processors get their oats and oat flakes from mills (Austria and Germany).
Knowledge and technology of actors: Oats can easily be processed, the flavour of it is in line with actual consumer trends, it is more or less a base product for a number of prominent product categories (such as muesli, plant-based milk alternatives, cereals). The technology to process oats is common knowledge, some companies developed their oat food in cooperation with universities or out of a family tradition. In parts, sustainability considerations were part of the decision to work with oats. Concerning other important source of knowledge the interviews reported machine manufacturers, self-research activities, and knowledge transfer by recruiting well-educated staff or by exchange of experiences with colleagues.
Entry barriers: For about half of the processors, it was quite easy for the processors to get into the market for oat foods. The other half reported some significant issues in the beginning of the marketing activities (in general difficult to get into a "new" market; existing competitors dominated the market; a completely new niche product made it difficult to forecast sales figures, profits, etc.). However, all companies reported that it would be easy to leave the market immediately without any significant damage to the company performance, e.g., because there might be better alternatives available. The production processes could be easily adapted. Only one food processor producing muesli and muesli bars reported that it would be really impossible to replace oat flakes because they are essential.

Resource and infrastructure

Inputs availability: In general, imports are quite important for most of the food processors; they are sourced from Germany, Czech Republic, Scandinavian countries, Poland, Hungary, the UK and other European countries. The interviewees reported imports of processed foods as well as raw material. There are some significant issues in particular concerning packaging materials and increased prices (mainly due to the actual Ukrainian-Russian war), but also quality issues and problems with the availability of, e.g., electronic parts were reported. Availability of oats, oat flakes is usually not an issue (quality was mentioned); however, one food processor reported problems in getting enough raw materials. Concerning labour force, about half of the interviewees reported difficulties in getting enough qualified personnel.

The most important cost categories are: raw material (oats, oat flakes), energy, labour force (and to some extent, packaging and transportation). The interviewees mentioned some ideas to improve the overall cost structure (bundling, higher sales, increase efficiency, switch in technology), but none of these considerations were exceptional or non-standard solutions.

Logistical issues: Two interviewees reported that (in addition to conventional logistics) sell their product direct to customers via mail order. But in general, all companies use external logistic companies to distribute their products. None of them mentioned to use their own car fleet, which was quite surprising.

Market conditions

Market trends and demand: Besides one specialised company, all interviewees intend to produce more oat food in the future. For this, actually only slight adaptions and investments concerning production and organisation are necessary, the actual resources seem to be sufficient. One interviewee intends to develop new products, two will rather shift production processes. One mentioned to do so if demand is raising and the market demands larger production volumes.

Confirming the interviewees important market trends supporting sales of oat foods are healthiness, organic food and sustainability, animal welfare incl. ethics, fairtrade, palm oil free (in particular relevant for younger consumer segments), veganism, natural food, regional food. For one company (the Whiskey producer) these trends are not relevant for his business, as the product takes a lot of time to be sellable. All other interviewees integrate these trends in their business plans. Market relevant data are collected via talks with consumers, suppliers and at fairs, publications in journals, in cooperation with market research institutes, and by discussions with employees. According to these data all employees believe that the market for oat foods will (moderately) increase in the near future (also triggered by the ongoing discussion about climate change). The production capacities to reach this goal are usually considered to be sufficient; only minor investments shall be necessary.

For their own business activities, the relations to business partners are of prime importance. To further support marketing of oat foods, the partners should be open to innovations and alternative products, to a "niche culture"; however, this always depends on acting persons and corporate structures; e.g., health food stores are willing to keep products longer in their shelves than classic food retailers.

Only one food processor was not that content. All food processors export their products, in one case up to 80%, mainly to Germany and other neighbouring countries, but also worldwide exports were reported.

Marketing: Four of six interviewees are quite satisfied with the price they get for their products. The prices are usually fixed based on the cost for production and raw materials (variable and fixed costs). The interviewees mentioned several benefits (USP) supporting marketing of their products: cholesterol-lowering effect (healthy food) (Grundy et al., 2018), reusable packaging, vegan and sustainable, customised products, tradition and regionality. To reach the consumers, public relations, word of mouth, classic advertising, fairs and social media (homepage) were mentioned. Mainly two points were mentioned as important strengths for their marketing activities in view of production: long-lasting experience and innovation. In view of marketing the interviewees reported the accordance of their

products with actual market trends (see above), customer focused behaviour, individualised customer service, and strong distribution cooperations and networks. However, some food processors reported that their products need a lot of explanation, which is of course a limiting factor to marketing. Also the small size of the niche market and a limited recognition were mentioned.
Distribution channels: The food processors sell their products mainly via wholesalers and retailers. Industries clients (B2B) were reported, too. Two food processors sell their products directly via online channels to consumers. All interviewees described their business relations as stable and long-lasting (with a growing share of core customers). However, most of the bargaining power is attributed to the retailers; they usually are in a very strong position.

Framework conditions
Regulatory & institutional environment: Almost no restrictions in connection with the regulatory framework were mentioned for oat food products. One minor point refers to oat drinks. Confirming the Austrian food codex it is not possible to name these drinks "oat milk" which makes marketing in fact a little bit harder. General food safety regulations are in general considered to be a benefit for food producers as the food quality increases. Same was said for labelling requirements. Half of the food processors have an organic certificate. IFS, quality management and safety certificates, were reported as well. None of the interviewees intends further certificates. Two thirds of the interviewed food processors get support from chambers and management consulting and are more or less satisfied with it in the past.
Role of public sector (support, policies, etc.): The public sector plays no role for oat food products.

1.3.6 Retailers

We made one interview with a retailer from one of the largest retail chains in Austria. They are selling usual oat food products such as oat milk, oat flakes, muesli, cereals.

VC capacities and organization
Vertical, horizontal and diagonal linkages: The retailer works within in a complex network of suppliers, wholesalers, food processors. The cooperations are stable over time, prices are based on bargaining and, of course, on supply and demand. This specific retailer tries to avoid price promotions.

Market conditions
Market trends and demand: Confirming the retailer, oat is not a niche product. It was a market niche 10 years ago. Meanwhile, it is a well-established product category which is triggered by trends such as veganism, sustainable consumption, regional products, traceability of food, and high production standards in agricultural production. In particular, replacement of meat products helps oat food products to gain more market share. In particular this can be said for younger customers. Communication of positive attributes of oats is mandatory here, whereby, to some extent positioning of oat food products in the shelves of supermarket chains is disadvantageous for the market segment.
Marketing: A challenge for marketing to further push the oats food market is in generating a wider range of products. This can be done mainly by food processors or retailers. Concerning the marketing view of the interviewed retailer it has to be considered that his clients are consumers (distribution in shops; small quantities also online). One of the largest challenges are fluctuating quantities and qualities in the oats market. In general, consumers have no concern for the nutritional benefits of oats; from time to time there are some requests concerning gluten. But the clientele for oats is stable and loyal. An appropriate communication strategy focuses on the positive characteristics of oat, on regionality and traceability.

1.4 Discussion

Confirming our interviews, oats cannot really be considered to be a niche product. For the last decade, a number of product innovations based on oats entered the market (oat drinks, muesli and muesli bars, etc.) besides the long existing product oat flakes. The market is already well established and most of the interviewees expect a rather moderate growth in the future. Oats has a number of benefits – it is a healthy, (possibly) regional, sustainable food product – which meets a number of important market trends: health consciousness, sustainability, less meat and veganism, regionality and traceability, to mention the most important ones. However, it has to be taken into account that the “real” healthiness might depend on the relevant Oat cultivars. For instance, although Loskutov and Khlestkina (2021) found in a recent study that amongst different grains (wheat, barley, rye, and oat) oat (and barley) had the highest levels of micronutrients, the results showed a huge bandwidth, the broadest of all investigated grains. Further, sustainability of the cultivation of oat might be discussed as well.
Consumer awareness and a lack of innovativeness are not really an issue for this market. However, national production of oats decreased significantly within the last decades, this could be a limiting factor concerning availability of domestic oats.

1.4.1 Past, current, and foreseen challenges & successes of the value chain

The findings in our interviews showed that there are some challenges for oat production (Table 2).

Market development

Almost all participants in the supply chain consider oat food products as a promising crop. It meets the most important lifestyle trends in the food market (less meat, sustainability, health consciousness, regionality, veganism). Nevertheless, during the last decades cultivation of oat decreased significantly. Too few seed producers with relevant market size are located in Austria. To further develop the oat market, these challenges have to be met. Farmers have to be motivated to switch to oat production, retailers must see the benefit to put oat food products in their shelves which requires innovative food products; it is already a well-established food category in their shelves. Confirming the interviewed food processors, it would not be a big issue to develop more oat food products; most of them are ready to do that and widen their business activities. For instance, protein extraction from oat (Boukid, 2021) might be an interesting approach to meet the demand on the market for meat alternatives. Production capacities seem to be available in all stages of the VC; processing knowledge can be considered to be widely established with the VC; for instance, scientific publications such as Angelov et al. (2006) deliver working technologies to develop innovative oat food products (here an oat-based probiotic drink). However, a stable or even increasing production volume of national, high-quality oat would be mandatory to be able to further develop the market. This is in line with literature, the market demands high-quality oat (Ames et al., 2013). Considering the actual price situation – farmers are not really content with the actual price level –, this seems to be an issue in the future. Altogether, the actors in the value chain expect an increase in the market for oat foods at least in the long run, however, a moderate one at max. In general, there seem to be no major entry barriers; oat is a well-established product category throughout the whole VC.

Consumer awareness

Considering the broad assortment of oat food products in the shelves of the retail sector, consumer awareness is not a significant issue to further develop the market. As mentioned before, the actual lifestyle trends further support the introduction of innovations within the product category. However, the interviewees still see some potential to better inform consumers about the benefits of oat. To reach the consumers, the whole spectrum of communication might be useful, public relations, word of mouth, classic advertising, fairs and social media, the company's homepage. Public authorities could play a significant role here, too (information campaigns towards a healthier diet; however, in general the role of the public sector in the market was considered to be rather limited). By that, a further boost in demand can be expected.

Challenges, strategies and potentials and benefits

The interviewees of the oat VC were asked to name the most important challenges, strategies to meet these challenges and potential and benefits for the actors of the VC. The outcome of it is summarized in Table 2 for each stage of the VC. As we can see from that, availability of high-quality oat, pricing, and product innovation might be the most important issues within the VC.

Table 2. Challenges, strategies and potentials and benefits

VC actor	3-5 main challenges (order: most important first)	Strategies undertaken/to undertake	Potential & benefits for the actor in the VC chain
Seed supplier	1. Availability of high-quality seeds 2. Yields and price levels 3. Seed quality (storage suitability)	1. More emphasis on breeding 2. Better communication with buyers 3. Permanent market observation	1. (Slightly) increasing demand for oat food products
Producers (farmers)	1. Fair prices 2. Sufficient rainfall and soil quality 3. High quality oats; more research to increase quality and adapt seeds to local conditions 4. Secured purchase 5. Storage capacities	1. Cooperation 2. Communication with stakeholders 3. Improve soil quality 4. Seed propagation by farmers themselves	1. Short term low potential for growth; rather stagnation production capacities 2. Long-term growth only if more efforts in promoting oats; also depending on consumer acceptance of oat food products
Food Processor	1. Price 2. Egoism within the VC 3. Standardised raw materials 4. Product acceptance of consumers; neophile customers 5. Enough quality oats from national farmers incl. traceability	1. Information of market partners 2. Public relations 3. Supporting stable and long-lasting relations (e.g., reliable order agreements) 4. Research 5. Supporting reliability of supply (e.g., self-cultivation of oats)	1. Stable market, max. slight growth in the short run 2. Market growth in the long run, depending on development of market trends (future importance of sustainability, regionality, health consciousness, etc.)
Wholesaler	1. Availability of oats (quantity and quality) and prices 2. Consumer acceptance 3. Innovation 4. Oats can be tricky concerning climate (not suitable for all regions) 5. Better variants via breeding	1. Permanent market observation 2. Communication, cooperation with stakeholders 3. Providing information to market partners	1. (Slightly) increasing demand for oat food products 2. Further increased production capacities and improved technology are mandatory

		(however, limited influence to market)	
Retailer	1. Stable production volumes 2. Better variants via breeding (resistance of seeds) 3. Product innovation 4. National production capacities	1. Providing information to market partners 2. Cooperation 3. Creation of know-how	1. Positive development expected if expansion of national production capacities and technology development works

1.4.2 Limitations

The limitations of the study are related are threefold: the (1) *qualitative nature* of the VCA; (2) the *unwillingness of VC actors* to be available for interviews; (3) actual global developments the VCA might not cover.
(1) It is obvious that our sample of interview partner *cannot be representative for all oat value chains* in Austria. We followed a snowball approach for our study. First, we searched for farmers or food processors in the oat chain and then we asked them to indicate their VC partners, which we contacted for further interviews. Nevertheless, we believe that our study delivers a good description of the constraints and context of the oat VC in Austria. To get a valid overview of the VC, few actors are sufficient to deliver a realistic picture of the situation.
(2) The supermarket retail sector in Austria is very competitive and highly restrictive to share information. That's why we could only conduct one interview from a nationwide supermarket chain.
(3) Another limiting factor is that most of our interviews happened before the war in Ukraine started. Insofar our study provides only limited knowledge about the impact of the war on the market for oat and, consequently, oat food products.

1.5 Synthesis

Oat for human food consumption is not at all new to the food market. It is marketed as a healthy, regional, organic food product rich in protein and micronutrients, promoting biodiversity on the fields. According to Ramzan (2020) it has a "good nutritional composition with extra benefit of the β-glucan as dietary fibre"; oat supports some cures for chronic diseases (heart diseases, gastrointestinal diseases, diabetes, even cancer); it is antimicrobial, antioxidant and shall reduce the blood cholesterol level. It is a preferable trendy meat substitute for vegetarians and vegans and a good source of plant protein (Boukid, 2021).
Because of its healthy food character, oat is well established in Austria. Wholesalers and processors see at least long-term growth due to actual trends in consumer behaviour. Several actors emphasized in the interviews that oat is not new to the market and well-established – likewise in literature (Ramzan, 2020) – and can therefore not be considered as a niche product. The further development of the market, the approximated (at least moderate) increase in sales and new product on the market, will significantly depend on the availability of national, high-quality oat. Only then the negative trend concerning the acreage of oat can be expected to reverse. Appropriate technology and consumer awareness for oat are given and by no means a limiting factor for the further development of the market for oat food products.

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