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TOWARDS A PROTEIN TRANSITION IN FLANDERS: INCLUSIVE BUSINESS IN THE CHICKPEA SECTOR

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Abstract

In the agrifood sector, many challenges regarding creating sustainability exist, going from environmental problems such as extensive water use, soil depletion, use of pesticides, etcetera., to social problems such as the low income of farmers, health, etcetera., to economic problems such as crop failures, affordability of prices, etcetera.

To act on a few of these challenges, the Flemish government together with 64 partners works towards a protein transition. This means changing the current 60/40 ratio between animal and plant-based protein intake to a 40/60 ratio. The introduction of new local crops high in proteins can not only facilitate this change but also ensures that the local agricultural sector can benefit from this transition. One of the crops in the spotlight is the chickpea.

Chickpea production is a fairly new activity in Flanders. However, there is a lot of potential in this sector. Not only are there value-addition opportunities in the additional processing sectors such as drying, cleaning and packaging, but cultivating chickpeas also offers some co-benefits such as nitrogen fixation, enhanced ecosystem services and a reduction of emissions. They serve as a nutritious alternative for meat as well. These opportunities for food security, regenerative agriculture, emissions reduction and regional and national economic advancement can be supported and enlarged by linking farmers in a profitable way to the chain. Inclusive business is a concept in which this is preserved and where small-scale farmers and other weak actors have an equal place in the chain and at the negotiating table.

In this thesis, the inclusiveness of the chickpea sector in Flanders is researched and with that, the biggest obstacles and opportunities of this sector are identified. At last, it is examined how the inclusiveness can be improved. Therefore, three farmers currently cultivating chickpeas were interviewed. The results of these interviews formed the guideline for four interviews with other actors in the chickpea sector.

It can be concluded that the main obstacles in the chickpea sector are: the high variability in yield; the uncompetitive price with respect to the world price and to other crops; the limited presence of systems to cope with production risks and innovation investment; the temporary nature of projects currently supporting research and the set-up of chains; the difficulties in finding cleaning companies willing to clean small batches and finally the questions around the possibility of organic production.

The biggest opportunities are: the large and still growing demand; the cultivation benefits; the resilience against the higher temperatures and droughts related to climate change and the strong chain-wide collaboration. To improve inclusiveness, two pathways were examined, staying small-scale and upscaling. The upscaling pathway faces more challenges in implementing inclusive business. Finally, this research shows that examining a sector using the inclusive business principles is a good method to identify the obstacles and opportunities of a sector and provide solutions. Researching a specific sector also gives useful insight into the complexity of trying to improve sustainability in the agrifood industry in general.

Résumé

Aujourd'hui, le secteur agroalimentaire est confronté à de nombreux enjeux pour faire advenir un modèle plus écologique et plus durable. Allant des problématiques environnementales (tels que l'utilisation extensive de l'eau, l'épuisement du sol, l'utilisation de pesticides, etc.) aux problématiques sociales (tels que le faible revenu des agriculteurs, la santé, etc.) et aux problèmes économiques (tels que les mauvaises récoltes, l'accessibilité des prix, etc.), le secteur agroalimentaire actuel n'est pas un modèle soutenable.

Pour agir sur quelques-uns de ces enjeux, le gouvernement flamand, en collaboration avec 64 partenaires, travaille à une transition protéique. Il s'agit de modifier le rapport actuel de 60/40 entre l'apport en protéines d'origine animale et végétale en un rapport de 40/60. L'introduction de nouvelles récoltes locales riches en protéines peut non seulement faciliter ce changement, mais aussi faire en sorte que le secteur agricole local puisse bénéficier de cette transition. Les pois chiches est l'une des récoltes à l'honneur.

La production de pois chiches est une activité relativement nouvelle en Flandre. Cependant, le potentiel de ce secteur est considérable. Non seulement, il existe des possibilités de valeur ajoutée dans les secteurs de transformation supplémentaires tels que le séchage, le nettoyage et l'emballage, mais la culture des pois chiches offre également certains co-bénéfices tels que la fixation de l'azote, l'amélioration des services écosystémiques et la réduction des émissions. Elle constitue également une alternative nutritive à la viande. Ces possibilités de sécurité alimentaire, d'agriculture régénératrice, de réduction des émissions et de développement économique régional et national peuvent être soutenues et élargies en reliant les agriculteurs de manière rentable à la chaîne de production. Le commerce inclusif est un concept dans lequel ceci est préservé et où les agriculteurs à petite échelle et autres acteurs faibles ont une place égale dans la chaîne de production et à la table des négociations.

Ce mémoire est une étude de l'inclusivité dans le secteur des pois chiches en Flandre et les principaux obstacles et opportunités de ce secteur sont identifiés. Enfin, il est examiné comment l'inclusivité peut être améliorée. Pour cela, trois agriculteurs cultivant actuellement des pois chiches ont été interviewés. Les résultats de ces entretiens ont servi de ligne directive pour quatre entretiens avec d'autres acteurs du secteur des pois chiches.

On peut conclure que les principaux obstacles dans le secteur du pois chiche sont : la grande variabilité du rendement; le prix non compétitif par rapport au prix mondial et à d'autres cultures; la présence limitée de systèmes pour faire face aux risques de production et à l'investissement dans l'innovation; la nature temporaire des projets soutenant actuellement la recherche et la mise en place de chaînes; les difficultés à trouver des entreprises de nettoyage prêtes à nettoyer de petits lots; et les questions autour de la possibilité d'une production biologique.

Les plus grandes opportunités sont : la demande importante et toujours croissante ; les avantages de la récolte ; la résilience face aux températures plus élevées et aux sécheresses liées au changement climatique et la forte collaboration à l'échelle de la chaîne.

Afin d' améliorer l'inclusivité de ce secteur en Flandres, deux voies ont été examinées: rester à petite échelle et passer à l'échelle supérieure. La voie de l'échelle supérieure est confrontée à davantage des enjeux dans la mise en œuvre du commerce inclusif. Enfin, cette étude montre que l'examen d'un secteur à l'aide des principes du commerce inclusive est une bonne méthode pour identifier les obstacles et les opportunités d'un secteur et proposer des solutions. L'étude d'un secteur spécifique, tel que celui des pois chiches, donne un aperçu nécessaire à la complexité que représente la tentative d'améliorer la durabilité de l'industrie agroalimentaire.

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List of abbreviations

CAP	Common Agricultural Policy
CIAT	International Center for Tropical Agriculture
CO_2	Carbon dioxide
CSR	Corporate social responsibility
EFA	Ecological Focus Area
EU	European Union
Ha	Hectare
ILVO	Institute for Agricultural, Fisheries and Food Research
N	Nitrogen
NGO	Non-governmental organization
PHAE	Project Hansbeke Agro-ecologie

1. Introduction

Many challenges lie in creating a sustainable future. One major challenge linked to many sustainable development goals (SDG's) is creating more sustainable food systems. Indeed, this theme is linked to SDG 1: no poverty, SDG 2: zero hunger, SDG 8: decent work and economic growth, SDG 9: innovation, SDG 12: responsible consumption and production, SDG 13: climate action, SDG 15: life on land and SDG 17: partnerships for the goals (Vlaamse overheid, 2021).

A measurement that can significantly reduce emissions is to produce and eat less meat (Departement Omgeving, n.d.-a). In the production of plant-based proteins, less water and space are used, fewer greenhouse gases are emitted and the impact on biodiversity is smaller compared to the production of animal-based proteins (Aiking, 2011; Vlaamse Overheid, 2022). That is why the Flemish government together with 64 partners wants to work on a protein transition. This means changing the current 60/40 ratio between animal and plant-based protein intake of our diet to a 40/60 ratio (Vlaamse overheid, 2021). However, currently, many plant-based protein products are imported (Departement Landbouw & Visserij, n.d.-b). The local cultivation of protein crops can counterbalance this a bit. Not only does it reduce food miles but it also creates a buffer when a crisis puts pressure on our food supplies (Iannetta et al., 2021). Moreover, the employment in the sector of plant-based food products in Flanders has increased by 52% over the last 15 years (Vlaamse Overheid, 2022). A protein transition can further stimulate this employment creation trend.

A possible new crop that has increasing popularity among consumers is the chickpea (Balázs et al., 2021; Casibeans, 2022; Peas and Beans, 2022). This crop is not only processable into many types of products such as the popular hummus but its nitrogen-fixating capacity makes it useful to include in rotation farming (Balázs et al., 2021; Iannetta et al., 2021; Kuhlman et al., n.d.; Merga & Haji, 2019).

Besides emissions, biodiversity loss and pollution, agriculture faces more fundamental obstacles on the road to sustainability. Farmers are often in a weak position at the negotiating table, which usually results in a low price for their products. This does not only have some social impact but due to their low incomes, farmers often have little margin to invest in innovations. Inclusive business tries to find an answer to these problems. It is a way of doing business where each actor in the chain gets an equal place at the negotiation table. Furthermore, inclusive business targets to generate not only economic value but also social and environmental value (CIAT, 2014). Implementing inclusive business into a new sector such as the chickpea sector could therefore facilitate a protein transition in Flanders.

The goal of this research is to examine the inclusiveness of the chickpea sector in Flanders and how it can be improved, to identify the biggest obstacles and opportunities in this sector and to research how the concept of inclusive business in general can contribute to the protein transition.

2. Literature review

2.1 The protein transition

2.1.1 What are proteins

Proteins are nutrients existing of units of amino acids that our body, among other things, needs to grow and maintain itself. There are different types of proteins that our body needs and therefore it is important that the protein intake comes from a variety of sources. In short, a varied diet is recommended (FAO, 2022; Hoge Gezondheidsraad, 2016; Voedingscentrum, n.d.).

Proteins can be found in all kinds of food products (Vlaamse overheid, 2021). These food products can have an animal-based origin, for example, meat, fish, dairy products, eggs and seafood are rich in protein. Proteins can also be found in plant-based food products such as nuts, grains, seeds, legumes et cetera (FAO, 2022; Vlaamse overheid, 2021; Voedingscentrum, n.d.).

2.1.2 The protein transition: What is it and why is it necessary?

In 2021, the Flemish government together with 64 partners has put forward a green deal with the ambition to create an 'environmentally responsible and healthy diet' by improving the ratio of animal-based to plant-based protein products in the diets of inhabitants of Flanders (Departement Omgeving, n.d.-a).

A green deal is an effort commitment between the Flemish government and partners such as companies, organizations and civil society, to work around a shared green project where the goals are often linked to innovation, increased competitiveness and good business practices (Departement Omgeving, n.d.-b). The opportunities of such a collaboration are increased participation of the partners in green governance and a better connection with the government as well as between partners. This boosts new and existing initiatives. The term for a green deal is between three and four years and a deal is closed by publishing a report of all the experience and knowledge gained throughout the years, thereby making all the efforts visible (Departement Omgeving, n.d.-b).

The green deal 'protein transition on our plate' has the specific goal to change the current 60/40 ratio between animal and plant-based protein intake to a 40/60 ratio by 2030 (Vlaamse overheid, 2021). This means replacing some animal-based proteins with plant-based proteins in our daily diet. The reason why this transition is desirable is fourfold.

First, it is good for the environment because less agricultural land and less water are required (Aiking, 2011; Vlaamse overheid, 2021). Depending on the type of animal, around 6 kilograms of plant-based protein is needed to produce 1 kilogram of animal-based protein. This results in a loss of 85% of protein that could also be consumed directly instead of being turned into meat (Pimentel & Pimentel, 2003). So only partly replacing animal protein consumption can already result in huge areas being set free for other purposes such as wild nature. This benefits biodiversity and reduces negative effects linked to biodiversity loss such as newly

spreading diseases like covid-19. For example, if all inhabitants of developed countries would cut one-third of the animal proteins in their daily diet this would result in 400 million ha worldwide being set free (Aiking, 2011). Besides using more land, holding livestock also is responsible for extensive erosion which degrades the quality of agricultural fields resulting, in the worst cases, in desertification (Aiking, 2011; Pimentel & Pimentel, 2003). This process leads to the ongoing need to exploit new land for agricultural uses often accompanied by deforestation (Aiking, 2011).

In addition to more land, the production of animal-based proteins also asks for more water, as water is needed for both the cultivation of animal feed and the maintenance of livestock. Also here a partial replacement of animal proteins with plant proteins can already make a big difference by reducing water use up to 40 times. Like deforestation, intensive water use also negatively impacts biodiversity by reducing (healthy) aquatic environments. Also, the drainage of excess pesticides, antibiotics and other pollutants through rivers to the sea reduces the habitat for aquatic life (Aiking, 2011).

Second, a plant-based diet also has a lower impact on climate change since less polluting emissions are emitted when producing plant-based proteins instead of animal-based proteins (Smil, 2002; Vlaamse overheid, 2021). Most of the emissions come from the electricity and fuel used to produce fertilizers and operate machinery, and from the leaching of nitrogen fertilizers into the air. In addition, also cattle themselves are a source of greenhouse gases, as methane is emitted through their enteric fermentation process (Smil, 2002). Decreasing the impact on climate change is an indirect positive impact of the protein transition next to the direct impacts of reducing land and water use (Aiking, 2011).

Besides the impacts of the protein transition described above, having a more varied diet also has a positive impact on health. Flemish inhabitants and by extension inhabitants of developed countries eat in general too much but also the proportion of animal-based proteins is too large (Aiking & de Boer, 2020; Hoge Gezondheidsraad, 2016; Mcmichael et al., 2007; Vlaamse overheid, 2021) despite the fact that the higher intake of unprocessed plant-based products lowers the risk for a long list of diseases (Vlaamse Overheid, 2021). Thus, a reduced intake of animal proteins in combination with eating less overall will have a positive effect on general health in these regions (Aiking & de Boer, 2020; Mcmichael et al., 2007; Vlaamse overheid, 2021). A protein deficiency as a result of the protein transition will not happen based on the current intake, on the contrary, a reduction in protein intake is seen as a positive side-effect of the protein transition (Aiking, 2011; Vlaamse overheid, 2021). Besides the direct impact that a protein transition can have on health, also here, indirect impacts of climate change on health are active and can be reduced by this transition (Mcmichael et al., 2007).

At last, a protein transition can also have an economic impact. The employment in the sector of plant-based food products in Flanders has increased by 52% over the last 15 years. Further opportunities for increasing employment can be created as a result of the protein transition (Vlaamse overheid, 2021).

2.1.3 The properties of chickpeas and their potential

Chickpea is a crop that provides a protein-rich product that can be processed in various ways and thus also can be used in a variety of ways e.g. cooked, hummus, chickpea flour, falafel etcetera. In addition, there are many benefits associated with the production of this crop. These benefits are nitrogen fixation, soil improvement and water retention. These properties can indirectly and directly lead to fewer emissions. These aspects make chickpeas a valuable crop in the process of a protein transition.

Chickpeas: a healthy product

The crop chickpea can be categorized as a pulse or grain legume (Stagnari et al., 2017). This category is characterized by legumes with a high percentage of proteins. Chickpea has a protein content of approximately 20,3 g per 100 g (Nutrition Advance, 2022). This is a lot in comparison with other food groups such as vegetables, fruit, cereal grains or even meat and dairy food. Only the category of nuts and seeds holds comparable protein percentages (Nutrition Advance, 2022).

Legumes	
Chickpeas	20,3 g
Lentils	24,6 g
Soybeans	28,6 g
Black beans	21,6 g

Cereal grains	
Couscous	12,7 g
Quinoa	14,1 g
Rice	7,5 g
Wheat flour	12,0 g

Vegetables	
Broccoli	2,8 g
Carrot	0,9 g
Onions	1,1 g
Tomato	0,9 g

Meat	
Bacon	13 g
chicken	17,4 g
Pork	16,9 g

Dairy food and eggs	
Eggs	12,6 g
Milk	3,3 g
Yogurt	3,5 g

Fruit	
Apple	0,3 g
Banana	1,1 g
Orange	1,0 g

Nuts and seeds	
Almonds	21,2 g
Cashew nuts	18,2 g
Walnuts	18 g
Pumpkinseeds	18,6 g

Figure 1: The protein content per 100g dried food (Nutrition Advance, 2022).

Besides being nutritious, chickpeas also contain vitamins, fiber and minerals. Consuming chickpeas can reduce cancer, cardiovascular and diabetic risks (Merga & Haji, 2019).

Production characteristics

Chickpea originates from semi-arid regions. They can tolerate sun and high temperatures well but also require dry soil. Excess water in the soil can be detrimental to crop growth. The optimal pH of the soil is between 7 and 9 (Inagro, 2022b). The growing process to maturity takes about 110 to 130 days (Saskatchewan Pulse Growers, n.d.).The mean global productivity

is 850 kg/ha (Merga & Haji, 2019) but this is subject to great variability (Balázs et al., 2021; Iannetta et al., 2021; Merga & Haji, 2019; Saskatchewan Pulse Growers, n.d.). To give an example, in comparison with grains, legumes have 50-60% more variability (Kuhlman et al., n.d.). All these aspects can differ depending on which cultivar (cultivated variety) is used.

Chickpea in rotation

Chickpea has some soil-improving qualities making it an excellent crop to insert into rotation (Balázs et al., 2021; Iannetta et al., 2021; Kuhlman et al., n.d.; Merga & Haji, 2019). Three important soil-improving qualities can be distinguished i.e. nitrogen fixation, soil improvement and water retention (Stagnari et al., 2017).

While growing, the chickpea plant cooperates with nitrogen-fixating bacteria (rhizobium) which are visible as nodules near the roots of the plant (Inagro, 2022b). It is those bacteria that in fact will extract nitrogen from the air and provide this to the plant (Inagro, 2022b) in return for protection of the plant in times of drought (Bonito & Beck, 1990). However, the bacteria is often not (enough) present in the soil and must be added artificially, a process called inoculation (Inagro, 2022b). By fixing atmospheric nitrogen, there is no need for additional nitrogenous fertilization anymore (Iannetta et al., 2021). Nitrogen is also fixated in the soil, benefited by the next crop in the rotation (Stagnari et al., 2017).

Then, chickpeas can provide water retention and better infiltration thanks to the stubble that remains even after harvest. Finally, these residues of the chickpea plant will turn into high-quality organic matter containing added nitrogen, phosphor, humus content and soil organic carbon (Stagnari et al., 2017).

These three qualities of chickpeas cause regeneration of a field, leaving it better for the following crop in the rotation cycle. There are cases that prove the higher productivity that rotation systems that include legumes can have if rightly managed (Kuhlman et al., n.d.).

Sustainability

The cultivation of chickpeas is considered a sustainable practice not only because the resulting product can partially replace meat in the diet and it can increase the productivity of a field, but also because it can have a more direct positive impact on climate change by the increase of biodiversity, saving energy normally used for fertilizer production, and emitting less CO_2 and nitrogen in the atmosphere than most other crops (Stagnari et al., 2017).

Chickpeas are conducive to rotation farming and can promote this practice which is by itself positive for biodiversity (Iannetta et al., 2021). An improvement in biodiversity is desirable for many reasons. Firstly, it lowers the risks of diseases (Balázs et al., 2021; Iannetta et al., 2021; Stagnari et al., 2017). This is certainly true for chickpeas in wheat-based rotations due to a with cereal crops contrasting susceptibility to various pests and diseases (Stagnari et al., 2017). Secondly, it creates resilience against the shocks of climate change (Balázs et al., 2021; Iannetta et al., 2021). Monoculture has become the standard farming system because it is economically advantageous to operate on big scales and it has long been promoted by

governments. However, this has led to an excessive use of external inputs, to unsustainable practices such as mechanical tillage, and to a system not resilient to the increasingly frequent extreme weather events and changing climate (Iannetta et al., 2021; Stagnari et al., 2017).

The reduced need for pesticides, lower disease pressure and higher resilience to climate change provide a safety net for some production risks. This makes the increased diversity of rotational agriculture also economically beneficial in many ways (Balázs et al., 2021).

In general, calculations show that legumes emit roughly 5-7 times fewer greenhouse gases per unit area than other crops (Stagnari et al., 2017). Besides directly emitting less, the reduced need for fertilizers indirectly causes a large decrease in emissions. Fabricating fertilizers accounts for a lot of energy use and CO_2-emissions so changing to the cultivation of legumes can reduce 277 kg per ha of CO_2 per year (Stagnari et al., 2017).

2.2 Inclusive business models

2.2.1 What are business models?

Definition business models

A business can be described as a commercial relationship between an actor who sells and an actor who buys (CIAT, 2014). A business model includes 'the rationale of how one of those actors creates, captures and delivers value' (CIAT, 2014). More detailed, a business model looks at the way customers are reached, how to generate profit and how and what is produced (CIAT, 2014a; FAO, 2015).

From a business model to a chain

Through sales and purchases, business models are linked together. This then leads to the formation of a product chain or value chain (CIAT, 2014a; FAO, 2015) that ends with a product or service delivered to the end consumer (CIAT, 2014a).

There are different actors connected to such chains. The buyers and sellers are called the direct actors. They will own the product at least once in the chain. There are also actors who will never own the product but who influence the chain by providing certain services. Those are called indirect actors. At last, every chain is located in an environment influenced by broader, external forces that the direct actors do not have any control over such as the law, the culture, the socio-economic system etcetera. These are called the external forces (CIAT, 2014a).

Business models will differ according to the position in the chain and the size of their business (CIAT, 2014a; FAO, 2015). This has also an influence on the position at the negotiation table. It is known that small-scale farmers often have the weakest position at this table (FAO, 2015). This problem is getting more and more pertinent due to the increasing concentration of production activities throughout the chain in the same (large) companies and thus leading to a concentration of power in the chain, a phenomenon known as vertical integration. This

trend is even more enhanced in the agricultural sector due to many challenges such as high levels of risk and variability (German et al., 2020).

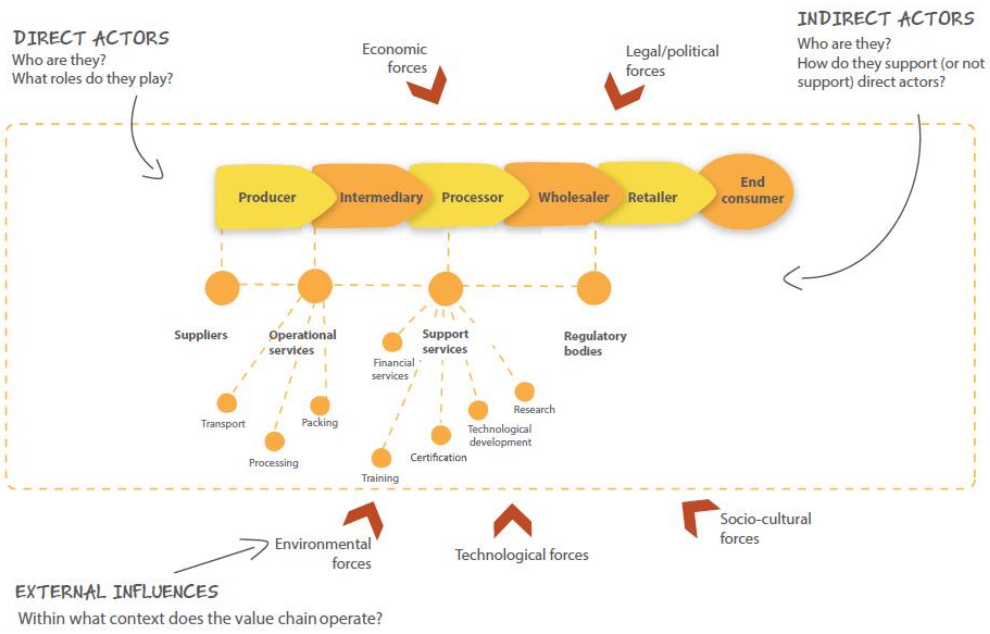

Figure 2: The value chain with the different activities and the different types of actors (CIAT, 2014).

2.2.2 Inclusivity in the chain

Definition 'inclusive business'

To indicate that small-scale farmers and other weak actors have an equal place in the chain and at the negotiating table, the term "inclusive business" was developed.

Various definitions of this term exist with each a focus of its own (German et al., 2020; Likoko & Kini, 2017; Wach, 2012). In general, two types of focusses can be distinguished. One focus emphasizes strongly on alleviating the poor by doing inclusive business. Some examples are:

> **World Bank**: *"Inclusive businesses provide livelihood opportunities and close access gaps for people living at the base of the economic pyramid. They do this in ways that are commercially and financially self-sustaining by focusing on poor and underserved individuals across their value chain as supplier, employee, distributor, retailer, or customer."* (IFC, 2022)
>
> **Endeva:** *"Inclusive business integrates people living in poverty into the value chain as consumers or producers, thus making a positive contribution to the development of companies, the local population and the environment."*(Tewes-Gradl & Knobloch, 2009)
>
> **FAO**: *"a business model is inclusive when it integrates smallholders into markets with the underlying principle that there are mutual benefits for poor farmers and the business community".* (FAO, 2015)

The other focus sees inclusive business as a tool to reach more comprehensive sustainability paying equal attention to all three, social, environmental and economic, aspects of the concept. Important is that these definitions include also environmental value, an aspect that sometimes is lacking in the definitions where the main focus is on alleviating the poor (Likoko & Kini, 2017; Wach, 2012). An example of this kind of definition is mentioned by the International Center for Tropical Agriculture.

> **CIAT:** "*Inclusive business is a **commercial relationship** between a private company and a group that **generates social, economic and environmental value** in order to **sustain long-term profitable interdependence**"*(CIAT, 2014a).

This research will use this definition, explicitly involving also the environmental aspect. This definition is chosen because it is believed that environmental sustainability is needed in working towards social sustainability and vice versa (Rosenstock et al., 2020; UNDP, 2010). For example, the weak actors in the chain will have the least resilience against climate change or environmental-based shocks so not acting to mitigate climate change and its effects will inevitably lead to social injustice (Rosenstock et al., 2020). On the other hand, small-scale farmers are often at the bottom of the pyramid and lack the means and capacity to invest in tackling environmental problems. Their primary concern is having a daily income to survive (Mizik, 2021). These aspects interact and influence each other. Therefore, there must be a clear and concrete focus on both.

To make the ideas behind inclusive business concrete, companies should adopt inclusive business models. Inclusive business models are meant to be **long-term viable** and self-sustaining due in part to the win-win outcome for both trading parties (German et al., 2020).

Inclusive business is no charity, **trading relationships** are at the center of the concept (German et al., 2020). Its rationale however builds on the concept of corporate social responsibility (CSR) (Golja & Požega, 2012), which means trying as a company to prevent and reduce social and environmental impacts as much as possible (European Commission, n.d.-b). Inclusive business goes beyond CSR by including other actors in the decision-making process with a focus on the weakest actors (Golja & Požega, 2012), by real collaboration through the whole chain towards the same goals (CIAT, 2014a) and by putting it at the core of the business model instead of seeing it as something 'extra'.

Besides CSR, there are more concepts linked to and intertwined with the concept of inclusive business. By some, the term 'full economic citizenship' or 'responsible business' is used to refer to 'inclusive business' (Idowu et al., 2013). Sustainable business can be seen as a broader concept which includes 'inclusive business' as one of the pathways (Schoneveld, 2020).

A big constraint to research on inclusive business is the lack of a widely accepted and applied definition that is precise in what the concept means and how it differs from other concepts such as sustainable business, corporate social responsibility etcetera. For now, in each research, a different definition is chosen and applied which makes it difficult to build on existing research (Schoneveld, 2020).

Trade-offs

It is important to acknowledge that no business model will be able to avoid all negative impacts and be economically viable at the same time (Wach, 2012). A trade-off between the inclusive and the business part will always exist in a profit-oriented economy (FAO, 2015). Often a business model that works towards some social and/or environmental goals will have increased costs and will therefore be less profitable (FAO, 2015; Wach, 2012) creating a limit to the goals that can be pursued. Elise Wach even suggests in her paper that financial rewards for being inclusive will be necessary (Wach, 2012). Also between the environmental and social goals, trade-offs can happen. For example, the findings of Rosenstock et al. in their research note that enterprises that are very focused on environmental friendliness often actually lack attention to the socio-economic needs of certain actors (Rosenstock et al., 2020). With the implementation of the definition of inclusive business stated by CIAT, focusing equally on the three aspects, this last trade-off should be restrained.

Standards

Another difficulty in doing inclusive business is the fact that product and process standards as well as quality standards are getting tighter and tighter due to globalization favoring big (global) players and stimulating vertical integration (German et al., 2020).

2.2.3 Measuring inclusivity

Using the CIAT definition of inclusive business, it is still difficult to make the distinction between inclusive and non-inclusive businesses. First of all, because there is no sharp line between inclusive and non-inclusive. The gradation going from the one to the other is continuous (Wach, 2012)**.** Besides that, the definition is too broad including everything and nothing and therefore is susceptible to interpretation.

Additional to their definition, CIAT developed a tool to make the concept of inclusive business not only more concrete but also measurable. This was also part of the motivation to choose their definition. In their tool, CIAT breaks down the concept of inclusive business into six principles to which active attention must be given in order to be able to speak of inclusive business. These principles are: chain-wide collaboration, effective market linkages, fair and transparent governance, equitable access to services and information, inclusive innovation and measurement of outcomes. These principles have been further explored and detailed by incorporating each sub-aspect into a question. Each question can be scored resulting in a total score indicating how inclusive a business is (CIAT, 2014a). In part 2.3, there will be a deeper look into the meaning of each principle, the sub-aspects of each principle and the importance of each principle. In the part on materials and methods, a detailed explanation of the scoring mechanism will be given.

As said, inclusive business is not a black-and-white concept. It should be kept in mind at all times that a business is not totally inclusive or not at all. Inclusive business is a relative term. Even the most inclusive business can keep on improving. However, scoring it can give an indication but it is impossible to capture all aspects. More important is that the concept of

inclusive business offers a way of looking at business relationships and that all actors recognize they are mutually dependent and need each other to address challenges in the chain.

2.3. Research questions and hypotheses

Chickpea production is a fairly new activity in Flanders. In 2020, farmer Thomas Truyen harvested chickpeas for the first time. However, there is a lot of potential in this sector. Not only are there value-addition opportunities in the additional processing sectors such as drying, cleaning and packaging (FAO, 2015), but cultivating chickpeas also offers some co-benefits such as nitrogen fixation, enhanced ecosystem services and a reduction of emissions (Iannetta et al., 2021) as do they produce a nutritious alternative for meat. These opportunities for food security, regenerative agriculture, emissions reduction and regional and national economic advancement can be supported and enlarged by linking farmers in a profitable way to the chain (FAO, 2015).

The new sector of chickpea production is still 'under construction' and there are many parties interested in developing this sector including governments, research institutions, processors and retailers. Inclusive business can facilitate the development of this sector and thus be part of the protein transition in Flanders.

Hence, in this research, the topics of the protein transition with a focus on chickpea production and inclusive business are combined. The first research question states:

> **How can inclusive business in the chickpea sector contribute to a protein transition in Flanders?**

Two other research questions are added to the more general question above:

> **What are the opportunities and obstacles in the production of chickpeas (for human consumption) in Flanders?**
>
> **How can the inclusiveness of this sector be improved?**

Position

Inclusive business can be implemented in all sectors. It currently is most commonly implemented in the agricultural sector (Golja & Požega, 2012). In inclusive business, there is an important focus on the weaker actors in the chain. Those are mainly consumers or farmers. This research will concentrate on the position of the farmer in chains in the agricultural sector.

The six principles of inclusive business

This section will give an explanation of each of the six principles of "inclusive business" offered by CIAT that will be used to define inclusive business in this research. Next, a motivation for the use of these principles will be given. At last, hypotheses for each principle will be given on how the Flemish chickpea sector is expected to score. The hypotheses are mainly based on

two case studies, one in Canada and one in Hungary, where the obstacles and opportunities of introducing leguminous crops were investigated (Balázs et al., 2021; Maaz et al., 2018).

1. Chain-wide collaboration

This first principle involves a collaboration between actors throughout the chain, pursuing common economic, social and environmental goals. Therefore, structures are needed where information is shared and problem-solving happens together. Leaders will be necessary to lead this process. Recognizing the interdependency on other actors is an important factor in this principle (CIAT, 2014a).

The aspects contained in this principle are important for many reasons. First of all, having aligned goals asks from both sides to understand each other goals and perspectives. This can make views and opinions from small actors finally heard (Vasconcelos et al., 2019). Important is also that good collaboration in the chain can build a safety net in case of problems (Rosenstock et al., 2020). Last but not least, climate change is a very complex problem and every actor is part of the solution so all should be included in acting on it (UNDP, 2010).

Hypothesis

Research shows that often many actors in the sector are behind the idea of a protein transition and the associated introduction of new crops such as chickpea. So the goals are aligned. However, although actors are convinced that in general changes need to be made they are not always convinced that they need to be/make the change (Balázs, 2021). This may be an obstacle in Flanders too.

In the case described by Balázs et al. in Hungary, a big obstacle to starting the production of legumes were the weak and incoherent political ambitions (Balázs, 2021). This obstacle is not expected in Flanders since many parties already spoke out their engagement in the green deal (Vlaamse overheid, 2021). Instead, this may be one of the main strengths to build on to make the protein transition a success. Besides the regional and national political support, there are also important financial incentives given on the European level (Balázs, 2021).

In short, it is expected that in general everybody has the same goals and there is enough political support however, it may be difficult to find actors that want to pioneer.

2. Effective market linkages

This means that the producers have a link to a stable market resulting in improved livelihoods. Therefore the trading relationships need to be profitable, clear and constant. Looking into potential opportunities is also part of this principle (CIAT, 2014a).

For farmers, it is important to be able to have security in the long term and be able to anticipate the market for example by making investments or by diversifying their production (Rosenstock et al., 2020). This can also counteract practices of dumping prices because farmers have certainty of sales. In addition, it is also interesting for companies to have a secure supply of materials (Golja & Požega, 2012) in a time of global competition and climate change.

Hypothesis

Having a stable link to a market consists of two aspects: having a stable supply and having a stable demand. The biggest obstacle here will be the high variability in product yield and economic return of chickpeas (Balázs, 2021). The question will be how to accommodate this variability which falls under production risks. On the consumption side, on the other hand, there is a great potential, namely a large and still growing demand (Iannetta et al., 2021; which is also expected to be present in Flanders (van Diepen et al., 2018). However, in Hungary, this was not the case and this was cited as one of the main reasons why the introduction of legumes did not prove successful (Balázs, 2021). The research of Maaz et al. in Canada has shown that market development was very important in the success of the introduction of legumes production so this is expected to be an aspect with potential to focus on in the process of a protein transition in Flanders (Maaz et al., 2018). Besides having a demand, the FAO also states that diversification of sales markets is beneficial for inclusive business. It is interesting to have a look at the current situation in Flanders in this aspect.

In short, the biggest obstacle to this principle is expected to be the variability in the yield of chickpeas. The biggest opportunity is expected to be a large demand for (local) chickpeas.

3. Fair and transparent governance

Fair and transparent governance involves clear and consistent commitments including risk-sharing throughout the chain and fair prices. Also, all actors should have an equal part in the decision-making process (CIAT, 2014a).

Attached to this principle are the logical benefits of fair prices for farmers. It would increase their quality of life (Golja & Požega, 2012). It can also lead to longer and more sustainable relationships because, among other things, the trust between the different actors is strengthened by this principle. Important is also that not only the result of having fair prices, fair share of risks etcetera counts but also that all actors are equally represented in the decision-making processes leading to these results (Rosenstock et al., 2020).

Hypothesis

In the study case of Canada, the researchers cite that the introduction of a new crop can only be successful when it is income-supported and when the whole farm risk management is captured in the price. However, for legumes, the added value for crop rotation needs to be taken into account. It is not seen as a crop where farmers can earn an income by practicing monoculture (Maaz et al., 2018). Another challenge is that the price of new crops are often not competitive with the price of established crops (van Diepen et al., 2018). Fair prices are therefore expected to be pivotal in achieving inclusiveness and in the success of introducing chickpeas in Flanders.

4. Equitable access to services and information

The services hereby referred to are financial services, market information and best agronomic practices. These services are needed in building resilience against market and production risks (CIAT, 2014a). This research will go one step further for this principle and takes also into

account informing consumers in terms of origin, production methods, true costs etcetera in order for them to make conscious decisions with all the information.

The competitiveness of a business model or even a whole chain is increased when market information is shared between the actors and when technical support is provided to smaller actors (FAO, 2015). However, providing services can go further than technical support, also policy support and financial support are necessary. The benefits hereby are proven (Vasconcelos et al., 2019).

Hypothesis

The biggest obstacle expected to this principle is the lack of appreciation and knowledge of the benefits of legumes in terms of crop rotation, nitrogen fixation and emission reduction by farmers (Balázs, 2021; Balázs et al., 2021). Arguments given against changing to legumes by farmers in Hungary are mainly that it requires more labor input and it is financially not desirable (Balázs, 2021). These arguments are expected to be the same in Flanders.

It is therefore expected that a lot of input in terms of research, technological support and financial support will be needed to be able to introduce chickpeas in Flanders. Good communication is central to this. In Hungary, for example, farmers were not well informed about existing subsidies (Balázs, 2021). It is therefore not enough to do research or provide subsidies, these measures must also reach the farmers. In addition, it is possible that investments will have to be made in new storage facilities and processing technologies (Vasconcelos et al., 2019).

5. Inclusive innovation

This principle means innovation 'with' the smallholder farmers and not only 'for' the farmers. Innovation should be an ongoing activity, the profits should be shared equitably and social and environmental impact should always be kept in mind (CIAT, 2014a).

Being inclusive is an ongoing process therefore innovating is key to staying and becoming inclusive. It is a mindset that should be constant and adopted by all participants in the chain (Rosenstock et al., 2020).

Hypothesis

This research argues that innovation in doing business and evolving to inclusive business will facilitate the wanted protein transition in Flanders. Another innovation that is expected to be a prerequisite in introducing chickpeas is genetic research on a breed adequate for Flanders' soils and climate which has proven to be important in Hungary and Canada (Balázs, 2021; Maaz et al., 2018). Serious investments in these innovations will be needed (Balázs, 2021; Balázs et al., 2021).

At last, Björklund mentioned that older people are generally less eager for innovation (Cederholm Björklund, 2018). In Flanders, this could clash with the fact that there are more and more older farmers.

6. Measurement of outcomes

In the spirit of 'you cannot manage what you do not measure', this principle focuses on measuring the results. This also obliges establishing and evaluating indicators and concrete follow-up plans and reduces the risk of deviating from goals and being destroyed by minor shocks (CIAT, 2014a).

Hypothesis

Measurement is necessary for clear communication within the chain but also when transferring learned lessons to other chains or policymakers (UNDP, 2010). However, this subject can be very difficult to quantify. Therefore it can be better to adapt impact indicators on top of measurement and evaluation tools (M&E) because impact evaluations can both demonstrate impact as well as improve processes (Wach, 2012). E. Wach lists in his paper three aspects a good measurement of inclusive business should include: 1) a causal chain analysis 2) capture all outputs of the business model and 3) determine and be clear about who decides on what is considered 'inclusive' (Wach, 2012).

3. Materials and methods

This research will consist of a literature review, a research to the current status of production, consumption and policies in Flanders and interviews with farmers and other actors in the chain.

3.1 Study area

The study area of this research is the Flemish region in Belgium. This study area is chosen because the political commitment to a protein transition pronounced in the Flemish green deal is limited to this territory. References to 'local production' will indicate production within this area.

3.2 Production and market research

In this part, an overview will be given of the current production, consumption and policies happening in Flanders with regard to chickpeas and inclusive business. The used data is mainly collected from FAOSTAT, reproduced by own editing or secondary sources.

3.3 Interviews

The second part of this research consists of two rounds of semi-structured interviews. A first round took place with only farmers participating. The second round involved all kinds of actors involved in the value chain of chickpeas. The questions were based on the new business model principles tool of CIAT adapted by Rikolto in Belgium.

Interview guide and process of the outcomes

In this research, the LINK methodology created by CIAT was used to examine the sector of chickpea production. The LINK methodology puts a focus on how inclusive these business models are. It consists of four tools: value chain mapping, business model canvas, new business mode principles and prototype cycle.

In this research, the tool 'new business model principles' was used to create the framework for the semi-structured interviews. The tool consists of a list of questions for each principle to be able to question each aspect. Rikolto made a practical adaption of this tool which will be used in this research (Rikolto, 2022). This adaptation consists of some changes in the questions and an excel to be able to execute the tool. The motivation for the changes made to the questions are at one hand practical to make the tool more concise. On the other hand, some substantive changes were made to adapt them to the Belgian context, to add more focus on the environmental aspect of inclusive business, to be more action-oriented and to involve all actors in the chain. The guideline for the semi-structured interviews with farmers of this research can be found back in annex 1. The guideline for the semi-structured interviews with the other actors was the summary of the obstacles and opportunities coming from the interviews with farmers in section 5.1.

After the interview is conducted, the answers to the questions are filled in an excel sheet as seen in figure 3. Each answer has its weight. The weights can be seen in figure 4. After answering all the questions, the sum of all points obtained per principle is divided by the number of questions of that principle. This gives the score for that principle.

Principle 1: Chain-wide collaboration		Assessment scale									
IMPORTANT NOTE: *No criterion can be left unanswered nor have two 'x' !*		Strongly agree	Agree partially	Disagree partially	Strongly disagree	Often/ a lot	some/ somewhat/ sometimes/	Nothing/ never/ none	Yes	No	n/a
1,1	You frequently exchange information formally* with your supplier.	x									
1,2	You frequently exchange information informally* with your supplier.		x								

Figure 3: The first two questions of principle 1 of the inclusive business tool (Rikolto, 2022).

Weighting (Do not change)				
Strongly agree	Agree partially	Disagree partially	Strongly disagree	NA/NS
1	0,6666	0,3333	0	NA
Often/ a lot	some/ somewhat/ sometimes/	Nothing/ never/ none	Yes	No
1	0,5	0	0,5	0

Figure 4: Weighting of the possible answers to the questions of the inclusive business tool (Rikolto, 2022)

After calculating all the scores, the scores can be represented in a table and a visualization in the form of a spider diagram can be made. An example is given below in figures 5 and 6.

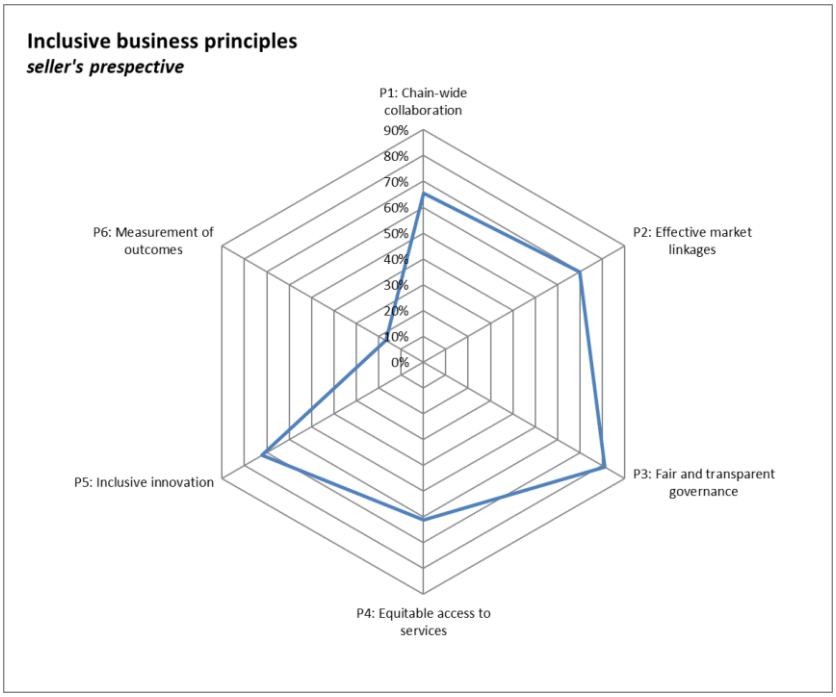

Figure 5: Example of a spider diagram of the scores of the inclusive business tool (Rikolto, 2022)

Buyer	
P1: Chain-wide collaboration	**65%**
P2: Effective market linkages	**70%**
P3: Fair and transparent governance	**81%**
P4: Equitable access to services	**61%**
P5: Inclusive innovation	**72%**
P6: Measurement of outcomes	**17%**

Figure 6: Example of a table with the scores of the inclusive business tool (Rikolto, 2022)

Farmers

Three farmers were interviewed in this research. The analysis of the interviews took place in three steps. First, the interviews were broadly written out and useful information and quotes were highlighted. Next, the excel was filled in based on the answers and the scores were calculated. At last, for each principle the highlights were described. The interviewees are all farmers in Flanders who currently cultivate chickpeas. A short description of each participant will be given below.

Actor	Interviewee	Function	Date of interview
Peas and Beans	Thomas Truyen	Farmer/manager	26/06/2022
PHAE	Felix Bousies	Farmer/Manager	26/07/2022
Biopolder	Fried Van Opstal	Responsible for the new crops	17/08/2022

Figure 7: Table with the details of the interviews with farmers.

Peas and Beans is a small company situated in Zwalm under the management of Thomas Truyen. Thomas Truyen is a pioneer in cultivating chickpeas in Flanders. In 2020, the first chickpeas of Belgium were cultivated and harvested on his fields. The total yield was between 2.000kg and 3.000kg. Chickpeas were sown again in 2021 and 2022 each time between 0,5 and 1 ha (*Peas and Beans*, n.d.). Peas and Beans is seen by Thomas as a hobby. It is not his main profession (Peas and Beans, 2022).

Besides chickpeas, Peas and Beans also cultivated red kidney beans in 2020 but stopped with this crop after one year. His pioneering work got a lot of media attention appearing on the national broadcaster two years in a row. In 2020, there was a focus on the pioneering work and the first good harvest. In 2021, they made the news again because the harvest had failed. Following this experiment and the media attention, research institutions started to research the breeding, processing and consumption of chickpeas. Thomas commits to participate in many of the projects set up around protein transition and chickpea production such as de green deal and KIKET.

Felix Bousies is the farmer and manager of **Project Hansbeke Agro-ecologie**, in short PHAE. PHAE is an arable farm that grows crops for animal feed as well as for human use. No animals are present. In 2022, chickpeas will be cultivated for the first time, intended for human use. In spring, 0,6 ha were sown (PHAE, 2022). The farm is located in Hansbeke, a small village in East Flanders.

PHAE participates in the KIK-LOVE and KIKET projects and is connected to PPAE. PPAE is an agroecology pilot platform and exists as a collaboration between PHAE, ILVO and agricultural consultant and researcher Alain Peeters (RHEA). The goal of this platform is to develop and spread expertise in agroecology in practice. Each year, PHAE makes a few parcels of land available for projects to be carried out on. These projects are usually related to soil quality, crop performance, diversification or product valorization (ILVO, n.d.-b).

Biopolder is a large organic agriculture company located in Berendrecht in the province of Antwerp. Common crops are cultivated as well as experiments with new crops are executed. In 2022, trials are executed with lentils, chickpeas, red beans and soya beans. Each on a quarter of a hectare. Biopolder is connected to the project 'een boon voor a' where a group of actors try to get restaurants to serve more plant-based proteins (Biopolder, 2022).

For this year, no buyer for the chickpeas is found yet nor a processor since it is a test year. This year revolves around cultivation technique and not about setting up a business case. Next year, the successful crops will be expanded to bigger areas (Biopolder, 2022).

The inclusive business tool was not filled in for this case since there has been no sale yet and it is uncertain if there will be a sale this year.

The goal was to do four or five interviews. Unfortunately, this was not possible due to the very small pool of farmers involved with chickpeas in Flanders. Another reason is the busy schedules of farmers and the many other projects concentrating on the protein transition in Flanders resulting in an overload of requests for interviews and surveys.

Other actors

After the interviews with the farmers, the obstacles and opportunities emerged from this will form the basis for the interviews with other actors in the chain. A short description of each participant will be given below.

Actor	Part in the chain	Interviewee	Function	Date
Inagro	Knowledge institution	Jonas Claeys	Researcher and advisor for protein crops	2/08/2022
ILVO	Knowledge institution	Aurélie Tredé	Researcher chickpea breeding	8/08/2022
Casibeans bvba	Intermediary	Bram Van Looveren	Commercial manager and co-owner	8/08/2022

Abinda BV	Processor	Marie-Astrid Dossche	Manager	5/08/2022

Figure 8:Table with the details of the interviews with farmers.

Inagro is a research institution with a focus on practical research and the transfer of this knowledge to all the stakeholders in the agricultural sector. For farmers, Inagro will provide advice or start research on the questions they cannot yet answer. The themes cover all aspects of agriculture, from arable farming, animal husbandry, aquaculture to breeding insects. The institution is located in Roeselare but has fields trials all over Flanders, often in collaboration with farmers to make that the tests are under field conditions. It is interesting and immediately applicable when research is done with realistic pest pressure, other fields in the neighborhood etcetera. Besides working together with farmers, Inagro often collaborates with universities and other research institutions such as ILVO. Inagro is also committed to making the translation for fundamental research to practice. The goal is to use their knowledge to drive innovation to create sustainable economic change that makes agriculture future-proof (Inagro, 2022a; Inagro, 2022c). Inagro participates in many projects including KIK-LOVE (coordinator) and KIKET. Jonas Claeys describes Inagro's method as the following: "*We created a kind of exchange network with a group of pioneering farmers to get to know the possibility the cultivation in Flanders better and also to identify the hurdles and success points*" (Inagro, 2022c). " (Inagro, 2022c).

Inagro's research on chickpeas focusses on the cultivation techniques answering questions such as when to sow, how deep to sow, how many plants per ha, when and how to harvest, to which pests is the chickpea susceptible, which herbicides to use etcetera. This research happens in collaboration with ILVO and with farmers such as Thomas Truyen from Peas and Beans. Both organic and conventional farming of chickpeas is researched (Inagro, 2022c).

ILVO, short for Institute for Agricultural, Fisheries and Food Research, is a research institute connected to the Flemish government. The purpose of this institution is to participate in making agriculture, fisheries and the agri-food sector more sustainable in Flanders mainly but the scoop can be broadened to Belgium, Europe and the rest of the world. Three key words in their organization are multidisciplinary, pioneering and independent. The subjects ILVO covers involve all aspects of agriculture from plant to animal and from seeds to bio-economy. ILVO participate in many projects such as KIK-LOVE, KIKET and PEUL-CHAIN. They also do research on the breeding of a Flemish variant of chickpeas. This research started in 2022 (ILVO, n.d.-a; ILVO, 2022).

Casibeans is a family-owned company that specialized in sourcing legumes over the whole world and marketing them to buyers that process them into high-end food applications. Co-owner and commercial manager Bram Van Looveren describes Casibeans as "*the connection between farmers and the food world*". Sustainability is core to their mission. Their head office is located in Melsele in Flanders. Their supply can be non-processed or already (partially) processed. Casibeans has some trial fields of their own where they also cultivate chickpeas (Casibeans, 2016; Casibeans, 2022).

Abinda is also a family-owned company. They are located in Ruddervoorde and specialize in the production of 100% organic and vegetarian food. This includes seitan, vegetarian burgers, cold and warm sauces and spreads. Humaneness, ecological awareness and creativity are described as the key values of the company. Currently, Abinda is not using Flemish chickpeas yet but they do process Flemish lentils (Abinda, n.d.; Abinda, 2022).

At last, all the results will be bundled to give a comprehensive overview of the obstacles and opportunities of the chickpea sector in Flanders.

4. State of the art in Flanders

4.1 Production of chickpeas

4.1.1 Production process

The production process from seeds to food on a plate takes place in different steps that are described in this part.

Figure 9: The different steps in the production of a chickpea-based product.

At this moment, ILVO and Inagro provide a group purchase of **seeds**. The soil temperature must be high enough to sow therefore, mid-April is seen as the best moment to sow but in some colder years, it will be necessary to wait until May or even June (Inagro, 2022c).

Harvest happens mostly in mid-September. In 2022, however, due to a dry and warm season, the harvest happened in mid-August. Between sowing and harvest, the farmers will have to follow up on their field and execute measurements such as bird protection, weed control and possibly disease control. While threshing, the farmer will try to have a minimum of non-chickpea material but often cleaning will still be needed (Inagro, 2022c).

If the moisture content is more than 15%, the chickpeas need to be **dried** to be able to stock. This is almost always the case (Inagro, 2022c). For other crops such as grains, this is seldom needed (ILVO, 2022).

Cleaning is necessary to remove weeds, little stones, soil, dust, leaves etcetera. An important step in cleaning is the triage which is kind of a sifting process in which all particles that differ in size from the chickpea are removed (Peas and Beans, 2022).

Peeling is not always necessary but it lowers the risk of allergies so for some applications this is asked (Inagro, 2022).

There are many possibilities to **process** chickpeas for example they can be canned, hummus can be made, they can be used in vegetarian burgers or ground into flour.

Technical aspect of the cultivation

Since chickpea is a new crop in Flanders, research has to be done on the technical side of the cultivation. Research institutions ILVO and Inagro are leaders in this research. An overview of the aspects of chickpea cultivation they currently are researching and the state of the art of the results will be described in this part. These include trials around inoculum, sowing date, sowing depth and breeding.

As described in part 2.1.3, chickpeas fixate nitrogen due to a collaboration with the Rhizobium bacteria. However, when a crop does not grow natively in the region the right bacteria will not yet be present in the soil. Farmers will need to introduce the bacteria to the soil, a process called **inoculation** (Inagro, 2022c).

Chickpea can grow also without this bacteria but they will need additional fertilizer instead of fixating nitrogen. This makes that one of the most important benefits of chickpeas is lost e.g. not having to use fertilizer and soil improvement for the next crop. Besides the fact that fertilizers degrade the quality of our soil, their production also requires a lot of energy. So inoculating the fields is really desirable (Inagro, 2022c).

Inagro is responsible for the test regarding the use of inoculum. Currently, three types of inoculum are being tested on different types of soil and in different amounts (Inagro, 2022c). The goal is to provide seeds that are coated with inoculum. This would be very practical for the farmers (ILVO, 2022).

Tests to the best **sowing date** are conducted by both Inagro and ILVO. Chickpea is susceptible to frost and therefore needs to be sowed late enough to avoid it. In Belgium, the ideal sowing date would then be around mid-April. Chickpea however is originally a tropical plant with a long growing season. Sowing in mid-April will result in a harvest in the autumn. This presents a challenge because autumns in Belgium are often wet and using heavy machinery on a wet field to harvest the chickpea can damage the field by removing the oxygen out of the soil (Inagro, 2022c). This can be avoided by harvesting a bit earlier but then you risk that the chickpeas will not be fully matured (Casibeans, 2022).

At the moment, the seeds used are variants adapted to the climate of Italy and the south of France which are already better suited to the Belgian climate but still some improvements could be made through breeding (Inagro, 2022c). The research to the perfect sowing date will continue next years.

The research on **sowing depth** was done by ILVO. This research will not have to be repeated next years. The conclusion is that superficial seeding is the right method. One challenge will be to keep the birds away (Inagro, 2022c).

As said, currently variants adapted to the climate of Italy and southern France are used. ILVO is leading the **breeding** tests to try to find a Belgian variant adapted to our climate. The main focus is to shorten the season, to make the variant resistant to the common fungi in the Belgian soil and to increase the number of pods per plant, all in order to decrease the variability in the yield and to increase the yield in general (ILVO, 2022; Inagro, 2022c).

Breeding happens in different steps. First, ILVO collected a broad mix of seeds requested from gene banks or purchased as commercial varieties from France or Italy. Next, all these types will be cultivated in small quantities. Then, researchers will phenotype every type which means listing all possible characteristics of the plants such as length, width, resistance against diseases etcetera. At last, those that are interesting in our climate are selected and used to build the Flemish variant by crossing the different types. The focus of ILVO lies on the Kabuli

types that produce big white seeds which are most asked by processors. The projected time frame to breed a Flemish variant is 10 years (ILVO, 2022; Inagro, 2022c).

4.1.2 Global production and trade

Worldwide the largest producer of chickpeas is India (figure 11). In India, chickpeas are also consumed a lot which has the consequence that India is not the largest exporter (figure 12) of chickpeas but on top of being the largest producer, the country is also the largest importer (*FAOSTAT*, 2022). Globally, most of the production is situated in Asia and North America. As can be seen in figure 10, Europe's share of global chickpea production is almost negligible, covering only 2% of the total (Merga & Haji, 2019).

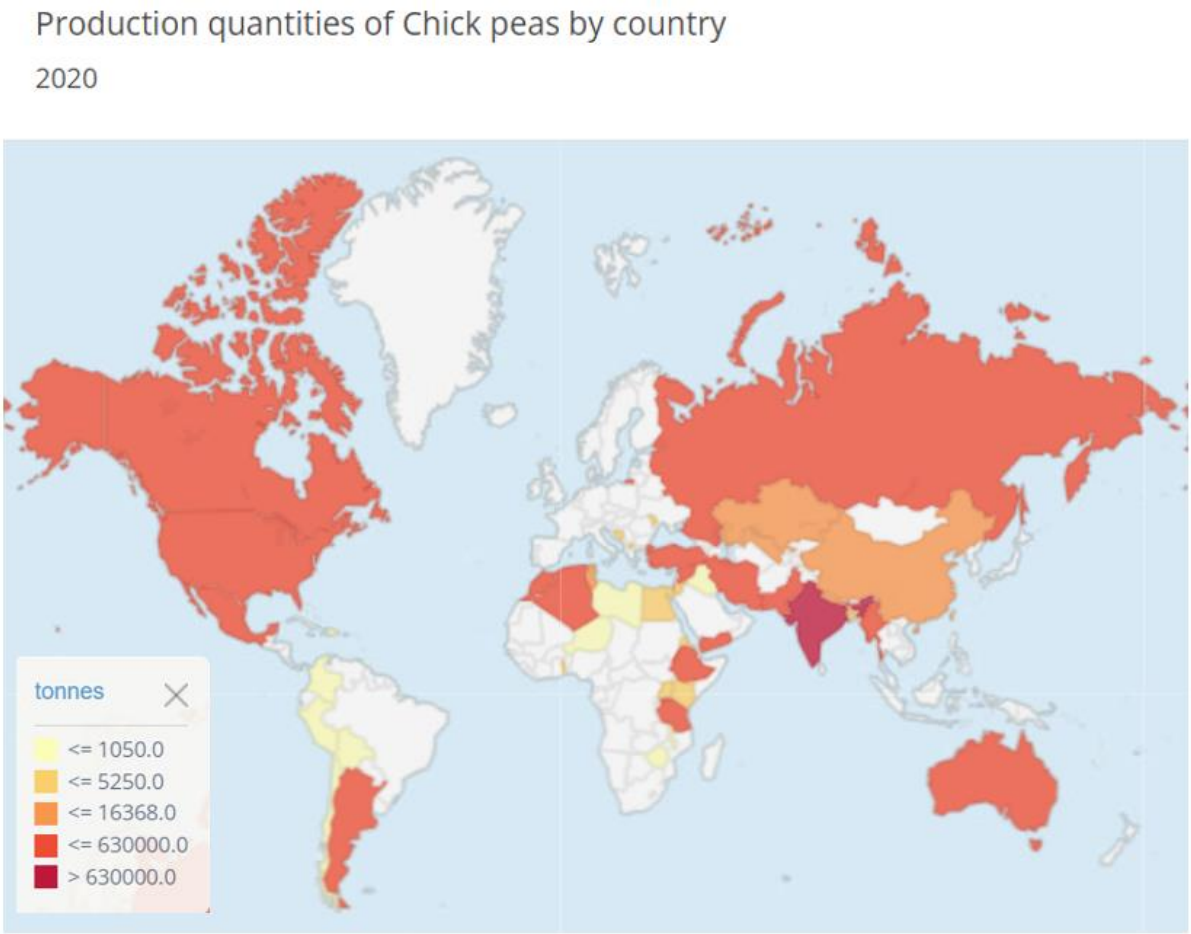

Figure 10: Map with the production quantities of chickpeas by country (FAOSTAT, 2022).

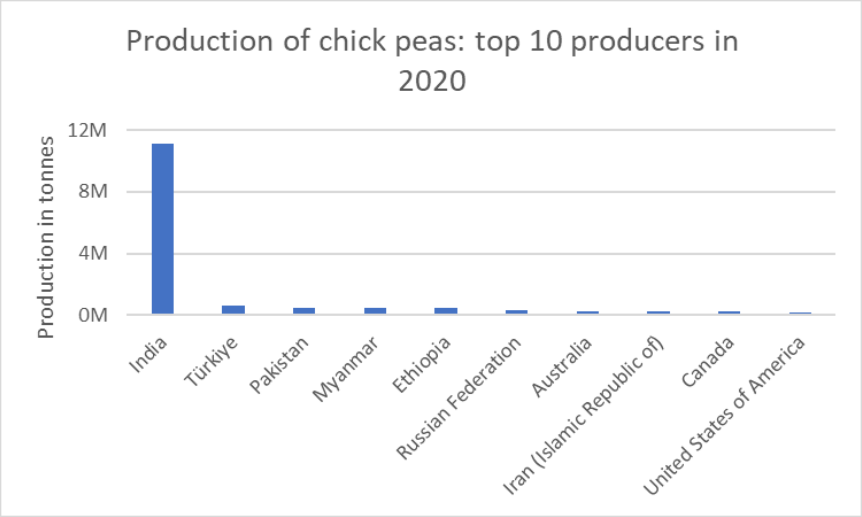

Figure 11: Graph of top 10 producing countries of chickpeas in 2020 (FAOSTAT, 2022).

Australia leads the top 5 of exporting countries in the chickpeas sector followed by Russia, Türkiye, India and the USA (figure 12). The top 5 of importing countries is leaded by India followed by Pakistan, Bangladesh, Türkiye and the United Arab Emirates (FAOSTAT, 2022). Figure 13 shows that the net import of chickpeas to Europe was around 200.000 tons in 2020. The estimated production of chickpeas was 143.000 tons (CBI, 2020a).

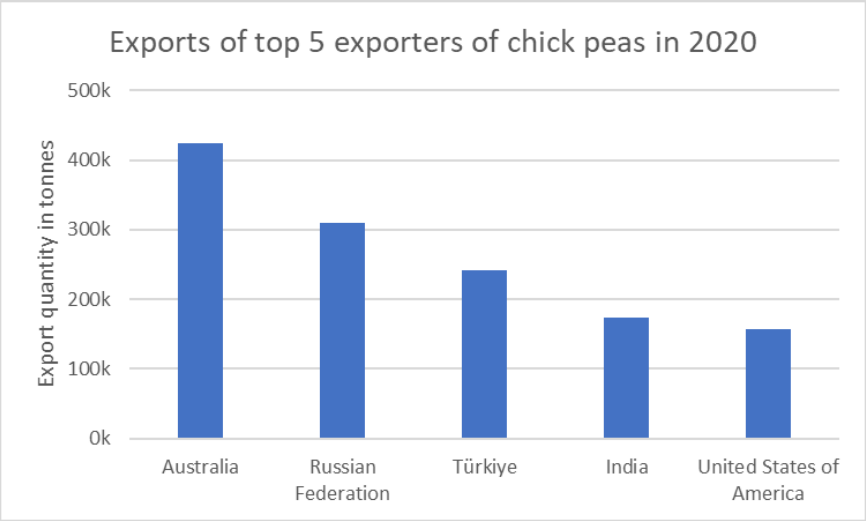

Figure 12: Graph of top 5 exporting countries of chickpeas in 2020 (FAOSTAT, 2022).

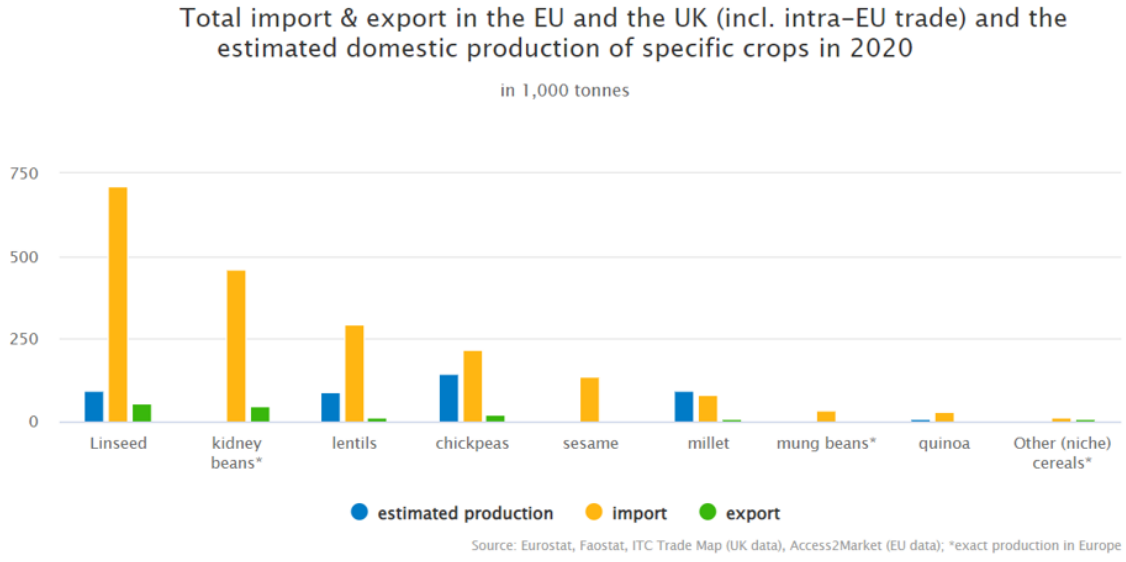

Figure 13: Graph with the estimated production, total import and export of specific crops including chickpeas to the European Union (CBI, 2020a)

4.1.3 Belgian production and trade.

Until 2020, no numbers of chickpea production in Belgium can be found, meaning that the production was (almost) non-existent. Thomas Truyen is cited to be the first farmer to harvest chickpeas in Flanders in 2020. In Wallonia, cultivation of chickpeas started a few years earlier (LAN, 2021)but with 3 ha sown in 2020, this too is an almost negligible amount (rtbf, 2021). In 2020, Flemish research institutions Inagro and ILVO had some trial fields with respective yields of 2.500 kg/ha and 3.700 kg/ha (Inagro, 2022b). Yields of trial fields can be higher than in practice because the field conditions are often better, more homogenous. Inagro calculates around 15% of increased yield due to trial conditions (Inagro, 2022c).

4.1.4 Yield

The average global yield level of a field was in 2019 about 1 ton/ha (Merga & Haji, 2019). The productivity of chickpea cultivation experienced a steady increase over the past few decades as can be seen in figure 14 (*FAOSTAT*, 2022; Merga & Haji, 2019).

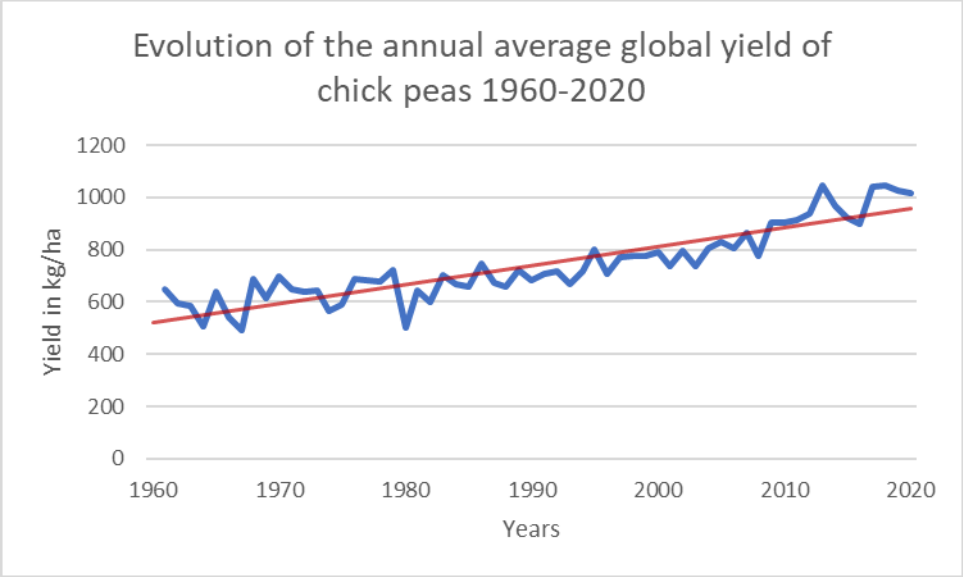

Figure 14: Evolution of the annual average global yield of chickpeas 1960-2020 (FAOSTAT, 2022)

However, big differences can be found between countries. Within the top 10 producing countries in the chickpea sector the average yield in 2020 variated between less than 500 kg/ha to more than 2.000 kg/ha (figure 15) (*FAOSTAT*, 2022). Reasons for these yield gaps can be weather-related, related to diseases or pests and/or related to a difference in knowledge and technological resources (Merga & Haji, 2019; Rawal & Navarro, 2019).

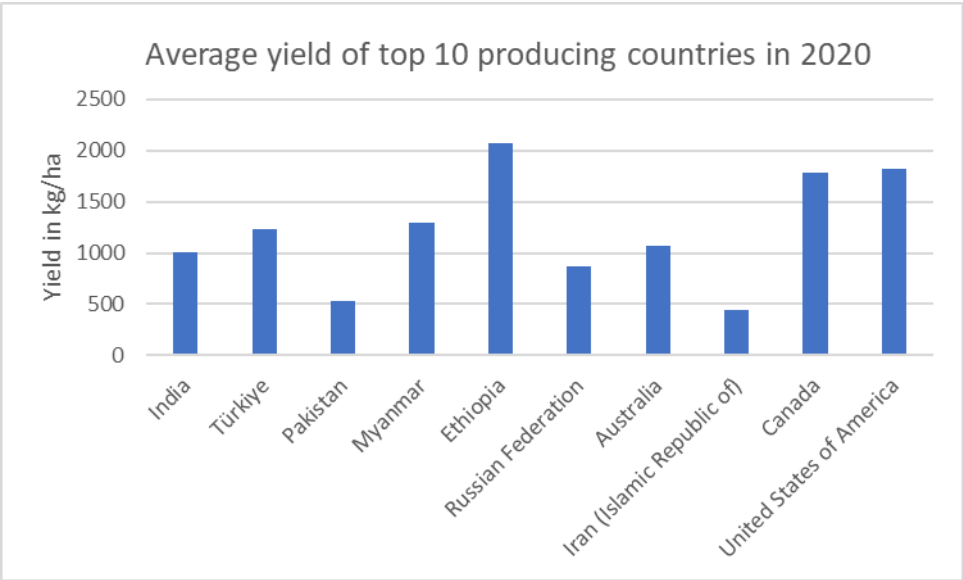

Figure 15: Average yield of top 10 producers of chickpeas in 2020 (FAOSTAT, 2022)

The trial fields of Inagro and ILVO in Belgium in 2020 had yields of 2.500 kg/ha and 3.700 kg/ha however this happened in testing conditions (Inagro, 2022b). In 2020, Peas and Beans had a yield of 2.500 kg/ha. Figure 16 shows that high yields are possible in Europe, but so far those countries are more southern than Belgium, so it cannot be assumed that Belgium will be able to reach the same yield levels.

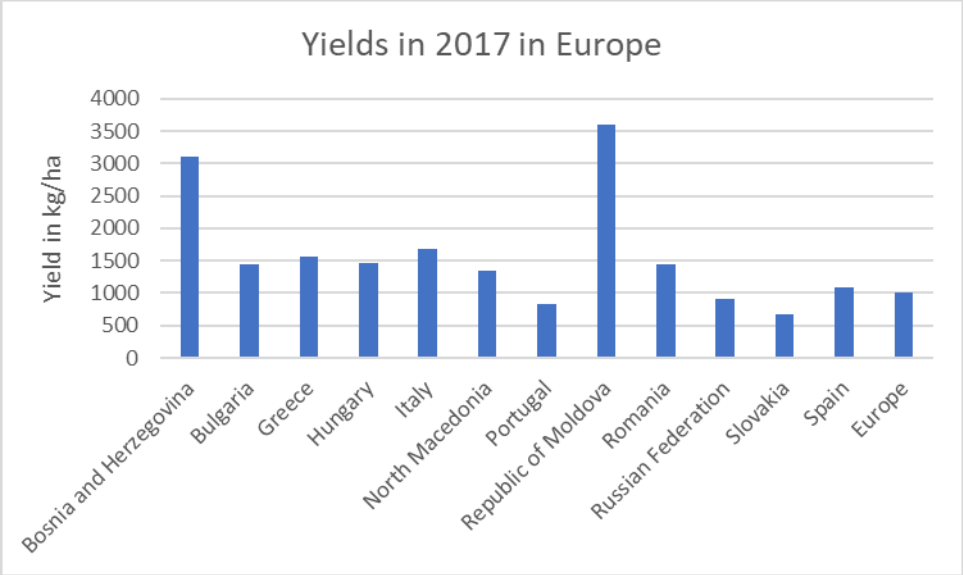

Figure 16: Yields of chickpea cultivation in Europe in 2017 (FAOSTAT, 2022)

4.1.5 Prices

The world market price of dried chickpeas in 2020 is around 0,5-0,6 euro/kg (Inagro, 2022b). This price has been volatile over the years, as can be seen in figure 17. This volatility is mainly caused by the variability in yields, increasing production volumes worldwide and the possibility of stockpiling dried chickpeas. For example, in recent years, fluctuating production in India, the largest producer globally, combined with increased production worldwide due to the high market prices of chickpeas in 2016 and 2017 led to overproduction in 2018 causing the world market price to crash (see figure 17). The world market price is expected to remain volatile partly also due to the carry-over stocks of dried chickpeas that remain large (CBI, 2020a).

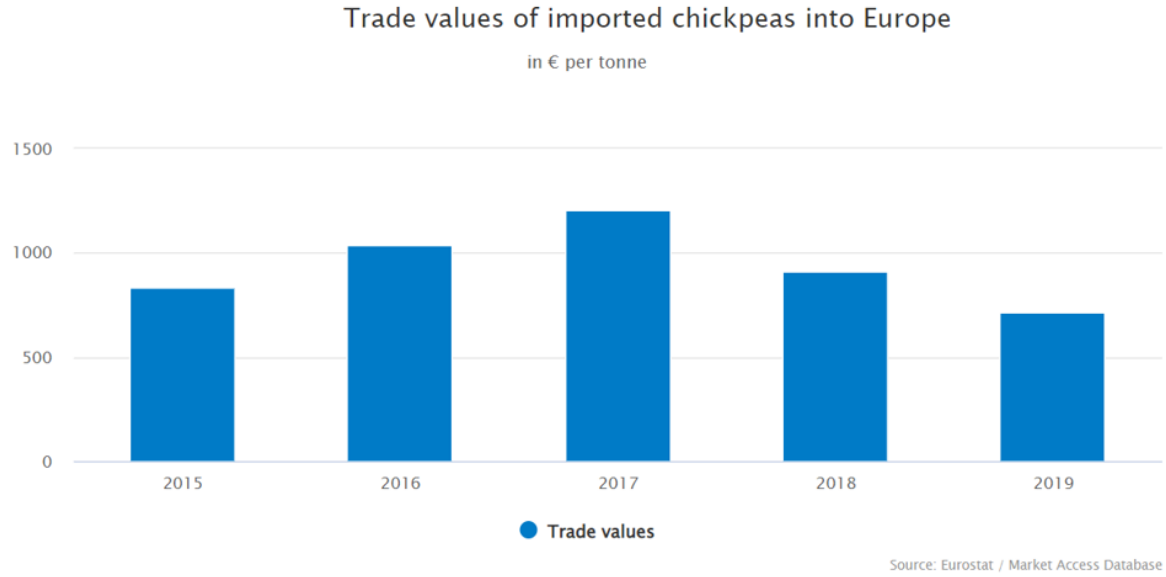

Figure 17: Trade values of imported chickpeas into Europe (CBI, 2020a)

Sales prices to consumers are often higher because the extra costs made from the field to the consumer have to be incorporated. Worldwide, the sales prices average between 2 and 4 euros/kg (CBI, 2020a). Costs are mainly made due to import costs, transport, packaging and

margins for retail. Organic-produced chickpeas can be sold for a higher price. The stocking costs for retail are quite high because dried chickpeas do not sell fast (CBI, 2020a). Canned chickpeas and the costs associated with that product are not considered in this research.

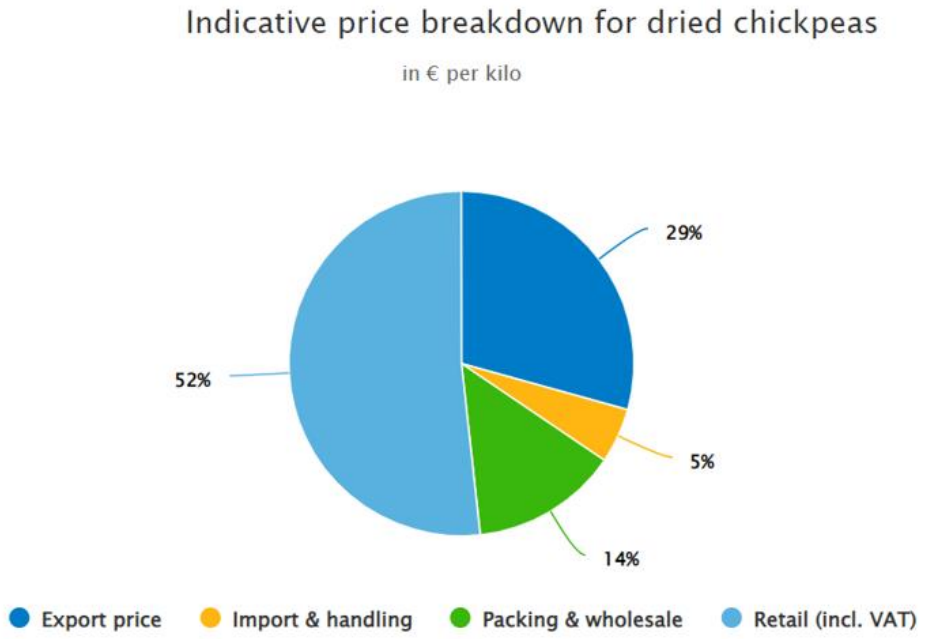

Figure 18: Indicative price breakdown for dried chickpeas (CBI, 2020a).

Research performed by Inagro with data from farmer Thomas Truyen from Peas and Beans calculated a cost of 1.722,81 euro/ha for cultivating chickpeas in Flanders. This includes the cost of seed, inoculum, fertilizer, crop protection, tillage, leasing and expenses, harvesting and drying. The yield of Peas and Beans in 2020 was 2.500 kg/ha. A sale at the world price in 2019 of 0,7 euros/kg would result in a revenue of 1.750 euro/ha or a net profit of 27,19 euros per ha (Wintein, n.d.).

However, there are additional steps before the chickpea can be sold to consumers such as packaging and transportation. Also, retail margins and their cost of packaging and storage add to the sales price. The consumer would then have to be charged 2,38 euro/kg chickpeas to reach break-even in the case of a complete Belgian chickpea chain, from seed to dish. This is below the average of current prices in Belgium of chickpeas that are so far all imported. In the mainstream supermarkets (Delhaize, Colruyt, Aldi, Jumbo and Chan's), an average of 3,08 euros/kg has been calculated. The average price for organically produced chickpeas is 3,71 euros/kg (Wintein, n.d.). Thomas Truyen was able to sell his chickpeas at 5,5 euro/kg or 3 euros per half a kilo. This resulted in a profit of 7.809,28 euro/ha.

Sales prices of Flemish chickpeas thus can be competitive in Belgium with imported chickpeas however this does not include a living income for the farmer yet. An important note is that in 2020 the harvest of chickpeas in Flanders failed and thus only made a loss (Wintein, n.d.). The question is whether Flemish farmers can earn enough income with these prices or can sufficiently supplement their income in case of rotational farming and can sufficiently build a buffer if crop failures occur regularly.

4.1.6 Reasons behind Europe's unrealized potential of legume production

As described in section 2.1.3 of this research, chickpeas, and more general legumes, carry many advantages in terms of food security, regenerative agriculture, emissions reduction and regional and national economic advancement. Section 3.2, will also show that there is a European and a Belgian market for legumes that has the potential to grow next years.

Despite the obvious potential of legumes, Europe lags behind in production in comparison to other regions (Balázs et al., 2021; Iannetta et al., 2021; Kuhlman et al., n.d.). There are a few explanations for this. The main reason is the competition with cereals, which have a more stable yield and as well as higher revenues (Balázs et al., 2021; Kuhlman et al., n.d.; Merga & Haji, 2019). The difference in productivity between legumes and grains has increased over the years due to the economic effect of crop specialization. In the 1970s, monoculture was promoted by governments in Europe (Balázs et al., 2021). This combined with a consumer preference for cereals meant that farmers' attention was focused on cereals (Merga & Haji, 2019). Investments and research thereby also focused on cereals. Consequently, this resulted in a faster increase in the technological development of the production of cereals than of legumes (Balázs et al., 2021; Merga & Haji, 2019). In comparison, chickpeas' productivity increased by 70% in the period 1974 to 2014 while the productivity of cereals increased by 104%, widening the yield gap (Stagnari et al., 2017). Less research and advice also resulted in little knowledge and appreciation for legumes among farmers (Balázs et al., 2021). In addition, a difference in revenues was magnified because cereals received various subsidies over the years (Kuhlman et al., n.d.). Legumes are also disadvantaged by the fact that the positive externalities they generate, such as enhanced biodiversity, are not included in the price (Balázs et al., 2021; Stagnari et al., 2017).

In addition to competition with cheaper crops such as cereals, the legume sector also faces competition from cheap N fertilizers as an alternative to providing nitrogen to the soil and competition from imported legumes (Kuhlman et al., n.d.).

It can be concluded that the current low production of legumes and specifical chickpea cannot be entirely due to climate conditions or farmers' choices but that it is also largely influenced by policies (e.g. giving subsidies) and by the amount of research on the crop and its production methods. Thus, a major role is played by policymakers and research institutions (Stagnari et al., 2017). This is a lesson that needs to be taken into the future.

4.2 Consumption of chickpeas

Besides being a sustainable crop, chickpea is also healthy. In recent years, the popularity of this product has increased strongly (Balázs et al., 2021). This can be seen in the strong increase in net imports of chickpeas that almost doubled last decade as shown in figure 19. This is a trend that is happening in general in Europe as shown by the increase in imports of chickpeas into Europe in figure 20. The study by Balázs et al. shows that barriers to consuming legumes nevertheless exist in Europe. For example, legumes are perceived as less attractive and less convenient by consumers, the environmental and health benefits are not sufficiently known

and there is not always sufficient knowledge of how to use legumes in dishes (Balázs et al., 2021). Acting on these barriers could stimulate the demand even more.

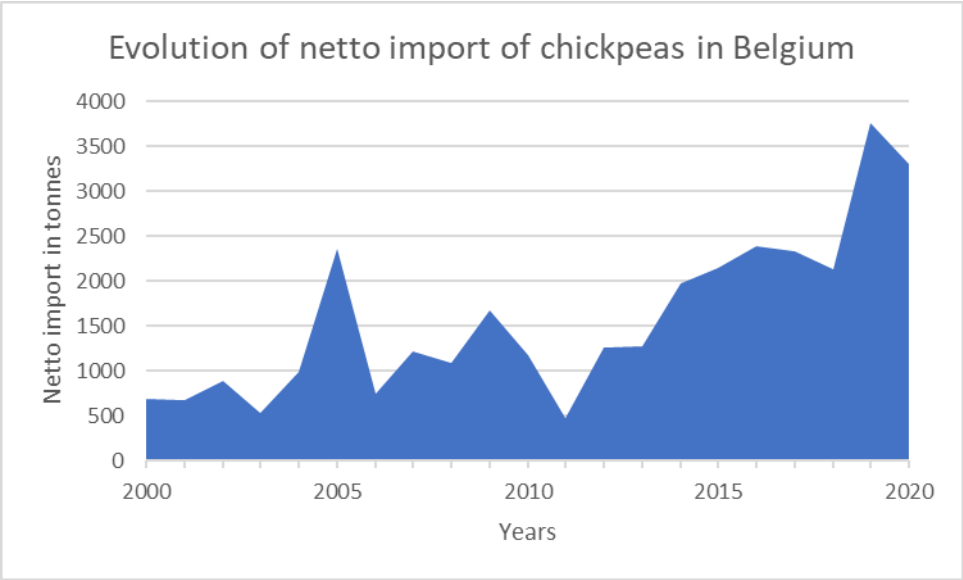

Figure 19: Evolution of net import of chickpeas in Belgium (FAOSTAT, 2022).

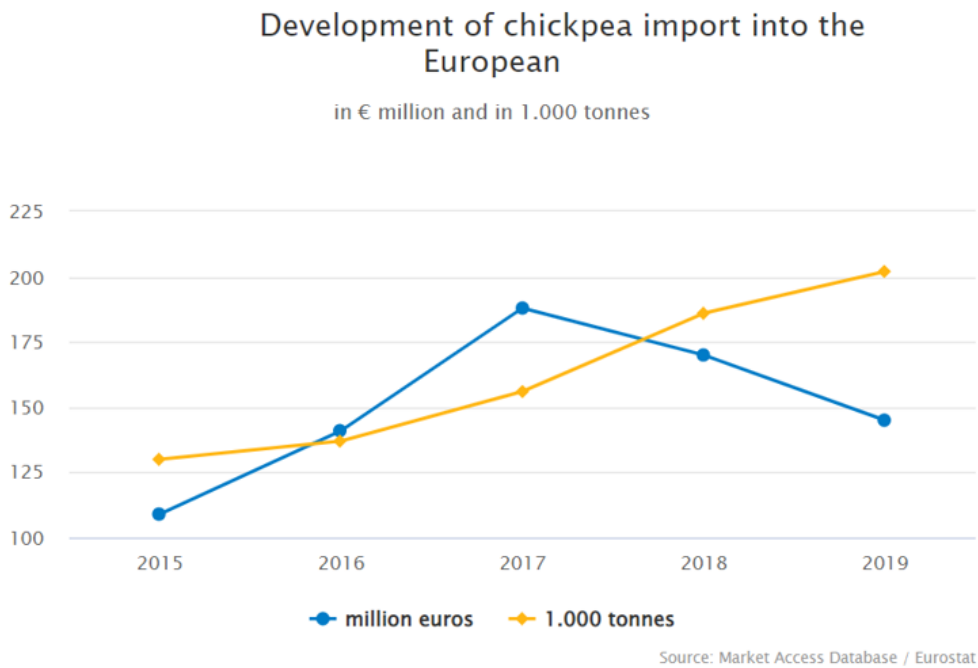

Figure 20: Graph showing the increased import of chickpeas and the price crash in 2018 (CBI, 2020b).

Moreover, more and more attention is being paid to conscious consumption. On the one hand, this translates into consumers looking for healthy, nutritional and allergen-free food (CBI, 2020b). On the other hand, this leads to an increase in flexitarians, vegetarians and vegans and the associated increase in plant-based food (CBI, 2020b; Cromheecke, 2022; Rikolto, 2019; Vleugels, 2020). In both motivations, chickpeas are perfect as an answer (CBI, 2020b). Also in the media, legumes are getting some attention and are being described as the food of the future (de Standaard, 2021; Het Nieuwsblad, 2021; Heylen, 2019; Rikolto, 2019).

Finally, more conscious consumers also take the origin of products into account and thus buy more locally. This is also a trend that has been growing for years and was given an extra push by the corona crisis (VILT, 2022). However, local chickpeas were not yet for sale.

It can be concluded that the demand for chickpeas is increasing and offers commercial opportunities (Balázs et al., 2021; Iannetta et al., 2021).

4.3 Regulation, context and support of chickpea production in Flanders

This section will look into the state of the art regarding policies influencing the chickpea sector in Flanders and projects and research around chickpeas and the protein transition in general in Flanders.

Green deal: protein transition on our plate

A good starting point is the 'progress rapport' of the green deal of the protein transition (see part 2.1.2). This report gives a summary of everything undertaken by the partners so far. In 2021, the green deal made a call to all its partners for projects that help realize the ambition of this green deal. A total budget of 4 million euros was attributed, with a minimum of 60.000 euros and a maximum of 240.000 euros per project. The implementation period had to be a maximum of 2 years. Besides these larger projects, many smaller actions also were executed. All these actions can be divided into five categories: inform, inspire and communicate, research and innovation, vision and tools, environment and supply, and at last monitoring. In each category, the relevant actions for the chickpea sector will be listed (Vlaamse Overheid, 2022).

Inform, inspire and communicate

This category holds all the actions in relation to knowledge sharing and spreading recommendations such as organizing webinars, lectures, inspiration days, spreading tips via the network of partners or organizing challenges such as the veggie challenge by EVA, a NGO working on the topic of plant-based food. The ambition is to share the insights from those actions to the maximum extent and to strengthen each other (Vlaamse Overheid, 2022).

Research and innovation

In this category, projects are often looking for an answer on how to improve the supply and better match the increased demand for healthy and sustainable products. There is also a focus on research into consumer behavior. Some of these researches are specifically working in the field of chickpeas and legumes. The most important actors are research institutions Inagro and ILVO and the college Arteveldhogeschool (Vlaamse Overheid, 2022). Most studies have only just started and are still ongoing so results are not yet available.

The **EI-MEET** research monitors the consumption ratio between animal and plant protein in Flanders and is executed by KU Leuven in collaboration with all the partners of the green deal (Vlaamse Overheid, 2022).

The **CO-MEET** research goes deeper into the context and the emotions related to vegetable protein consumption and actively searches for opportunities to make the Flemish people make the transition. This research is conducted by the research group of Be4Life and UGent. The results are expected at the end of 2022 (Vlaamse Overheid, 2022).

In the **PEUL-CHAIN** project, the potential for the production and consumption of legumes is investigated. The goal is to stimulate the local cultivation, processing and consumption of legumes in Flanders through knowledge sharing and awareness raising. The executor of this project is a big group of partners of the green deal including farmers, processors, research institutions and governmental institutions (Vlaamse Overheid, 2022).

KIK-LOVE and KIKET are both projects working specifically on chickpeas. KIK-LOVE was a research with the aim of collecting the currently existing initiatives around chickpeas and spreading them in order to further expand the group of farmers and work together on chain development. More specific, field trials were conducted with a focus on inoculation, varietal differences, and weed control to be able to optimize yield and product quality. This research was led by Inagro and has been completed. However, research into breeding chickpeas is still ongoing (Inagro, 2022c; Vlaamse Overheid, 2022).

KIKET builds on the information acquired by KIK-LOVE and aims to optimize the local production of chickpeas. It looks therefore also to other actors in the chain besides the farmers and their willingness to change to a Flemish chickpea, as well as the willingness to pay and the application possibilities in order to determine the ideal scale. This research is led by Arteveldhogeschool in collaboration with 10 other partners (Inagro, 2022c; Vlaamse Overheid, 2022).

Besides these projects, some smaller research projects were executed. Some students of arteveldehogeschool did research on chickpeas and the protein transition as part of their studies. The research questions were each drafted in consultation with other green deal partners after which the information could also be shared (Vlaamse Overheid, 2022). An example of this is the research of Margot Wintein on the price of locally produced chickpeas in comparison with imported chickpeas (Wintein, n.d.). At last, test-aankoop executed research on the place legumes have in the supermarket and the influence of this on sales (Vlaamse Overheid, 2022).

Vision and tools

Parties within and outside of this Green Deal are encouraged to translate the vision into their own tools. An example of this is the implementation of a 40/60 animal/plant protein policy when offering food in a company (Vlaamse Overheid, 2022).

Environment and supply

The goal of this category is to put the behavioral insights into practice and to nudge consumers e.g. by changing the location of a product in the supermarket. Besides this, the goal is also to expand the supply(Vlaamse Overheid, 2022). An important development in this category is the establishment of protealis, a spin-off from ILVO and VIB that develops seeds and seed technologies for legume crops to facilitate their adaptation to the European environment (Protealis, 2021; Vlaamse Overheid, 2022).

Monitoring

Good monitoring is necessary. Most of this is included in the research projects such as EI-MEET, CO-MEET and PEUL-CHAIN. In addition, consumers survey were conducted by EVA and test-aankoop (Vlaamse Overheid, 2022).

CAP

Also on the European level, there are policies regarding food that can influence the chickpea sector. This can be in the form of tariffs, import restrictions, regulations around hygiene, labels, pesticides etcetera. There are no items relevant specifically to the chickpea sector of these. However, some policies of the EU's Common Agricultural Policy (CAP) can have a specific influence and are listed below (Zander et al., 2016). The CAP is a common policy directed at farmers' support and food security in the European Union. It is controlled and financed at the European level using funds from the EU budget (European Commission, n.d.-a).

Under the recent CAP, member states can opt to give voluntary coupled support for specific crops up to 8% of the annual national ceiling for agricultural subsidies or in some cases up to 13% (Zander et al., 2016). This was currently not applied by Belgium until 2022 but it will be put into practice from 2023 on (Departement Landbouw & Visserij, n.d.-a). It could be a possibility to boost the production of protein-rich crops (Zander et al., 2016).

30% of the direct payments to farmers under the CAP can only be distributed if two conditions are met. The first condition contains crop diversification. When a farm holds 10-30 ha of arable land at least two crops need to be cultivated. If it holds more than 30 ha at least three crops need to be cultivated. This condition is favorable for chickpeas since it is perfect for crop rotation farming. However, it is expected that this condition will have almost no influence on legume production (Zander et al., 2016).

The second condition concerns ecological focus areas (EFA's). This means that farms over 15 ha need to establish an EFA on 5% of their land with as the goal to preserve and improve biodiversity. Different measures can be taken to make an EFA such as landscape features such as hedges, fallow land, green cover, agroforestry but also nitrogen-fixing crops (IEEP, 2016). Each measure has a weight depending on the environmental benefit they deliver. The cultivation of legumes is weighted 0,7 which is the highest weight for all harvestable uses of EFA's. This condition has the potential to be a good incentive for the production of grain legumes (Zander et al., 2016).

Besides direct financial support, support can also be given by investing in research and innovation. This is believed to have a bigger impact on the production of legumes. Research indicates that this kind of investment is at the basis of the growth of legume production in Australia and Canada (Balázs et al., 2021; Zander et al., 2016). With the green deal, the Flemish government is indeed clearly investing in this type of support.

The CAP will be put into practice in Flanders in 2023. The Flemish government has said to install eco-regulations in which direct support to some crops will be given. The budget provided by the European Commission for Flanders for direct support to farmers will be 229 million euros each year. Farmers applying for this premium must implement three sustainable practices: crop diversification, conservation of permanent pasture, and creation of ecological focus areas (Departement Landbouw & Visserij, n.d.-a). Until the first of January, the pre-eco-regulations are in effect. One of the five pre-eco-regulations is dedicated to crops with a positive impact on the environment, climate or biodiversity including leguminous plants or mixtures of leguminous plants and cereals (Departement Landbouw & Visserij, n.d.-b). So far chickpea was not part of this list yet but with the annual review, this could change (Inagro, 2022c).

Due diligence

Besides the CAP, the law of due diligence is also worth mentioning in this context. The definition given by the European Commission is "the processes through which enterprises can identify, prevent, mitigate and account for how they address their actual and potential adverse impacts" (European Commission, n.d.-c). It means that companies can be held responsible for risks in their chain such as pollution or child labor. The impact of this is that products have to be fully traceable which may lead companies to local products.

4.4. Inclusive business in Flanders

This section will look into the state of the art regarding inclusive business in Flanders. This topic is difficult to research since there is no overview of all actors working on inclusive business. Also, as described in section 2.2.2, inclusive business is known under different names and definitions and has some overlap with other concepts such as corporate sustainability and true pricing. Therefore, in this section, there will first theoretically be looked into the potential of NGOs regarding inclusive business. Next, two examples in Flanders will be given. One where the NGO is a facilitator between the different actors in the chain in improving their inclusiveness, another tries to improve the inclusiveness by the introduction of a label.

The theoretical part is based on the paper 'Co-creation for sustainable development: The bounds of NGOs contributions to inclusive business' by Tytti Nahi on how NGOs can contribute to inclusive business partnerships and initiatives but also its limits based on seven examples (Nahi, 2018).

The main contribution NGOs can make to improve the implementation of inclusive business principles into business relationships is the ability to facilitate. First of all, NGOs are usually independent regarding business relationships. Attention must be made when NGOs are paid by companies for their services so that they keep being independent. Often, NGOs are financially supported by governments giving them a certain legitimacy that can give them some weight in negotiations. From their other work, often around development, they have acquired skills that are also useful in this context, such as creating a dialogue (Nahi, 2018).

Also, they often have many connections in all fields they can address in building collaborations. Next, NGOs typically have a lot of social and environmental knowledge. However, they sometimes lack knowledge about the corporate world and culture. At last, Nahi mentions that research needs to be done on the benefits and costs that these partnerships and initiatives can bring to NGOs in reverse (Nahi, 2018).

Rikolto is an international NGO with a Belgian department working around healthy and sustainable food involving all steps going from farmers to the consumer. Inclusive business is a central concept in their association (Rikolto, n.d.). They transformed the inclusive business principles described by CIAT into a tool whereby they facilitate the dialogue. This tool is used in this research.

Socopro is an NGO founded and supported by the Walloon government. They focus on the diversity of the sectors that make up Walloon agriculture and on letting each actor be heard. In 2017, the NGO Socopro launched the label '**prix juste producteur'**. This label shows when a product is made by giving a fair price to the farmers. By using a label, consumers are informed and are able to make a conscious choice. To get the label, producers need to meet 15 conditions under which guaranteeing local origin or traceability of the sources and taking production costs in the price (Prix Juste Producteur, 2020). This is a promising example of how to put inclusive business into practice.

5.Results

5.1 Interviews with farmers

For this research, Thomas Truyen of Peas and Beans, Felix Bousies of PHAE and Fried Van Opstal of Biopolder were interviewed. With the answers of Peas and Beans and PHAE, the inclusive business principles tool could be completed. The calculated scores are shown in figure 22 and figure 24. Figure 21 and figure 23 visually represent these scores in a spider diagram. The scores will be discussed by principle. The scores given are not objective but subject to different contexts and experiences. Different scores do not mean that one is more inclusive than another but they can give an indication on which principles there is a lot of work on and which are going already in the right direction.

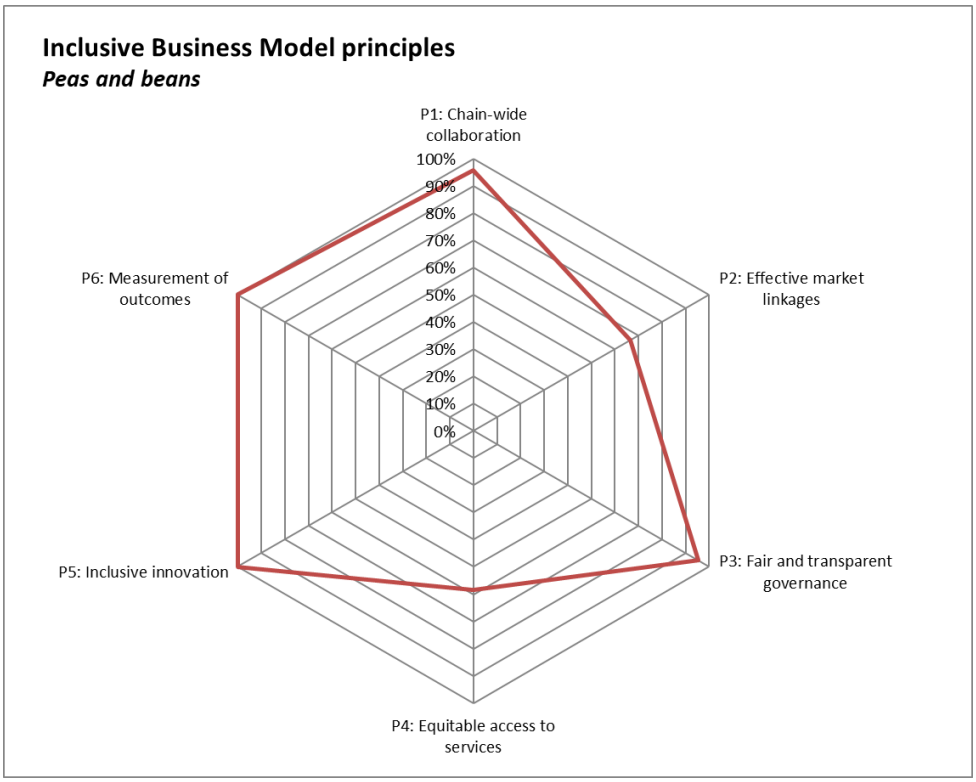

Figure 21: Spider diagram showing the scores of Peas and Beans of the inclusive business model principles tool visually.

Peas and beans	
P1: Chain-wide collaboration	**96%**
P2: Effective market linkages	**67%**
P3: Fair and transparent governance	**95%**
P4: Equitable access to services	**58%**
P5: Inclusive innovation	**100%**
P6: Measurement of outcomes	**100%**

Figure 22: Table with the scores of Peas and Beans for each inclusive business principle.

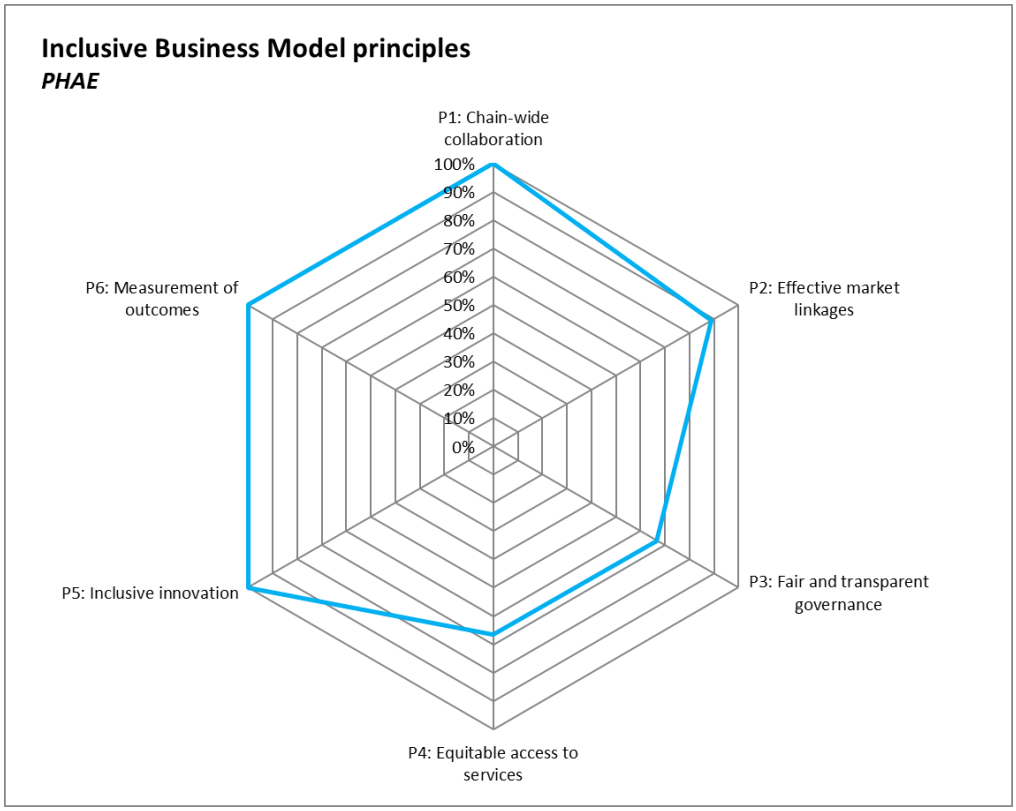

Figure 23: Spider diagram showing the scores of PHAE of the inclusive business model principles tool visually.

PHAE	
P1: Chain-wide collaboration	**100%**
P2: Effective market linkages	**89%**
P3: Fair and transparent governance	**67%**
P4: Equitable access to services	**67%**
P5: Inclusive innovation	**100%**
P6: Measurement of outcomes	**100%**

Figure 24: Table with the scores of Peas and Beans for each inclusive business principle.

1) Chain-wide collaboration

The score that Peas and Beans gives to this principle regarding their experience is with 96% very high. Peas and Beans operates only on a small scale where all contacts with sellers are direct and mainly informal. This gives room for an open dialogue. The few percentages lost are due to an example given in the interview whereby an investigation into a possible fungus on the chickpeas was needed. The costs were incurred by the farmer and fortunately could be partly recovered through the projects of KIK-LOVE and KIKET (Peas and Beans, 2022) but for the time being, there is no system for possible cost sharing for this kind of problems when these projects stop.

Also, the score given by PHAE is with 100% very high. PHAE is connected to the KIK-LOVE and KIKET projects. These projects bring together all the actors in the chain and are a great example of how to ensure collaboration in the chain (PHAE, 2022).

The marketing for PHAE chickpeas was provided by the KIKET project. The chickpeas will be purchased by the supermarket Delhaize (PHAE, 2022). However, this means that there is currently no direct contact between the farmer and the seller concerning trade conditions.

All the farmers indicate that they work together towards environmental sustainability throughout the chain (Biopolder, 2022; Peas and Beans, 2022; PHAE, 2022). The sustainable aspect that chickpeas can offer as an alternative to animal proteins plays a role in the motivation of all actors in the chain. Moreover, Peas and Beans only cooperates with sellers who are working on environmental sustainability in their business. This can happen in different ways such as packaging-free stores, short-chain projects, vegan restaurants or sellers who are focused on local products and businesses (Peas and Beans, 2022).

2) Effective market linkages

The most important aspect of the chickpea is that it is a sustainable product with increasing popularity (Biopolder, 2022; Peas and Beans, 2022). This makes the potential markets not only diverse but also numerous. Moreover, consumers of plant proteins are generally concerned with sustainability and are therefore often interested in local cultivation (Peas and Beans, 2022).

At the moment, there cannot be spoken of a real local market for chickpeas in Flanders. The problem here lies in the production. This is far from stable, with even a year without a harvest in 2020. Thomas Truyen puts it like this: "*Purely as a business model, it is not yet ripe, but if the cultivation is stable and I can sell them at the same price as I have done so far, then you could make a business model of it.*" Guarantees for long-term security can therefore not be given. This explains the lower score of 67% given by Peas and Beans for this principle (Peas and Beans, 2022).

PHAE has with 89% a higher score for this principle. This is because 2022 is the first year they are growing chickpeas and they cannot yet make predictions in terms of variability of yield. The projects KIK-LOVE and KIKET also arranged the marketing and provided a fixed price per ha regardless of the harvest, which results in very stable prices. However, this is only for two years so no long-term commitments are expressed (PHAE, 2022).

When asked if the buyer is familiar with the production system and therefore the associated risks, both farmers gave a positive answer. Many buyers made already field visits (Peans and beans, 2022; PHAE, 2022).

A motivation for Biopolder to choose legumes is also the fact that they can be stocked when dried. This makes that the farmer does not have to sell immediately when harvesting but they can wait a bit until the price is more advantageous.

> *Biopolder: "The advantage of legumes is that you can also dry them and then you are not so dependent on having it to go away fast and you have to accept what the buyer gives you for it and then you get those situations where farmers would rather plow their crop under than selling it that way, like recently in the news. We try to deal with that a little bit by not focusing so much on fresh products but on products that can be stored" (Biopolder, 2022).*

3) Fair and transparent governance

PHAE: "We just get a fixed price per hectare from the research project, regardless of the crop." (PHAE, 2022)

The score for this principle given by PHAE is 67%. The situation of PHAE is rather exceptional within agriculture. The company receives a fixed price per ha regardless of the yield of chickpeas. As such, all production risks lie with the project. This is advantageous for the farmer but still results in a lower score since it is not a fair distribution if all risk lies with one actor. Fixed prices are also not always the most fair. If prices go up the farmer should get its fair share. This principle loses some percentages also because this model is not sustainable and will stop after two years (PHAE,2022). However, in this case, with the high risks, it seems very fair to use this system.

Peas and Beans does have with 95% a high score for this principle. This is mainly due to the fact that the farmer can determine his own price. This is very exceptional in agriculture too and is a result of the current high demand for local chickpeas and the little supply, giving the farmer a certain position of power. It also gives Peas and Beans a strong position in negotiations on other trading conditions with sellers, as Thomas Truyen says himself: *"But due to the fact that I had a lot of demand and little supply, I could say okay, no problem, I'll sell it to someone else".* An example of this was the request of a store to clean the chickpeas even more because it was easier for their customers but this would mean an extra effort for the farmer but in this case, it led to a termination of the cooperation without this being a problem for the farmer. Of course, the standards of the FASFC (Federal Agency for the Safety of the Food Chain) must always be met. In addition, Peas and Beans also receives compensation through KIKET for participating in the project (Peas and Beans, 2022).

Until now, the production cost was not the basis for the price calculation as 2019 was only the first time cultivation had taken place so there was no clear view of costs yet. On the basis were the prices of chickpeas in the store. Peas and Beans communicated clearly about their price and that local production means a higher price (Peas and Beans, 2022).

Peas and Beans: "I have always said mine are going to be expensive, I have no intention of growing cheap." (Peas and Beans, 2022)

4) Equitable access to information and services

After sowing, farming and harvesting, there are a few more steps in the chain before the product reaches the end consumer. These steps involve cleaning, sorting, packaging, marketing etcetera (Peas and Beans, 2022). Cultivation requires little access to extra services as this can be done with existing machinery. However, some challenges exist for the other steps. The biggest is the chickpea cleaning. There are currently no central cleaning sites willing to clean the small quantities grown in the chickpea sector (Peas and Beans, 2022; PHAE, 2022) and for organically grown crops it is even more difficult (PHAE, 2022).

Thomas Truyen explains: *"Suppose you as a farmer have harvested 1.000 kg where do you have to go with that to have it cleaned? Those companies that do that are used to starting batches of 100.000 tons as a minimum. It's not easy to work with smaller quantities. But even*

those small-scale short-chain products need a central point somewhere where they can clean up because farmers can't finance that themselves. Those are necessary investments that need to happen". This is a major bottleneck. The same can be said for the sorting of the chickpeas.

> *PHAE: "For small quantities, it is not always easy to get to a grower because they do volumes and you are not a priority and the mobile grower, the only one in Flanders, they only do conventional so for an organic farmer like me that is not possible" (PHAE, 2022).*

From the research institutions, farmers can count on support. This support ranges from workshops, joint purchasing of seeds to triaging of the chickpeas (Peas and Beans, 2022; PHAE, 2022). Also, connecting the other actors and connecting farmers could be seen as a service provided by the KIK-LOVE and KIKET projects. Many research and projects evolve around how to reduce the variability of the harvest. No services so far are dedicated to how to build resilience against these production risks. This is an important aspect of this principle missing.

From the buyers, little is offered in terms of services but this is because these are small actors and it is too small of a sector (Peas and Beans, 2022). Larger actors such as supermarket chains or frozen food companies that often offer certain services such as for example weed control for other crops are not connected to the chain so far.

For informing the end consumer, there is certainly collaboration. For example, the KIK-LOVE project had signs posted at the field stating "local chickpeas are grown here" and Thomas Truyen mentioned that posts of his company are regularly shared on the sellers' social media (Peas and Beans, 2022, PHAE, 2022).

It can be concluded that there is a lot of support coming from research institutions. Directly from the buyers, there is no support (yet) due to the small scale of the sector. Also lacking are services to resilience building around production and market risks. Finally, farmers are particularly struggling to find cleaners and sorters with their small amounts. The combination with organic products creates an additional obstacle here. The scores are therefore still not very high with 58% and 67% for Peas and Beans and PHAE respectively.

5) Inclusive innovation

Important in this principle is that the innovation happens 'with' and not only 'for' the farmer. This is certainly the case here as Thomas Truyen pioneered the project as a farmer on his own, after which other chain actors also started to engage to this topic. In all further projects and research, farmers remain closely involved.

> *Peas and Beans: "Much more than a professional project or to make money out of it, I see it as a project to learn from it and to make some things shift and it did" (Peas and Beans, 2022).*

Also important to the inclusive business principles is that innovations pursue environmental and social goals. The motivation of both PHAE and Peas and Beans included a strong environmental component. For PHAE, an important argument was the fact that chickpeas are leguminous and therefore useful in a crop rotation that also has low demand for nitrogen

(PHAE, 2022). For Peas and Beans, giving a local plant-based alternative for animal proteins was part of the motivation (Peas and Beans, 2022).

In addition, both farmers indicated that crops such as chickpeas will increasingly thrive due to climate warming. Also, the farmers are aware that the market for plant proteins is growing and are responding accordingly. With this innovation, the farmers are trying to build resilience for changes in the future such as climate change and changing markets and thus be able to secure their business.

> *Peas and Beans: "A lot of farmers are frustrated because 'we grow pigs here and everyone becomes vegan and we don't get enough for our product anymore' but I think you have to be innovative. If people are going to stop eating meat soon they still have to get their proteins from somewhere then you just have to see those new opportunities and try to seize them"(Peas and Beans, 2022).*

For both, the financial part also played an important role. For PHAE, it was mainly the fixed price that was important (PHAE, 2022).

> *PHAE: "I took it because I knew the outlet was taken care of but if it wasn't I would think differently" (PHAE, 2022).*

Peas and Beans in turn saw economic opportunities by being the first to start the cultivation of chickpeas (Peas and Beans, 2022).

> *Peas and Beans: "I also saw a niche product in there that was also easy to hype marketing-wise" (Peas and Beans, 2022).*

It can be concluded that both environmental goals such as providing an alternative to meat and introducing more nitrogen-fixating crops, as social goals such as a higher income for farmers and safeguarding the future of their business, are pursued. This resulted in very high scores of 100% for both companies.

6) Measurement of outcomes

The measurement of results is mainly handled through the KIK-LOVE, KIKET and PEUL-CHAIN projects. Important is that learned lessons are spread between farmers as well as between different actors. PHAE and Peas and Beans, therefore, give a score of 100% here.

Some **obstacles and opportunities** to a successful evolution of the chickpea sector can be extracted from the interviews with the farmers. Four obstacles and four opportunities were listed and they formed the guideline for the interviews with other actors where not only views on these obstacles and opportunities were sounded but also possible solutions or advancements were explored. A summary of these obstacles and opportunities are given below.

The biggest obstacle is the **variability in production**. As Thomas Truyen describes it *"It is actually the basis that is not stable"* (Peas and Beans, 2022).

Another big obstacle is that for chickpeas, currently cultivated in small quantities, it is difficult to find **places to clean** and sort the product since the chickpea is not yet a known product and the companies doing this require large batches.

Then, another obstacle is the **lack of a system to spread the production risks**. Research is of course trying to lower this risk but the risk of crop failure will always be there. If there would be a system to share these risks, farmers would be more inclined to start cultivating and, of course, it would be more inclusive.

At last, some projects are supporting the farmers well also financially. However, these **projects are temporary**. A robust system needs to be found for when they stop.

> *Peas and Beans: "Yes, support from the government and reimbursement for certain services. But if you want to roll that out on a large scale... Now that's good for the startup but that's not a sustainable model" (Peas and Beans, 2022).*

The biggest opportunity lies in the fact that there is an **increasing demand** for chickpeas. Besides the popularity of the crop itself, governments and companies are increasingly paying attention to local production making chickpeas a potential cash crop (Biopolder, 2022; Peas and Beans, 2022; PHAE, 2022).

There are also **some advantages connected to the cultivation itself**. First of all, the cultivation technique is not so difficult and the required machines are the same as for other crops. No investments need to be made in these. Also, chickpea is a crop that is suited to use in rotation farming and does not need extra fertilizer (PHAE, 2022). At last, the crop is easy to dry and stock (Biopolder, 2022).

> *PHAE: "It can be a cash crop because companies are going to want to bet on those local crops and on top of that if it fits into your crop rotation then those are actually two conditions that make it interesting" (PHAE, 2022).*

Next, chickpea is a crop expected to grow well in our regions when temperatures rise due to **climate change**. Starting with cultivation and research now can create resilience for the future (Peas and Beans, 2022; PHAE, 2022).

> *Peas and Beans: "Normally wetter winters and drier summers and if so that does favor chickpeas" (Peas and Beans, 2022).*

At last, the way in which all actors are brought together and **collaborate** is a system whereupon can be built to tackle the obstacles and enhance the opportunities.

5.2 Interviews with other actors

The interviews with the other actors were structured to focus on the biggest opportunities and obstacles coming from the interviews with farmers as written in part 5.1.

Biggest obstacles

1. Unstable yield

All actors in the chain of chickpea production admit that the current unstable yield is a problem (Abinda, 2022; Casibeans, 2022; ILVO, 2022; Inagro, 2022c). The processors in the chain struggle with this fact and, without significant improvement, find it difficult to see a future for this crop in Flanders (Abinda, 2022; Casibeans, 2022).

> *Casibeans: "Climatically, we have questions about whether that chickpea is actually a suitable crop here" (Casibeans, 2022).*

> *Abinda: "I hope that we are going to have a positive outcome of the project and we are very eager to go there but at this point, it is not in our hands" (Abinda, 2022).*

Casibeans emphasized that not only crop failures are the problem, but that the short Belgian season also often results in unripe chickpeas. As a result, Casibeans is not focusing on local chickpeas but is making efforts for other legume crops that are already doing well in Flanders in terms of climate, such as the dark red kidney beans (Casibeans, 2022).

Abinda expressed that the production risk is known and that there would be an understanding on their part in case of shortages. They could guarantee in a cooperation that they could import from abroad in that case (Abinda, 2022).

Moreover, most actors do also emphasize the need for breeding a Flemish variant that is better adapted to our season (Casibeans, 2022; ILVO, 2022; Inagro, 2022c).

> *Casibeans: "Surely something will have to be done about the varieties of chickpeas before there is really going to be a big movement to chickpeas in the Flemish fields" (Casibeans, 2022).*

Research institutions started already with breeding but in the meantime are also working on researching the crop failure rate with the varieties currently in use to possibly factor this in (ILVO,2022; Inagro, 2022).

ILVO mentioned another difficulty besides the fact that research still needs to be conducted on breeding and cultivation aspects, and that is that, for the time being, not many crop protection products are permitted for chickpeas. However, Aurélie Tredé believes this will evolve next years. This is not an issue for organic farmers (ILVO, 2022).

Like Peas and Beans, Casibeans and Inagro also state that the irregular yield for the time being stands in the way of a sustainable business model. Nevertheless, research on chickpeas is seen as useful since the demand and thus the economic potential is so high (Casibeans, 2022; Inagro, 2022c).

Casibeans: I do think it is interesting to test it on trial fields because it is a product that is much in demand by consumers and certainly also locally but we do not see a revenue model in it at the moment actually, not for the farmer and therefore nor for our food customers" (Casibeans, 2022).

2. Cleaning of small batches

The fact that it is difficult to find a place that can and wants to clean the small batches that are currently offered by chickpea producers is an obstacle that is confirmed by the other actors in the chain (Abinda, 2022; Casibeans, 2022; ILVO, 2022; Inagro, 2022c). This is a problem that is encountered in many new crops. Also, a further split has to be made between conventional and organic which makes this problem even more pertinent (Inagro, 2022c).

Specifically, the problem arises from the fact that the machines need to be cleaned before and after cleaning the product. This is too high a cost if the batch is too small. It must remain profitable. The larger the batch, the more economically interesting it is (Casibeans, 2022; Inagro, 2022c).

Inagro: The technology is available but it's hard to justify doing the small quantities. It is relatively a big investment (Inagro, 2022c).

Casibeans: It's all possible but it costs a lot of money. It's not about not wanting to but the product just becomes very, very expensive (Inagro, 2022c).

An important question is therefore who is responsible in the chain to think about this and organize something to respond to this problem. Possibilities include investing in smaller machines or an intermediary who will combine everything into one large batch (Casibeans, 2022; Inagro, 2022c).

Inagro: "It's a little bit of the story of the chicken or the egg: is that going to be the big buyer who has to be somewhat flexible, is that going to have to be an intermediary or is agriculture going to take care of that itself" (Inagro, 2022c).

Casibeans does say that as an intermediary they can be the ones who collect everything but even combined the quantities of chickpeas are not enough at the moment (Casibeans, 2022).

Not only for cleaning but also for other processing steps such as canning, packaging etcetera, small quantities are not convenient (Casibeans, 2022). This is certainly the case when chickpeas are processed into products such as spreads or vegetarian burgers that involve many other products (Abinda, 2022).

Abinda: "If you have to coordinate that with 5 suppliers instead of 1 central point, it is of course a big difference. We try to keep this centrality because we have so many ingredients. We cannot spend hours and days for each ingredient" (Abinda, 2022).

3. Spreading of production risks

Another obstacle observed from the interviews with the farmers is the lack of a system to spread the production risks. There is also awareness around this obstacle further down the

chain. The other actors realize that at the moment the risk is often too high for farmers to start with chickpeas (Abinda, 2022; Casibeans, 2022; ILVO, 2022; Inagro, 2022c).

> *Casibeans: "If there is a lot of uncertainty around the expected harvests because the climate is actually not optimal, then you're not going to find many farmers who are going to want to sow that in Flanders because there are actually better alternatives with lower risks and higher rewards" (Casibeans, 2022).*

> *Inagro: "Will that be feasible in the long term? Yes, if an economic story is coupled to it whereby everyone earns a good living income and that the risk of cultivating chickpeas and, by extension, legumes, is taken into account" (Inagro, 2022c).*

In this regard, Inagro suggests possible compensations to cover the losses in the bad years (Inagro, 2022c). Casibeans sees an option in subsidies and tries to make a differentiation of the local product compared to imported products towards their consumers (Casibeans, 2022). When considering the option to charge a higher price for chickpeas to incorporate the risk, processors mainly look at the consumer and whether they are willing to pay for this increase (Abinda, 2022; Casibeans, 2022).

> *Casibeans: "Consumers want the right pricing for a product, sometimes they accept somewhat higher prices for local, sometimes not" (Casibeans, 2022).*

> *Abinda: "Including it in the price that is also a study by KIKET to what extent that consumers are ready for that" (Abinda, 2022).*

Abinda also mentions that they often buy the product from intermediaries because they use already cleaned or ground products. Therefore, in many cases, they do not pay the farmers directly but there are production steps and other entities in between who have an influence on the price (Abinda, 2022).

Of course, it is not only the consumer nor only the farmer who has to pay for the risks but all actors in the chain. This is emphasized by Inagro but not by the other actors interviewed.

> *Inagro: "If everyone wants those chickpeas then maybe they should contribute something for that. The risks are not dependent on the farmer but also on the climate" (Inagro, 2022c).*

Inagro highlights that at the moment the price can be determined by the farmers but that there must be caution that when scaling up, this inclusive character is maintained (Inagro, 2022c).

4. Competition with the world market

Following the obstacle of how to share risks, another economic obstacle is determined by the other actors in the chain. This barrier is the fact that at the moment the price of local chickpeas in Belgium is not competitive with the price on the global market which is three to four times lower. This creates also difficulties for incorporating the risks in the price since the price often is a very dominant issue in decisions around purchases of food products (Casibeans, 2022). Reasons for the high price are multiple. Jonas Claeys from inagro explains:

Inagro: "We are actually not competitive with world prices. Those chickpeas can be grown much cheaper somewhere else even though the yields per hectare are lower or similar there. Yet, they can produce them cheaper because of the lower labor costs, because of the lower prices of the soil and so on, or the fact that they can process much larger quantities" (Inagro, 2022).

Inagro sees a possible solution in banning the import of chickpeas (Inagro, 2022c). Another possible solution could be giving a premium to the local farmers (Casibeans, 2022; Inagro, 2022c).

Inagro: "Europe has set as an objective to become more independent in terms of protein but at the moment Europe is also our biggest competitor so to speak just by the fact that they keep importing, that there are trade agreements at the low world price" (Inagro, 2022c).

Casibeans: "There should also be some kind of premium for farmers to be competitive with the world market" (Casibeans, 2022).

Currently, no premiums are given to chickpeas yet because it is still in its experimental startup phase. There is a budget for research and trial fields coming from the Flemish government (Inagro, 2022c) so the subsidies will go to established crops under which already many other legumes (Inagro, 2022c; Casibeans 2022).

5. Organic production

Abinda wondered if specifically, the organic production of chickpeas will be feasible and what the additional cost will be (Abinda, 2022).

<u>Biggest opportunities</u>

1. Increasing demand

The increasing demand for chickpeas is also by many other actors in the chain mentioned as the biggest opportunity in the production of chickpeas (Casibeans, 2022; Inagro, 2022). One of the drivers behind this increase is believed to be the upcoming flexitarian, vegetarian and vegan lifestyles (Casibeans, 2022; Inagro, 2022c).

Casibeans: "It could be a hype but that's also what they said 5 years ago but I think it's going to become more and more mainstream that consumers will have occasional meals without meat and the number of alternatives is limited. We are convinced that the demand for vegetarian protein is only going to increase, especially in Western Europe" (Casibeans, 2022).

The economic potential is so high that research on this crop is considered interesting even though the cultivation of the crop itself has big challenges in comparison with other legumes that are easier to grow in the Belgian climate (Casibeans, 2022).

Casibeans: "The biggest opportunity is the demand, therefore the studies are interesting even though climatically seen it may not be the right crop. There are not so many alternatives to get the right amount of vegetarian proteins every day and legumes are

one of the most important solutions and chickpea has a very good name" (Casibeans, 2022).

Inagro notices that there is interest among the companies for locally produced chickpeas since they often get the question of why chickpeas are not yet produced locally. However, they also underline that for the locally produced chickpeas in the current context, more consciousness by the consumers is needed to be created (Inagro, 2022c).

Inagro: "You just need a conscious consumer and a conscious chain that is also just willing to pay a price for that" (Inagro, 2022c).

2. Cultivation benefits

The cultivation benefits of chickpeas are also considered important by Inagro and ILVO. For Inagro, all the benefits of chickpea production make them perfect for rotation farming. By using chickpeas in rotation farming, biodiversity can be enhanced. This has an important influence on the performance of following crops in the rotation and will lower risks such as pests. Rotational farming with many varieties including chickpeas can counterbalance intensive farming that depletes our soil (Inagro, 2022c). For Inagro, this aspect is the main motivation to put efforts into the research of chickpeas.

Inagro: "For me personally, it's about diversification of agriculture and I see a lot of added value from including protein crops, not just chickpeas but others as well, in rotation" (Inagro, 2022c).

Also, the reduced need for fertilizers when cultivating chickpeas is highlighted. Since that fertilizers are environmentally unsustainable due to the emissions and the extensive use of energy in their production but also by depleting our soil. ILVO adds that it is also economically interesting to reduce the need for fertilizers since prices are rising (ILVO, 2022).

ILVO: "It's now a year when fertilizers have become very expensive due to all kinds of circumstances so that's going to be an important one. The little need for fertilizer and the droughts are two things that are going to make chickpeas interesting" (ILVO, 2022).

The story of how farmers are actively enhancing biodiversity and reducing emissions by growing legumes can have the potential to help the image of the farmer that is currently generally negatively depicted in the media although it is the consumer who asks for perfect vegetables. Also here, increasing consumer awareness could help (Inagro, 2022c).

The cultivation benefits were mentioned only by the research institutions and not by the other actors in the chain. An important notion in this section is that the cultivation benefits mentioned are not specific to chickpeas but can be attributed to all leguminous plants (Inagro, 2022c).

3. Resilience against climate change

Also, the opportunity that chickpeas can withstand rising temperatures and droughts currently predicted to happen more often in the summer due to climate change mentioned

by farmers is repeated by some actors in the chain such as ILVO, Inagro and Casibeans (Casibeans, 2022; ILVO, 2022; Inagro, 2022c).

> *ILVO: "I think there is potential to continue with chickpeas especially given the circumstances of climate change and I think that will be something more and more important that there are crops that can deal with it of course" (ILVO, 2022).*

However, even when climate change could make our Belgian climate more suitable for chickpeas this is not something that will happen soon. Putting efforts into breeding will stay important (Casibeans, 2022).

> *Casibeans: "If there are no new varieties coming from the breeders then I see the chance very small that there is a great potential for chickpeas within the Benelux. Or we must be 30 years further with the current climate warming, never say never" (Casibeans, 2022).*

4. Collaboration throughout the chain

The last opportunity mentioned by the farmers is the extensive collaboration throughout the chain. This opportunity was not directly mentioned by the other actors in the chain but it is often mentioned that projects are in collaboration with farmers and decisions are made with farmers (Abinda, 2022; Casibeans, 2022; ILVO, 2022; Inagro, 2022c).

6. Discussion

6.1. Discussion of research questions

In this section, a comparison of the results with the hypothesis will be made structured along the six inclusive business principles as written in part 2.3. Next, all three the research questions will be discussed.

6.1.1 Comparison with hypotheses

1) Chain-wide collaboration

As predicted in the hypothesis, the chain-wide collaboration is strong. There are many projects evolving around the protein transition in Flanders with some specific focus on chickpea production. A big changemaker was the set-up of the green deal and the accompanying support of the Flemish government. In opposition to the hypothesis, also other actors have shown strong engagement to this goal and are willing to pioneer with new crops unlike the hypothesis stated. However, in the case of risk-spreading methods, no big actors have popped up as pioneers yet.

> *Peas and Beans: "The current problem is that in large companies the farmer is no longer the central focus, but in such projects the farmer is the central focus again and that is a positive aspect of such projects" (Peas and Beans, 2022).*

The overall goal may seem the same being pursuing sustainability by facilitating a protein transition. However, if the specific motivations of different actors are examined differences are found. For research institutions creating sustainable farming is the most important. Therefore upscaling in terms of establishing some big producing actors is not a goal in itself. For processors (of which only big actors were interviewed) the possible economic opportunity is part of the motivation for which upscaling will be needed and they preferably purchase from as little as possible different actors. For the government upscaling is also a goal because they want to reduce imports. For farmers is the motivation an economic opportunity as well as the cultivation benefits chickpeas provide.

2) Effective market linkages

For this principle, the biggest challenge has indeed proven to be the variability in yield. The main hope for significant improvement is set on the breeding of a new Flemish variant. The high demand has proven to be the biggest opportunity.

3) Fair and transparent governance

Fair prices and risk sharing are indeed pivotal in introducing chickpeas in Flanders. Farmers will not start when the risks are too high. One way to solve this in the context of chickpeas is through breeding, another way is to share the risk with more actors. An example is the farm PHAE that gets a fixed price which convinced them to try out.

4) Equitable access to information and services

The prediction was that investments in storage and cleaning facilities would be needed. This is indeed the case. It is not decided who will invest in them.

> *Peas and Beans: "The whole process from harvest: cleaning, storage, stocking, sales... These are things where big steps have to be taken, but it's also logical that they haven't been taken yet because we haven't got the cultivation right yet" (Peas and Beans, 2022).*

Information on cultivation benefits seems well spread among the farmers with help from the research institutions. It is striking that other actors in the chain are aware of the variability and risks of chickpea cultivation but apparently less aware of the cultivation benefits. A story that could be marketed.

At last, farmers told in interviews that chickpeas are rather easy to grow regarding the already existing machinery. The hypothesis of more labor input has proven to be untrue.

5) Inclusive innovation

Breeding is indeed a prerequisite for introducing the crop successfully, as also stated in the hypothesis. The innovation is happening inclusively with farmers, governments, research institutions, processors and retail combining forces.

6) Measurement of outcomes

The green deal as well as specific projects such as KIK-LOVE and KIKET are closely following up on all developments. However when these projects end, the continuation of this kind of collaborations need to be secured.

6.1.2 Opportunities and obstacles in the production of chickpeas (for human consumption) in Flanders

To answer the first research question '**What are the opportunities and obstacles in the production of chickpeas (for human consumption) in Flanders?**' all information coming from the state-of-the-art section, the interviews with farmers and the interviews with other actors in the chain is bundled.

<u>Obstacles</u>

1. Unstable yield

The challenge posed by the unstable yield of the cultivation of chickpeas is undeniable. Especially for starting a sustainable business, it is quite essential to have stable production. It was pointed out by most interviewees, farmers and other actors, that this is therefore not yet a possibility.

However, much research to optimize the production process is still ongoing so improvement may happen in the upcoming years. After all, average global productivity has already increased in recent decades (Figure 14), so improvements are probably also possible in Belgium, provided that research is conducted. ILVO is also working on a Belgian variant

through breeding whereby the yield would be higher and more regular. The timeline for this is 10 years so the variability may change over the next decade.

2. Spreading of production risks

Nonetheless, there is a demand for local chickpeas not only from the consumer but also from some other players in the chain so if we insist on having a local chickpea then the risks need to be spread along the chain. So far, the risk is not enough shared or not consciously enough shared.

Also, farmers are now often compensated for certain activities by research projects and for some farmers, even marketing is arranged. However, these projects end after two years so there must be thought of how to cope with the loss of those kinds of aids or to give guarantees that certain compensations will be given also after the projects such as KIK-LOVE and KIKET end. Consideration should also be given to whether these compensations can continue to be given as the sector scales up because at the moment this is something the farmers take into account to calculate if it is feasible to start chickpea production.

> *Peas and beans: "Yes there is government support but if you want to roll that out on a large scale... Now that's good for the startup but that's not a sustainable model" (Peas and Beans, 2022).*

3. Cleaning of small batches.

A difficulty in the production process of chickpeas is where to clean them. Due to the small batches, it is economically not advantageous to start the often big installations. Solutions for this problem could be combining batches of different farmers by forming cooperatives of different producers or through an intermediary but at the moment even combined the batches are too small.

4. Competition with the world market

Related to the obstacle of the need for spreading the risk is the obstacle of not being competitive with the world market price. This gives processors less room in price negotiations. The question is also if the consumer is willing to pay higher prices for locally cultivated chickpeas.

5. Organic production

As known so far no distinction is made in research between organic and conventional production of chickpeas. This, however, could be interesting to look into since the organic market will be an important market for the sale of local chickpeas. This is mentioned by Inagro and Abinda as well as shown in research.

<u>Opportunities</u>

1. Increasing demand

The greatest opportunity lies in the high demand and the predicted increase in this demand in the coming years. This is not only shown by figures from FAO and Eurostat but it is also

emphasized by all actors in the chain that were interviewed. It is important to note that this increase can be linked to the increase in flexitarians, vegetarians and vegans as chickpeas and by extension legumes are ideal to replace animal-based proteins. These types of consumers are often conscious of the impact of their consumption and are therefore also sensitive to local products. The segment of consumers who buy organic is also sensitive to local and plant-based foods. Therefore, it is also important to specifically research the organic production of local chickpeas. The pool of conscious consumers could be further expanded by spreading more information not only about the benefits of chickpeas regarding health and sustainability but also practically how to incorporate them in recipes, something they are already aiming for in the green deal.

An important question is to which price consumers are willing to pay and can pay for local products. Casibeans, therefore, choose to invest in legumes that are better adapted to the Flemish climate (Casibeans, 2022). Is the potential of chickpea demand high enough to be worth all the investments that are made right now? Many actors say yes to this question. An aspect that influences this answer is that chickpeas are a niche product that has some processing possibilities that other legumes do not have. Hummus is the prime example here.

2. Cultivation benefits

The cultivation benefits are numerous going from soil improvement and nitrogen fixation to a reduction of pests through an increase in biodiversity when this crop is included in the rotation. Chickpeas is also an easy product to stock. These benefits are not specific to chickpeas but to all leguminous plants. This opportunity was indicated in interviews by farmers and research institutions but not by other actors. This may indicate that these benefits are less known to the other actors in the chain.

These advantages can also be economically beneficial, leading to higher productivity of the other crops and fewer crop failures. More directly, this crop can also provide financial benefits by reducing the need to purchase fertilizers. What exactly the added economic value is of including chickpea or by extension legumes in the rotation is not yet studied.

These benefits could be further exploited to promote the cultivation of chickpeas. For example, fertilizers could be made more expensive, which would lead to more interest in this crop. Furthermore, premiums could be given for the positive externalities such as biodiversity increase. There are possibilities to do this within the CAP whereby currently premiums are given to several leguminous plants but not yet to chickpeas as they are still in the experimental phase. Actively working on the increase of biodiversity and the reduction of nitrogen could give farmers positive media attention in contrast to the current negative tendency. Especially regarding nitrogen emissions in Flanders, farmers today have a bad name.

For these measures, policymakers play an important role. Also for spreading information about the crop and the possible premiums themselves to farmers and other players in the chain, policymakers and research institutions play a key role, as also described in section 4.1.6.

3. Resilience against climate change

*Inagro: **"**A good farmer is a farmer who will also be a farmer in ten years. Who must have an economic story that can last" (Inagro, 2022c).*

With the current low income of farmers, it is sometimes difficult to make decisions with results far in the future. Although their sector will be highly affected by climate change. Chickpeas and other legumes are resistant to the predicted warmer and drier summers in Flanders. This aspect is surely something that is part of the motivation of most interviewees to show interest in chickpeas. However, everybody needs to eat in the future, so all actors, processors, retailers, consumers, research institutions, policymakers and farmers need to participate in the process to make agriculture resilient against climate change. So again, an argument can be made for economic support for farmers and risk-spreading.

4. Chain-wide collaboration

The green deal progress report shows a lot of commitment to the protein shift that translates into many projects, and actions including some like KIK-LOVE, KIKET, EI-MEET, CO-MEET specifically focused on chickpeas. The interviews also showed that the collaborations are running smooth and everyone is motivated. This is also evident from the high scores given to the principle of chain-wide collaboration by farmers. This is a fertile basis on which can be built. It will be necessary to implement certain systems for when the green deal and associated projects such as KIKET end.

Inagro: "We try to get information from the farmers but also to give information by making this a kind of exchange network to get to know the cultivation in Flanders better and also to identify the weak points and success points" (Inagro, 2022c).

According to research by Inagro, Flemish chickpeas can, in principle, be competitive with the world market but not if the farmer wants to make a good profit and that is important also in building a buffer against bad years. Thomas Truyen was able to sell his chickpeas with a nice profit by selling them through the short-chain but he does not advise his fellow farmers to start with it for financial reasons.

It can be concluded that the opportunities linked to chickpea production are strong. To some obstacles, solutions can be found such as searching methods for risk-spreading and for cleaning the small batches. However, the variability in yield is, to say it with the word of Thomas Truyen, "a sword of Damocles" over the successful introduction of chickpeas in Flanders.

6.1.3 Improvement of the inclusiveness in the chickpea sector

To answer the second research question '**How can the inclusiveness of this sector be improved?'** two possible pathways the chickpea sector can follow in the future, staying small and connected to short-chain circuits and scaling up, will be examined.

Inagro: "It depends on what chains we set up. I think we're going to have to work at a limited scale in the beginning anyway possibly to then have a stepping stone to something bigger but I don't really care as long as it's a story that makes sense and that we get more biodiversity" (Inagro, 2022c).

The first pathway is staying small and connected to short chain circuits. One of the advantages of this pathway is that the conscious consumer can be specifically targeted by selling through packaging-free stores, restaurants with a sustainable focus or short chain initiatives such as Thomas Truyen does. Those purchasers and their consumers will often agree with a higher price. This can result in the farmer deciding the price and therefore being able to not only have a fair income but also to take into account risks.

This way of doing business also results more often in close contact between the farmer and the purchaser, an aspect that is more frequently missing in trade relationships between farmers and larger actors or lost due to the extra steps between farmer and consumer.

Jonas Claeys emphasizes that the increase in biodiversity is especially important to him. Should upscaling lead to a monoculture of chickpeas, it would lose one of its main benefits.

Inagro: "My goal specifically is to get more protein crops on arable farms. Now very often a lot of the same crops return with a lot of problems, certain diseases, certain pests,... It's not that I want to cover all of Flanders with chickpeas because then we'd get way too much of the same crop again" (Inagro, 2022c).

Nevertheless, there is certainly interest in upscaling from a few large players. The advantage of this is that a farmer often does not have to look for a buyer but can sell everything to one trading partner. These larger players also often have advantages such as employing agronomists or arranging cleaning and/or transport.

Biopolder: "A farmer wants to grow, work, create a product but he is not engaged in marketing with a sales strategy,etcetera…" (Biopolder, 2022).

However, it is important to ensure that there is no evolution towards contract farming where the farmer has little say in determining the terms of trade.

Inagro: "We have to be afraid of the extreme story that we now often have in agriculture with contracts." (Inagro, 2022c).

Biopolder: "Competing against the funnel system: many farmers, few buyers, many consumers. Breaking through that funnel and digging your own channel from producer to consumer is the key and we strongly believe in it but that is a work of years. In the case of chickpeas, it's just a matter of testing can this now or do we have to wait another 10 years" (Biopolder, 2022).

The price will certainly go down when scaling up. On the one hand, you are going to target less of a specific type of consumer which is now the case by selling mainly to conscious consumers. Other types of consumers shopping in a supermarket, for example, will not want to pay more for local products but are more likely to choose cheaper products (Casibeans, 2022; Inagro, 2022c).

Inagro: "I think we need to aim for that market of conscious consumers because otherwise it might not be a viable story then" (Inagro, 2022c).

In addition, each step in the chain wants to make profit, the more steps the more expensive the product or in other words, the less there is left for the farmer. Finally, as we scale up, a local chickpea will become less and less of a niche product, which will also have a negative impact on the price.

Peas and Beans: "The problem in agriculture is that as a farmer you grow a product at a low price and all the other steps have to have a share of the pie so there is not that much margin left for agriculture" (Peas and Beans, 2022).

Translated into the principles of inclusive business, in the short-chain pathway, the principles of chain-wide collaboration, effective market linkages and fair and transparent governance are most likely to be maintained and/or ameliorated. The principle of equitable access to information and services is most likely to ameliorate when upscaling happens mainly due to an improvement in provided services.

It can be concluded that at the moment chickpea production in Flanders is only a feasible and inclusive story by connecting it to the short-chain. When scaling up, it will be necessary to try to make the inclusiveness grow to larger systems by drawing lessons from the short-chain sector. If a Belgian variant is created that can be grown at a lower cost price, there is perhaps potential for upscaling if systems are incorporated that maintain inclusiveness.

6.1.4 The contribution of inclusive business in the chickpea sector to a protein transition in Flanders

Research on the inclusiveness of a sector following the inclusive business principles has proven to be able to identify the biggest obstacles and opportunities. It comes up with specific recommendations on which to improve to overcome obstacles. In this research, the main recommendation is to think about and install risk-spreading systems that work in the short-chain circuit as well as on large-scale business relationships. Also, this method identifies key strengths of the sector which are in this case the tight collaboration chain-wide and inclusive innovation. By identifying these clearly, learned lessons can easily be spread to other sectors. It can be concluded that the concept of inclusive business can contribute to the protein transition by using this kind of research also on other sectors.

6.2 When is production local?

This section will focus on the question of whether the chickpea is the right crop to focus on to produce locally in Flanders. This is a question that came up during some interviews. For example, Casibeans mentioned in their interview that they rather focus on legumes that do well in the Flemish environment because the currently existing variants of chickpeas are not really suited resulting in unripe legumes and very variable yields (Casibeans, 2022).

Casibeans: " I think there is a lot of potential for legumes to be sown in western Europe which is actually very limited today. But I see the challenges for chickpeas being greater and that they also remain more severe than for many sisters of chickpeas within the legume group" (Casibeans, 2022).

Also for Inagro, the different types of legumes are interchangeable on the road to their goal which is to insert leguminous plants in rotation in order to improve biodiversity and accompanying benefits such as soil improvement and a reduction of diseases and pests (Inagro, 2022c).

Inagro: "My goal is to make arable farming more sustainable in general and I believe that protein crops offer an important added value. Does it happen with chickpeas or with another protein crop, that doesn't matter to me" (Inagro, 2022c).

If other legumes do well here and chickpea faces difficulties, why not focus more on other legumes to which sustainable business models can be attached?

There are arguments to be made for local cultivation. A first argument is food sovereignty. Flanders does not want to be so dependent on imported plant-based proteins (Departement Landbouw & Visserij, n.d.-a). In times of crises such as the coronavirus and the war in Ukraine, which put pressure on the global food market, this argument becomes more important in order not to be too dependent on the world market (Iannetta et al., 2021). The question that can be asked here is how far 'local' reaches. Is this Flanders or is within the European Union also considered as local?

There is also the argument of food miles, the further food is imported, the more energy and emissions will be associated with transportation. However, this argument can be countered by the fact that crops produced in the region where productivity is highest require less space and fewer pesticides for the same yield, among other things, due to a better climate (Born & Purcell, 2006). In the case of chickpeas, producing in southern France or Italy would be more advantageous in terms of total emissions. The ability to stock chickpeas in a dry state already eliminates the need for rapid or refrigerated transport, both very polluting.

The motivation of the green deal is to make a protein transition happen in Flanders. This means less meat consumption and could also mean lower profits for the meat industry. On the other hand, there are economic opportunities to be found in the production of plant-based proteins. Chickpeas have a small advantage over other legumes because of their processing possibilities into hummus, falafel and flour.

The introduction of chickpeas could also be an experiment to cope in the long-term with climate change. This could be another argument for choosing chickpeas.

Finally, local is often confused with short-chain and the inclusive benefits associated with the latter. However, local is not directly linked to being 'just' or 'sustainable' and can result in unfair prices for farmers (Born & Purcell, 2006). In addition, imports can also be made from France via a short chain. It is therefore important to take into account that the values that are aimed for must be clear and will not automatically be fulfilled by local production.

It can be concluded that when asked if it is useful to invest in local chickpeas in Flanders, there will be different answers depending on the motivation. If the motivation is to create more biodiversity, other legumes will also satisfy. If the motivation is to create more food sovereignty, then the question is whether this is within the European Union or at a regional level. If the motivation is to give farmers a decent income, then it is interesting to look at short-chain or other inclusive business initiatives rather than focusing on the local level. Nonetheless, those initiatives can be local. If the motivation is to capitalize on the economic potential, then there is something to be said for chickpeas, provided that there is a Flemish variant, otherwise other legumes are maybe also in this case more interesting. The latter motivation is influenced by the time scale that is looked at. In the short term, the investments in chickpea production will probably not pay off. In the long term, however, there is potential. This is also an aspect that plays a role in the last motivation, namely creating resilience against climate change. Chickpeas could be an interesting crop in this respect.

6.3 Recommendations and further research

Through the interviews, some solutions for the obstacles were offered by the various interviewees. They will be listed below as recommendations to try out.

Cleaning of small batches
A first option could be to give a **compensation** for the companies that run small batches to make it financially possible.
Uniting farmers in for example cooperations to make an shared investment in cleaning machinery or in the transport for **combining their batches.**
The **multiple batches can also be combined by an intermediary**. However, currently the combined production would still deliver too small batches.
Competitiveness of the price
A **ban or restrictions for chickpeas imported** from outside of Europe.
To give **premiums** to the farmers for chickpea production. The CAP gives options for this to be implemented.
Variability in yield
The best way to reduce this is to invest in **research and breeding**. Both are already conducted but need time.
Building stocks to mitigate weaker years. Chickpea is very suitable to stock when dried.
Risk-sharing
A possibility is to work with a **double price system**, a fixed price that covers all the productions cost and a variable price regarding the quantity and quality of the crop. This

ensures that when crop failure happens at least the farmer will have no financial losses. PHAE has already experiences with this system for other crops.
Another possibility is to pay a **high** enough **price** to create a buffer for the weaker years.
To build **fund** with different actors that contribute could also provide a buffer in case of crop failures.
When **farmers process the chickpeas themselves** they can earn the revenue margins themselves. However, to do this they need enough volume of the product.
Further research
Research on specific financial benefits on other crops from including chickpea in rotation. This is useful to be able to include the gains of the externalities when making decision e.g. for research, price-fixing and/or subsidies.
Research to and comparison of methods for risk-sharing. These methods need to be robust and implementable on different scales. Many methods are already put into practice but comparing them and spreading them can be very useful to be able to make business inclusive.
Research can also be done to the application of inclusive business in domains other than the agrifood industry. Also in other industries, attention must be given to sustainability. It may be interesting to see if the concept of inclusive business can be helpful there as well.

6.4 Reflections on the agrifood industry

The topic of sustainability in the agrifood industry is very broad. Researching the specific sector of chickpea production and processing with its problems and opportunities provides also more understanding of the bigger picture. In this section, some of these reflections will be shared.

A first observation is that insufficient incomes are a real struggle for farmers. Many of the farmers that were contacted past year, both for this thesis as for other projects, work in agriculture as a side job mainly because of the low revenues. The step to stop definitively then becomes small. This creates a dangerous, unstable basis for our food industry and by extension for our society. The low revenues are not only a problem for the number of farmers willing to keep working in agriculture and their quality of life but it also hypothecates opportunities to shift to more sustainable farming. Although, the potential of agriculture to act against climate change is large.

Producing and consuming more plant-based proteins instead of animal-based proteins, reducing the use of pesticides and introducing landscape features that capture CO_2 and promote biodiversity does not only have the potential to significantly reduce pollution and emissions but they can also create something positive by improving biodiversity, soil quality, air quality etcetera. At this moment, farmers are often negatively depicted in the press as major polluters but the agricultural sector could also tell a positive story of how they in fact

do care about nature and climate change and are making positive changes. However, farmers often not only lack the financial capacity to do this, they also lack room from the other actors in the chain up to the consumer. If retailers and consumers demand perfect vegetables, they are with that also responsible for the extensive use of pesticides and discarded food. It would help if externalities were taken into account, while also paying attention to the low-income consumer. A step in the right direction here is the subsidy for EFAs as part of the CAP. Here, it can be concluded that the trade-offs between the economical part and the environmental and social part are really a problem. The drive for profit and cheap products by other actors and by consumers, which is still existing in many cases, results in a low income for farmers and a high pressure on our environment. However, in the future, this will also cause economic problems when resources are shrinking and pollution dangers our health. So also economically, it is interesting to invest in our farmers and in sustainable agriculture. Policymakers can make important efforts in this case but everybody should be aware of their influence on the food system.

The next observation is that farmers have shown to be concerned about global warming. Many are looking ahead and realize that it will have a big impact on their business or they even felt the impact already. Farmers not only want to make adjustments in preparation for higher temperatures but are also usually willing to work on environmental enhancement as far as they have the ability to do so.

A final observation is a trend towards cooperation both among farmers and with other actors in the chain. This would be conducive not only to disseminating information but also to empowering farmers. These collaborations will be needed to overcome the complex task of making the agrifood industry more sustainable.

These observations were extracted from the chickpea sector but it is believed that they can serve as examples of aspects that apply to the entire agrifood industry.

7. Conclusion

It can be concluded that the main obstacles are: the high variability in yield; the uncompetitive price with respect to the world price and to other crops; the limited presence of systems to cope with production risks and innovation investment; the temporary nature of projects currently supporting research and the set-up of chains; the difficulties in finding cleaning companies willing to clean small batches and finally the questions around the possibility of organic production.

The biggest opportunities are: the large and still growing demand; the cultivation benefits; the resilience against the higher temperatures and droughts related to climate change and the strong chain-wide collaboration.

By focusing on inclusiveness, some of these opportunities can be strengthened and obstacles reduced. Here, there need to be looked at different paths how the chickpea sector could evolve. One option is not scaling up in the sense of having large areas of chickpeas on one farm, but by including chickpeas in the crop rotation schedules of many farms while staying connected to a short chain that delivers to conscious consumers. The other option is scaling up so that larger players can also be connected to this sector without having to inefficiently address many farmers to collect the desired quantity. For now, only the first path seems feasible. Within this path, the principles of chain-wide collaboration, effective market linkages and fair and transparent governance will be most fulfilled. The other option may have potential if a Flemish variant is found. This option can best strengthen access to services and information.

Finally, it can be concluded that examining a sector using the inclusive business principles is a good method to identify the obstacles and opportunities of a sector and to provide solutions. Researching a specific sector also gives useful insight into the complexity of trying to improve sustainability in the agrifood industry in general.

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ILVO : A. Tredé, personal communication, August 8, 2022

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