CLIMACT

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on **climate change**

IDEA CONSULT thinking ahead

Socioeconomic impacts assessment of the climate transition in Belgium

Factsheet – Agri-food sectors

Santé publique
Sécurité de la Chaîne alimentaire
Environnement

Introduction to the factsheet

Following on from the SPF's publishing of scenarios for a climate-neutral Belgium by 2050, the objective of this factsheet is to **feed discussions with the agriculture and food processing industry stakeholders** (specifically professionals and training institutions) on the socioeconomic impacts of the climate transition on the sector's professionals, with a main focus on job volumes and key skills (for the transition).

For that purpose, this factsheet aims at :

- **[Part 1]** Underlying the main employment dynamics within the sector (main jobs in volume, variations) (Part 1.1), suggest a decomposition of the sector's carbon footprint, and discuss the different transition scenarios and levers (Part 1.2)
- **[Part 2]** Identifying the impacts of transition scenarios on employment volumes
- **[Part 3]** Identifying the key skills to possess and highlighting the gap between the competency profiles and the required skills.

Recommendations to bridge the skill gap shall be designed together with stakeholders.

This factsheet is a document that should help to highlight the main tensions that could affect the agriculture and food processing sectors, by following the trajectory of decarbonisation of these sectors. It is not a detailed socio-economic impact study.

PART 1. Sector characterisation *(Economics, decarbonisation scenario)*

PART 1 Sector characterization

PART 1.1 Sector economics

PART 1.2 Sector’s decarbonisation challenges

Economic profile

Key economic data

NACE Codes selected : 1,2,3,10,11

Activity

1. **172.000 workers (2023), accounting for 3.5% of workers in Belgium**
2. **+ 0,9% of jobs over the last 10 years , less than national level (+11%)**
3. **Added value 12,5 billion euros (2% of Belgian GDP)**

Source : NBB

Main Belgian companies

1. **Inbev (3000 workers)**
2. **Ferrero Ardennes (1450 workers)**
3. **Puratos (1350 workers)**
4. **Frieslandscampina Belgium (1200 workers)**
5. **Barry Callebaut Belgium (1100 workers)**

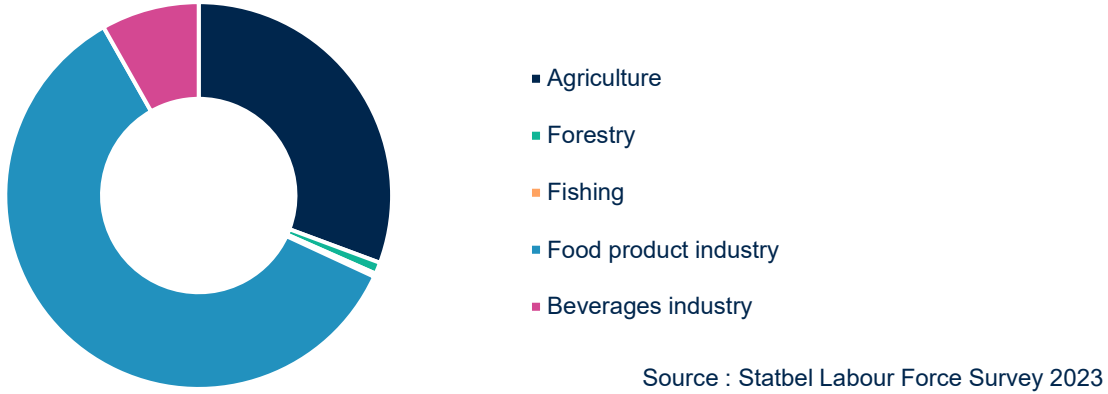
Source : Belfirst

Main professions (in terms of volumes)

1. **Food and related products machine operators (24.500 workers)**
2. **Shop sales assistants (13.800 workers)**
3. **Bakers, pastry-cooks and confectionery makers (12.000 workers)**
4. Field crop and vegetable growers (8.600 workers)
5. Livestock and dairy producers (7.700 workers)

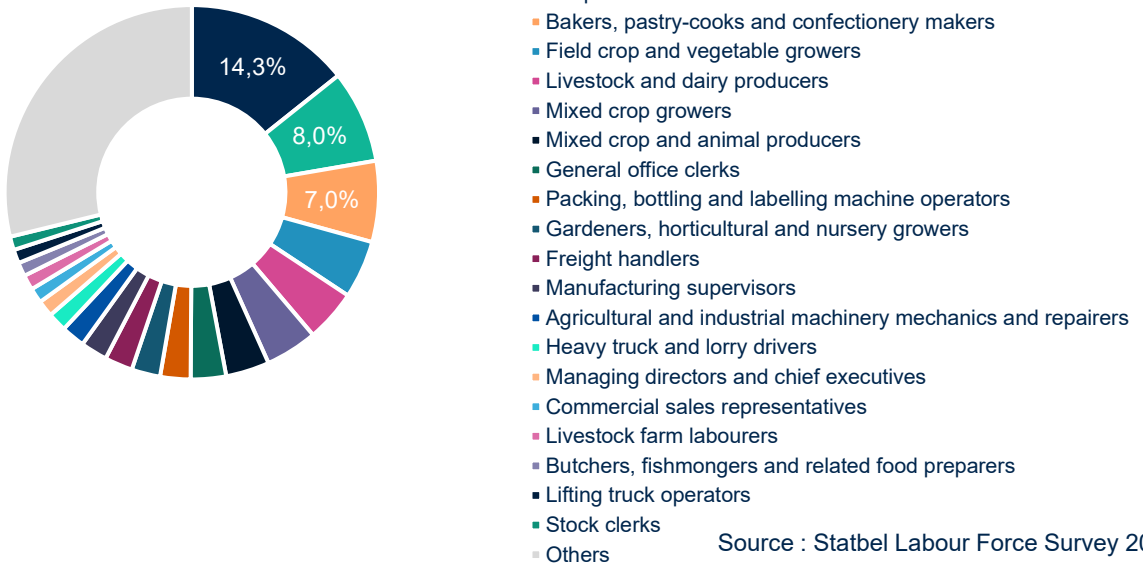
Source : Statbel

Jobs distribution per subsector



Source : Statbel Labour Force Survey 2023

Professions distribution (focus on the top 20 professions in 2023)



Source : Statbel Labour Force Survey 2023

Main Belgian companies of the sector - 2023

Agriculture		Forestry		Fishing		Food product industry		Beverages industry	
360 workers	Belorta	100 workers	Grijkoort – Werkplaats	20 workers	Aude Audenda	**1450 workers**	**Ferrero Ardennes**	**3000 workers**	**InBev**
320 workers	Den Berk	85 workers	Comptoir de bois Daniel Sabbe	20 workers	Vlaamse Visserijcooperatie	**1350 workers**	**Puratos**	600 workers	Alken-Maes
250 workers	Biobest group	50 workers	Boskat	20 workers	Aquiflor	**1200 workers**	**Frieslandscampina Belgium**	500 workers	Spa Monopole
210 workers	Stoffels	50 workers	Natuurinvest	20 workers	Joose – Luyckx Aqua Bio	**1100 workers**	**Barry Callebaut Belgium**	400 workers	Duval Moortgat
190 workers	Plukon Mouscron	45 workers	Sylva	15 workers	Vitafish	1000 workers	Alpro	400 workers	Brouwerij Haacht

Source : Belfirst

Subsector specifications

Agriculture		Forestry		Fishing		Food product industry		Beverages industry	
52.700	**workers**	**1.600**	**workers**	**500**	**workers**	**103.000**	**workers**	**14.000**	**workers**
16,3%	Field crop and vegetable growers	53%	Forestry and related workers	56%	Managing directors and chief executives	21,4%	Food and related products machine operators	18,2%	Food and related products machine operators
14,6%	Mixed crop growers	13,9%	Forestry labourers	30%	Inland and coastal waters fishery workers	13,3%	Shop sales assistants	7%	Supply, distribution and related managers
14,5%	Livestock and dairy producers	10,6%	General office clerks	13,6%	Gardeners, horticultural and nursery growers	11,7%	Bakers, pastry-cooks and confectionery makers	6,5%	Commercial sales representatives
12,3%	Mixed crop and animal producers	8,2%	Gardeners, horticultural and nursery growers			4,2%	Packing, bottling and labelling machine operators	5,5%	Stock clerks
7,6%	Gardeners, horticultural and nursery growers	5,7%	Regulatory government associate professionals not elsewhere classified			3,5%	Manufacturing supervisors	5,3%	Lifting truck operators

Source : Statbel Labour Force Survey 2023

Subsector evolutions (workers)

NACE 2	NACE Code 3	10 years evolution	2023
Agriculture	Growing of non-perennial crops	-27%	8000 workers
	Growing of perennial crops	1%	4200 workers
	Plant propagation	-31%	1300 workers
	Animal production	3%	13500 workers
	Mixed farming	-18%	20800 workers
	Support activities to agriculture and post-harvest crop activities	45%	4700 workers
Forestry	Silviculture and other forestry activities		
	Logging	-16%	1200 workers
	Gathering of wild growing non-wood products		
	Support services to forestry	-42%	400 workers
Fishing	Fishing	-61%	150 workers
Food product industry	Processing and preserving of meat and production of meat products	-4%	14300 workers
	Processing and preserving of fish, crustaceans and molluscs	4%	1000 workers
	Processing and preserving of fruit and vegetables	0%	11000 workers
	Manufacture of vegetable and animal oils and fats	40%	3000 workers
	Manufacture of dairy products	-9%	8500 workers
	Manufacture of grain mill products, starches and starch products	17%	4000 workers
	Manufacture of bakery and farinaceous products	19%	35000 workers
	Manufacture of other food products	-4%	22000 workers
	Manufacture of prepared animal feeds	20%	4600 workers
Bevarages industry	Manufacture of beverages	26%	14000 workers

Source : Statbel Labour Force Survey 2023

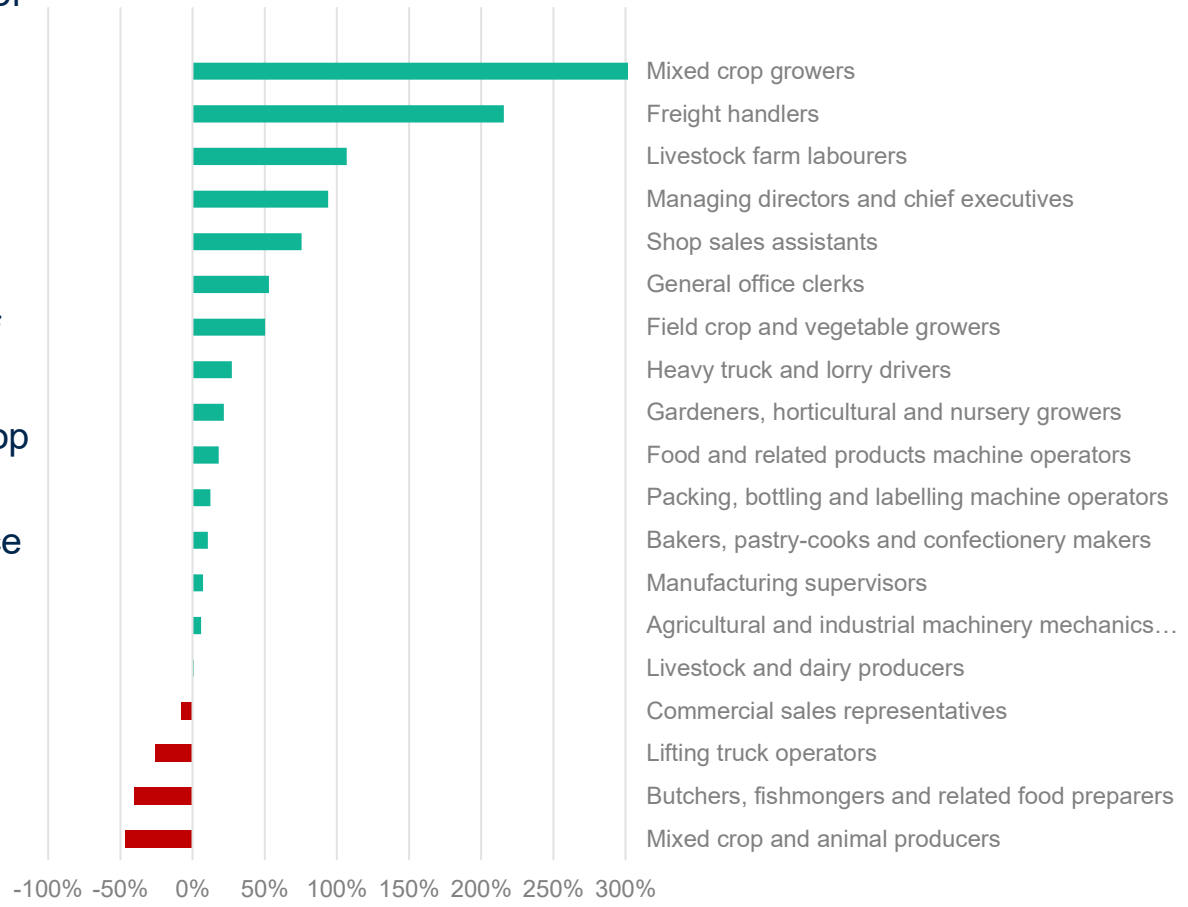
A downward trend in the mix of activities and jobs, a sign of increasing rationalization in the sector to boost productivity?

- Workers in the fishing sector, plant propagation, growing of non-perennial crops and mixed activities
- Decrease of mixed crop and animal producers, stock clercks and butchers

- Workers in the following sectors :
  - Manufacture of bakery and farinaceous products, of beverages, of vegetable and animal oils and fats
  - Support activities to agriculture and post-harvest crop activities
- Increase of mixed crop growers, freight handlers and office workers

- Due to the seasonal nature of certain crops, it is always difficult to estimate the exact number of workers and changes linked to agriculture sector.

#jobs evolution over the last 10 years for the top20 professions



Conclusions

Significant numbers

AGRICULTURE

- **Drastically decrease:**
  - Mixed Farming : - 4 500 job
  - Plant propagation : - 500 jobs.
  - Non perennial crops : (-27%) = - 3000 jobs lost, but increasing productivity

  => Unclear distribution between switch in « culture » or increase in productivity.
- **Significant rise** :
  - +1500 in support activity

  => Reflect of mécanisation and terciarisation.
  - +400 in animal production

  => reflect an increase of the activity, taking into account that the productivity is raising

FOOD PROCESSING INDUSTRY

- **Significant rise :**
  - Bakery is in high progression : +5 600 jobs (+19%)
  - Manufacture of vegetables and animal oils and fats increase dramatically: + 1000 jobs (+40%)
  - Manufacture of prepared animal feeds : +750 jobs

Key takeaways

- The big trend is the continuous **decline of mixed farming** activities in the NACE Code, mostly in favour **of animal-only agriculture**. The number of practitioner is increasing.
- **Increase in processing sectors related to non-perennial crops**, such as bakery and beer production, which represent the largest share in terms of volume.
- The **industrial sector related to vegetable farming** remains **stable**, despite the increase in jobs in the animal production sector.
- Today, we have **people trained in the field of cereals and plant propagation who are losing their jobs**, while animal production is increasing. This is a damaging transfer with a loss of valuable skills for transition. It is consistent with the declining interest in professional training programs related to vegetable planting. The issue of the sustainability of processed products made from cereals, oils, and fats is important to investigate.

Policy recommendations

- **Focus in a first time on game changing decision in order to force the diminution of meat consumption:**
  - Campaign in a first time
  - Introducing a carbon tax on the product
  - **Focus on helping the conversion in the actual farming system**
- **Urgent support to non-animal production** that is facing a huge destruction of jobs (-8000)

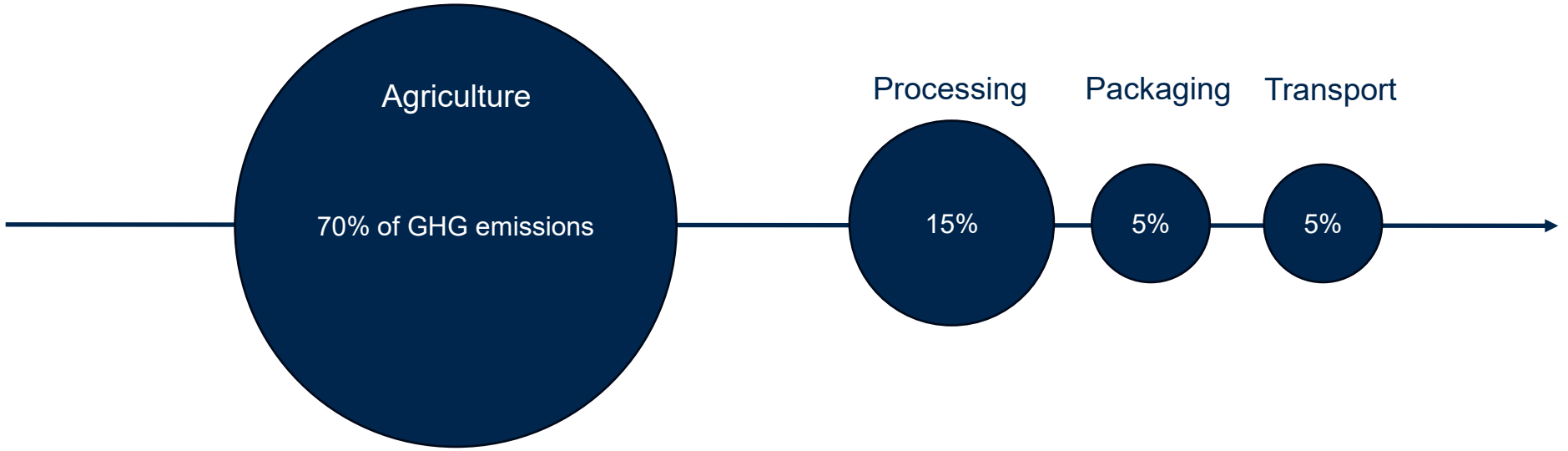
PART 1 Sector characterization

PART 1.1 Sector economics

PART 1.2 Sector's decarbonisation challenges

Agricultural production accounts for most of the greenhouse gas emissions from food products over their life-cycle

Average share of GHG emissions from food products(1)



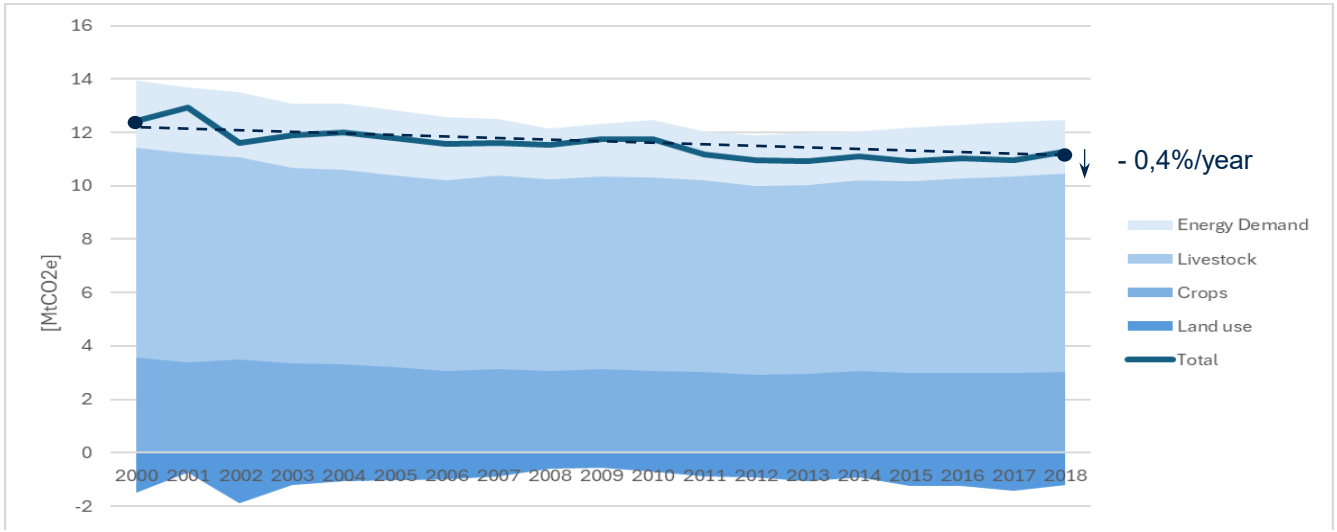
1 **Focus on agriculture** and existing decarbonisation (transition) scenarios in this factsheet

2 Additional information on food processing industry(2)

(1) Details on the environmental impacts of specific food products (and disparities) can be found in the annexes, slide 69. All data can be found in the Ademe database *Agribalyse*.
(2) The BECalc scenarios do not propose a specific model of decarbonation of the food processing industry.

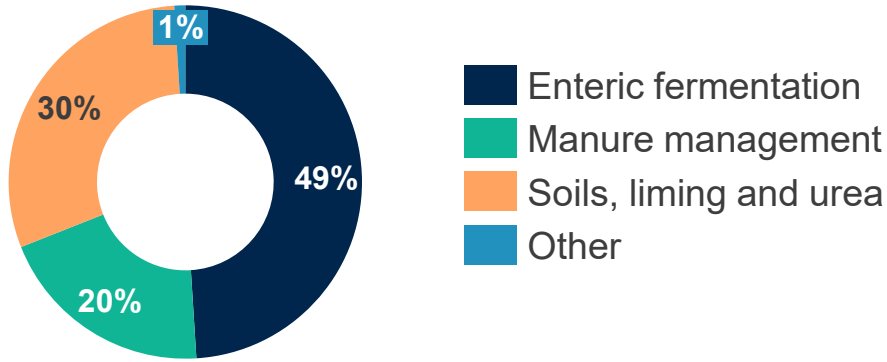
Between 1990 and 2022, greenhouse gas emissions from agriculture fell by 8% (-0,4%/year), with livestock being the main source

Historic GHG emissions due to agriculture sector in Belgium (2000 – 2018)



Source: Core-95 in Scenarios for a climate neutral Belgium by 2050, FPS Public Health (2021)

Main sources of emissions from livestock and crops



In 2022, the sector accounts for **8.9% (12 MtCO2) of Belgium's GHG emissions (excluding fuels)**. The share of agriculture varies from region to region, as Wallonia has a higher share of land used for crops and livestock (14% of total GHG).

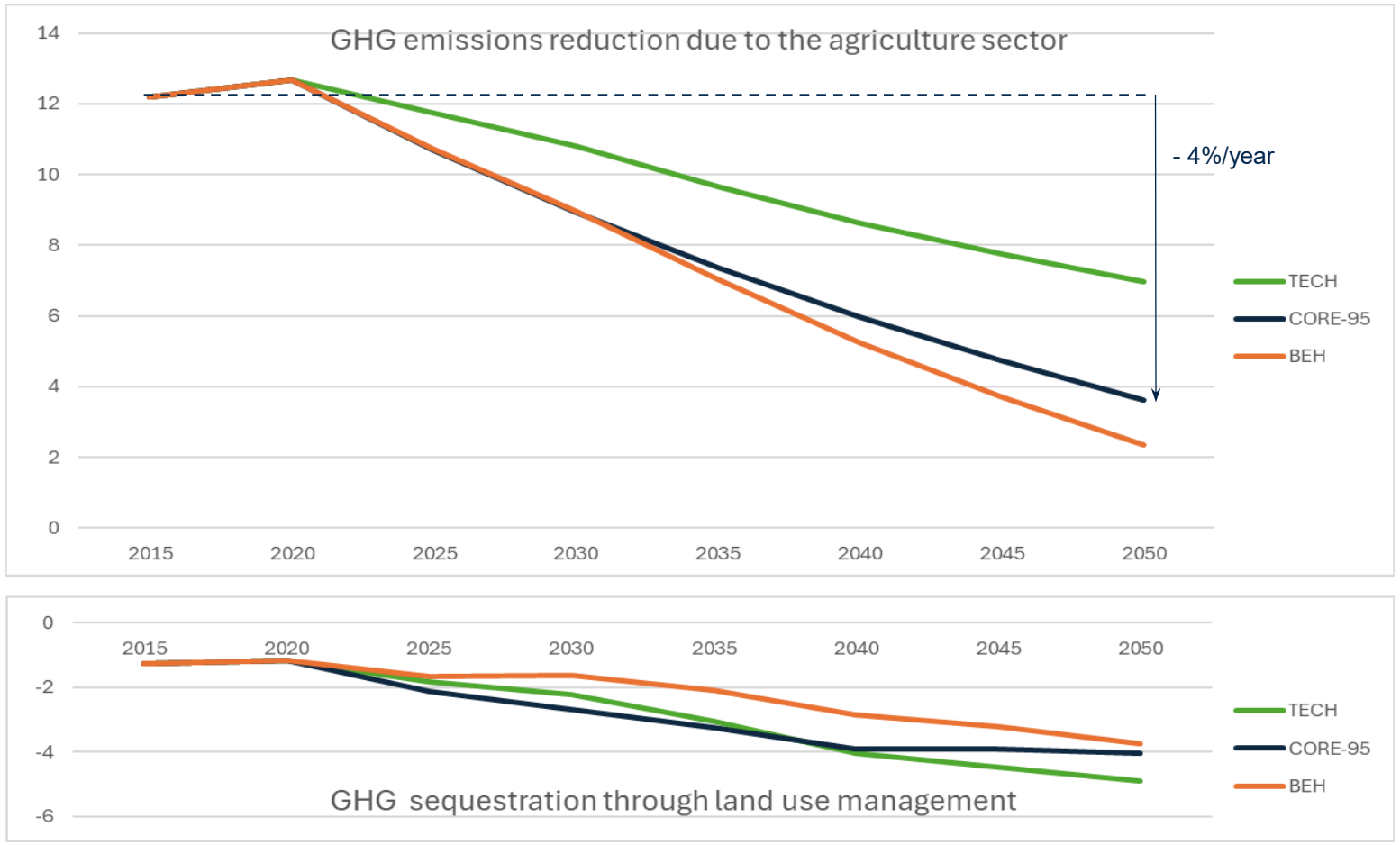
The main sources are methane from **enteric fermentation** (cattle) and **manure management** (pigs), and **nitrous oxide from soils**, which has slightly decreased since 1990 due to the reduction and modification of livestock and the reduced use of mineral and organic fertilisers.

The two other main sources of emissions are **energy demand** (combustion of engines) and **crops** (fertilisers and land use change).

Even if we opt for very high ambitions for each lever, net-zero decarbonisation for the agricultural sector will not be achieved without natural sequestration

Projected evolution of GHG emissions and sequestration in MtCO2e in the agricultural sector (2000 – 2050)

Source: Scenarios for a climate neutral Belgium by 2050, FPS Public Health (2021)



- For each scenario, **net-zero in 2050 is not achieved**, but a reduction of -45% (TECH), -70% (CORE-95) or -80% (BEH) compared to 2020 emissions is proposed, implying a rate of -2%/year (CORE-95). Livestock remains the main source, increasing to 90% of emissions(2).
- In the TECH scenario(1), no effort is made in the agricultural sector and total decarbonisation is achieved by decarbonising other sectors.
- **Natural sequestration from land use** could allow the sector to be fully decarbonised, contributing to a rate of -4%/year from 2024 to 2050 (3) (CORE-95).
- This is a **major challenge**, as agricultural emissions have only decreased at a rate of -0.4%/year (3) over the last two decades.
- In addition, there have been considerable **fluctuations** over the last two decades and even increases in the intervening years.

(1) See slides 19 and 20 for presentation and details of scenario levers.
(2) See slide 70 in the notes for details related to CORE-95.
(3) Annual decline calculated using the CAGR formula.

The three decarbonisation scenarios are based on three main levers for the agricultural sector (mainly changes in behaviour and practices)

For the agriculture, forestry and other land use (AFOLU), the FPS scenarios activate three types of levers at different levels to reach net zero: **key behaviours** (total amount of calories per person, proportion of red meat in consumption), **agricultural practices** (use of chemical inputs, emissions from energy use, manure management) and **land use management** of released lands (reforestation, natural prairies, etc.).

Key behaviours Direct levers	**Agricultural practices** Direct levers	**Land use management** Activation by the other two types of lever, depends on the activation level of the other two
Key behaviours levers focus on actions that fall within the **consumers' scope of responsibility (*)**, focusing on diets, e.g. the total amount of calories per person, or the level of red meat consumption.	Agricultural practices levers play on actions that fall within the **production's scope of responsibility (*)**, focusing on the use of pesticides, chemical fertilisers, emissions from energy use for the sector, and manure management.	Land use management levers focus on the percentage of released lands to **reforestation**, **natural prairies** and **non-food cropland**, thanks to other levers. For example, less meat consumption implies less surface area required for meat production.

Most of the levers are behaviour or practices-based.

(*) This is a simplification of a more complex reality, to facilitate the appropriation of concepts.

Activation of these decarbonisation levers will result in a fundamental transformation of the agricultural model

1

The three different decarbonisation scenarios are determined by the ambition of the levers in the agricultural sector.

	TECH *high ambitions in technological levers*	CORE-95 *Intermediary scenario*	BEH *high ambitions in behavioural levers*
Key behaviours	• Reduction of total red meat consumption around 30%.	• Significant reduction of total red meat consumption around 55%.	• Very significant reduction of total red meat consumption up to 75%.
Agricultural practices	• The entrants use (pesticide and chemical fertilisers) is kept constant compared to 2015 (according to FAO stats). This results in constant yields (without considering soil degradation due to entrants). • Livestock and manure management follows historical intensification trend.	• Slightly lower ambition on the generalization of agroecology practices to all crops, with no fertilizers or pesticides. • Livestock management is even more extensified, with even lower animal density on pasture (around -65% compared to 2015), and manure management that is less treated, and more applied on fields.	• Generalization of agroecology practices to all crops, with no fertilizers or pesticides, but a loss of 25% crops yields. • Livestock management is extensified, with lower animal density on pasture (around -50% compared to 2015), and manure management that is less treated, and more applied on fields.
Land use management	• Percentage of freed up lands to afforestation (33%), natural prairies (33%), and non-food cropland (33%).	• Id.	• Id.

Summary of the decarbonisation challenges faced by the agriculture and food processing industries

- In the value chain of any food product, **agriculture (growing or breeding)** is responsible for **most greenhouse gas emissions**. It accounts for between 60% and 98% of total emissions throughout the life cycle of a food product. **Decarbonising food must first and foremost be achieved by decarbonising agriculture** (whose emissions come mainly from livestock farming).

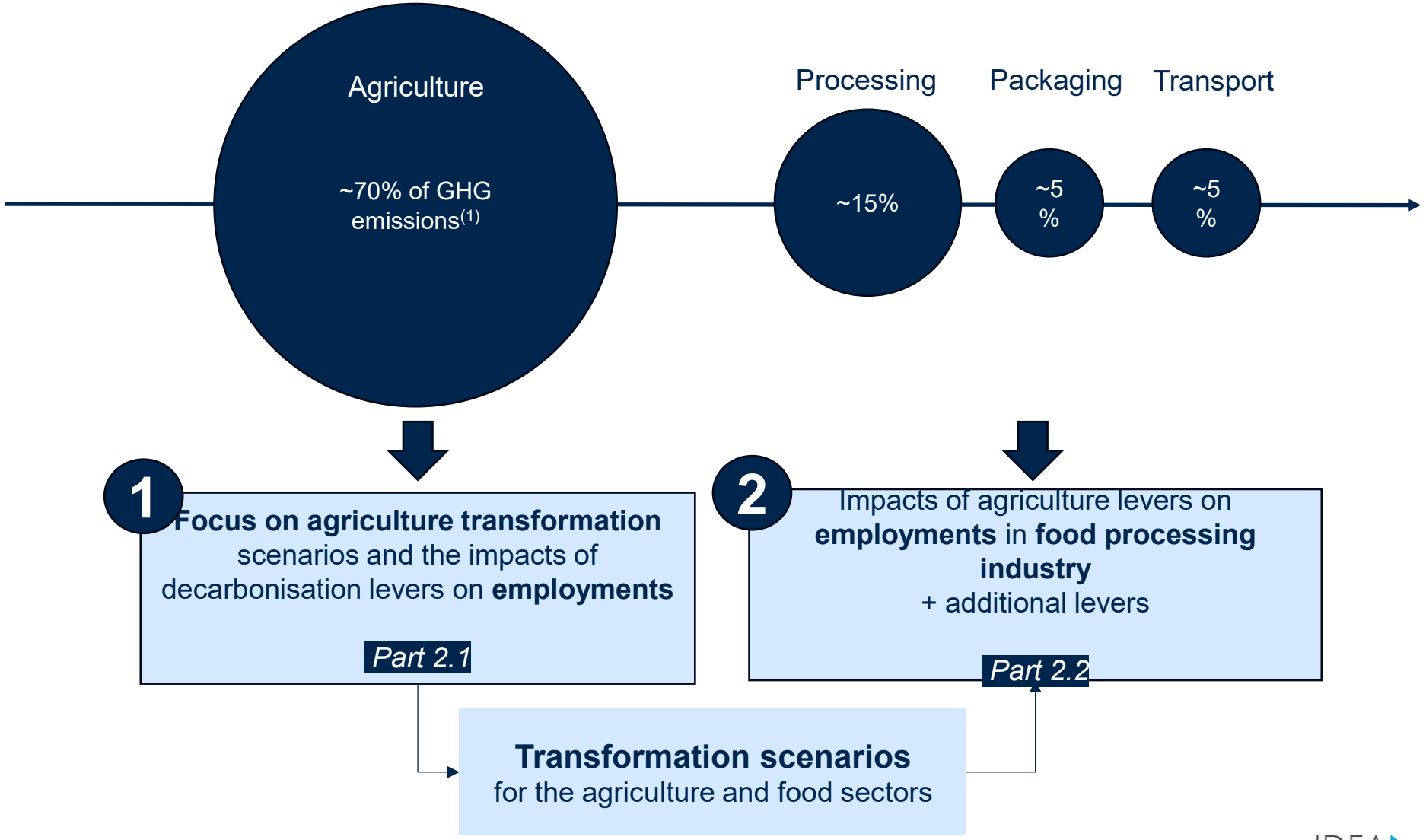
- Even if we opt for very high ambitions for each lever, **net zero decarbonisation** will not be achieved for the agricultural sector due to unabatable emissions.

- The decarbonisation of agriculture focuses on two levers based on **changes in diet and farming practices** (reducing emissions) and a third lever based on **land use management**, which would only be activated once the first two levers have been activated (soil sequestration).

- The activation of these decarbonisation levers would require a **fundamental transformation of the current agricultural model**. The **employment implications** of this transformation will be discussed in the following slides (Part 2).

PART 2. Expected socioeconomic impacts

The decarbonisation focus of this factsheet is on the agricultural sector, discussing transformation scenarios that will also affect the food processing industry



(1) Details on the environmental impacts of specific food products (and disparities) can be found in the annexes, slide 69.

Context, global methodology and limitations

- This section develops an analysis of the climate transition's impact on employment (volumes) within the agriculture and the food sectors.
- **The analysis is based on the « Scenarios for a climate neutral Belgium by 2050 »** published by the FPS in 2022. Nevertheless, these scenario mobilises decarbonisation levers from which the impact on employment cannot be derived. Consequently, **3 high-level « transformation » scenarios have been designed, to translate the decarbonisation levers into transformation levers for the sector**.
- Developing a precise estimation of job variations requires to consider a wide range of variables (economic activity, decarbonisation scenarios, macroeconomic policies, geopolitical context, etc.). This analysis does not aim at building such a dynamic model. **It rather focuses on main trends, with the purpose to spot the tensions that could jeopardize the climate transition (skills shortage, jobs losses).**
- **The following two sections deliver and discuss the results of the scenarios.** The methodologies used for the two sectors are slightly different:
  - **Agriculture:** the three transformation scenarios are applied to the sector.
  - **Food processing:** the three transformation scenarios are applied to the sector, with additional levers for those jobs that are not directly affected by the transformation levers.
- These transformation scenarios are **only plausible under certain conditions**, which are likely to include **strong policies** to address the profitability issue.

PART 2 Expected socioeconomic impacts

PART 2.1 Agricultural production

PART 2.2 Food processing industries

The decarbonisation scenarios are translated into three transformation scenarios

(Transition) Scenarios
for a Climate neutral Belgium by 2050

- TECH: -45% agriculture emissions
- CORE95: -70% agriculture emissions
- BEH: -80% agriculture emissions

Transformation scenarios
for the agriculture and food sectors

- LOW transformation
- INTermediary transformation
- HIGH transformation

Note : the TECH, CORE95 and BEH scenarios respectively lead to what can be simplified as a low, intermediary and high transformation for the agriculture and food (A&F) sectors. However, both TECH, CORE95, and BEH lead to a very high degree of transformation of the Belgian economy. The TECH scenario, which ambitions a lower reduction level of GHG emissions in the Agriculture sector, requires to achieve higher emission reduction in other sectors.

Transformation levers

- Reduction in red meat production and livestock's size per farm
- Relocation of vegetables and fruits production
- Generalization of agroecology practices
- Diversification of farm activities

Lever directly derived from the Transition scenarios
Levers adapted to Belgium, using the model developed by the Shift Project, to estimate the jobs variations in the Agriculture sector(*)

(*) The Shift Project (France, 2021), *L'Emploi : moteur de la transformation bas carbone*

Decarbonisation levers generate direct and indirect consequences on agriculture

These consequences are expressed as 4 transformation levers.

Legend

Direct consequence	Indirect consequence	No consequence

		4 transformation levers			
		Reduction in red meat production and in the livestock's size per farm Because of a decrease of at least 30% in meat consumption and a shift to less ruminant meat	**Relocation of vegetables and fruits production** Up to 40% of relocation, aiming at increasing Belgium's self-sufficiency	**Generalization of agroecology practices** Reduced use of chemical inputs together with smaller farms, short distribution channels and an agricultural model that supports biodiversity	**Diversification of farm activities** Expansion of on-farm activities to include processing and commercialization
Decarbonisation levers (Scenarios for a Climate neutral Belgium by 2050)	Agricultural practices				
	Key behaviours				
	Land use management				

Ambition levels of the transformation scenarios are set for each lever

Transformation levers	Variables	2050 targets in transformation scenarios *(non-official, defined by CLIMACT)*			Assumptions *(to define the 2050 targets)*
		LOW	INT	HIGH	
Less production of red meat and reduction of the livestock's size per farm	Red meat production reduction *(Bovines and pigs, compared to 2015 consumption)*	-30%	-56%	-75%	• Evolution in perfect correlation with the evolution of domestic meat consumption in each scenario • Belgian import/export ratios for meat consumption remain stable over time. • The analysis focuses on bovines and pigs, whose production is the most emitting activity amongst meat production activities.
	Average number of heads per holding's livestock	150	100	50	
	Average number of pigs per holding (Wallonia)	800	533	267	
	Average number of pigs per holding (Flanders)	1500	1000	500	
Relocation of vegetables and fruits production	Self-supply rate for fruit and vegetables	13%	30%	50%	• Belgian's self-supply rate is significantly low (12%, compared to 40% for France). It can be largely increased. • To support the relocation, new diversified farms are created. Ratios for each scenario are derived from the model built by The Shift Project
	Ratio of additional FTE for conversion of existing horticultural enterprises towards sustainable practices(1) (2)	1%	10%	15%	• Some conventional horticultural holdings should shift to produce more diversified fruits and vegetables
Generalization of agroecology practices	Proportion of farms converted to agroecology(3)	1%	40%	80%	• The conversion of one farm would require 2,5 new FTE to reach 4 FTE/farm (not considering the hectares, therefore may be underestimated)
Diversification of farm activities	Proportion of holdings that have diversified their activities(3)	1%	15%	30%	• Conversion could require 0,5 new FTE per farm (may underestimate real needs)

(1) Percentage of the total amount of FTE in 2022.
(2) Adapted from the ratios of the Shift Projects in L'Emploi : moteur de la transformation bas carbone – The Shift Project – Déc. 2021 – Rapport final)
(3) Percentage of the total amount of farms in 2022.

The ambitions for each scenario are discussed in the following slides.

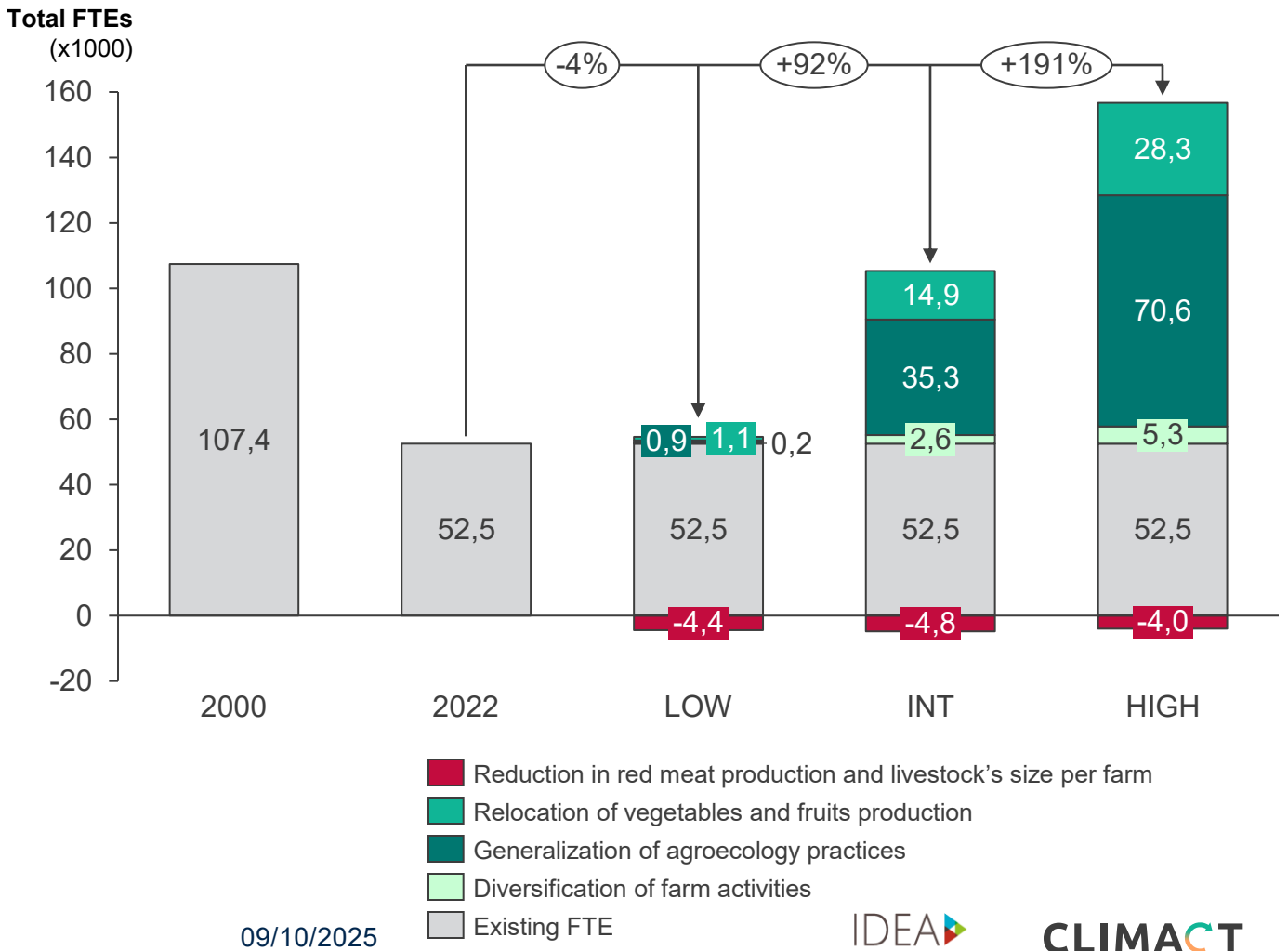
Key takeaways for transforming the agricultural sector

- Scenarios offer **highly contrasted perspectives** in terms of their impact on total agricultural employment.
- Decreasing the production of red meat would lead to **job losses**, which could be **limited** by increasing the number of farms rather than their size.
- The relocation of fruits and vegetables production could lead to a significant creation of new jobs, if achieved via the development of **agroecological farms**.
- The generalization of agroecological practices would lead to a **very strong increase in labour demand** for agricultural workers.
- The diversification of farms' activities is a strong lever for both jobs and **value creation**.

Scenarios offer highly contrasted perspectives in terms of their impact on total agricultural employment (x1, x2, x3)

- **The low transformation (LOW) scenario would not have a significant impact on the employment**. This scenario assumes amongst else a **30% reduction in red meat production** and almost **no change in the agriculture sector's activities.**
- **The intermediary transformation (INT) scenario would require 35.000 more FTEs** and a number equivalent to 40% of the actual farms to switch to agroecology (this number includes the creation of new farms).
- **The high transformation (HIGH) scenario would require 104 000 more FTEs.** This scenario is built on 75% reduction of red meat production, smaller livestock farms (2/3 less animals per farm in average), relocation of vegetables and fruits production (tending to 50% of auto-consumption, compared to 12% currently), important generalization of agroecology practices (80% of actual farms) and the diversification of activities within 30% of the farms
- **The generalization of agroecology practices is the most impacting lever for the total number of jobs.**

Simulation of the total number of FTEs within the agricultural sector in 2050 for each scenario



Decreasing the production of red meat would lead to job losses, which could be limited by increasing the number of farms rather than their size

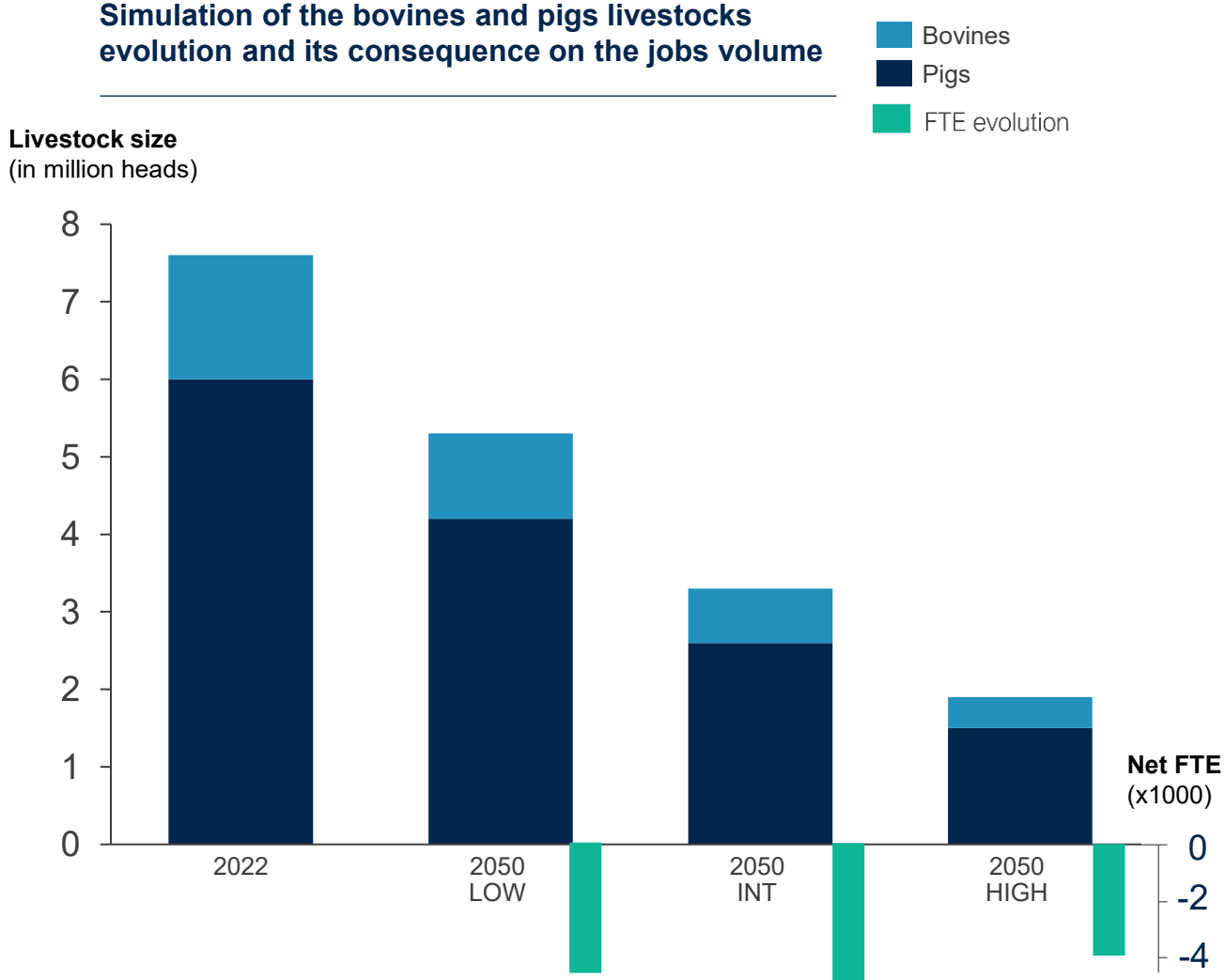
Key takeaways

- **Bovines and pigs' livestock reduction could lead to a small net job loss in all scenarios, between 1.400 FTE (3%) in HIGH to 2.500 in INT (5%). Nevertheless, this limited loss is conditioned to the reduction in the number of heads per holdings.**
- **Reorganising the sector around smaller farms could lead to the creation of new farms and limit the job losses**. This require to reverse the historical trend, which has consisted in a continuous expansion of the farms' sizes together with a reduction of the labour intensity per farm.
- **A reduction in meat consumption in foreign markets, which represent a significant market share, would increase the potential jobs losses**. This analysis considers a stable foreign demand, with a total volume equal to 2022's volumes
- **Over the last two decades, the livestock size has already been decreasing, thanks to subsidies, but not enough.**

Policy recommendations

- **Livestock's reduction efforts must be tailored to each Region, as there are significant differences between them in the current livestock's size.** In 2022, farms in Wallonia and Flanders had an average of about 150 bovines each. Pig farms averaged 900 pigs in Wallonia and 1700 in Flanders.
- Compensation, help and advices are required for the transformation of the livestock farms.

Simulation of the bovines and pigs livestocks evolution and its consequence on the jobs volume



(1) Core-95 in Scenarios for a climate neutral Belgium by 2050, FPS Public Health (2021)

The relocation of fruits and vegetables production could lead to a significant creation of new jobs, if achieved via the development of agroecological farms

1

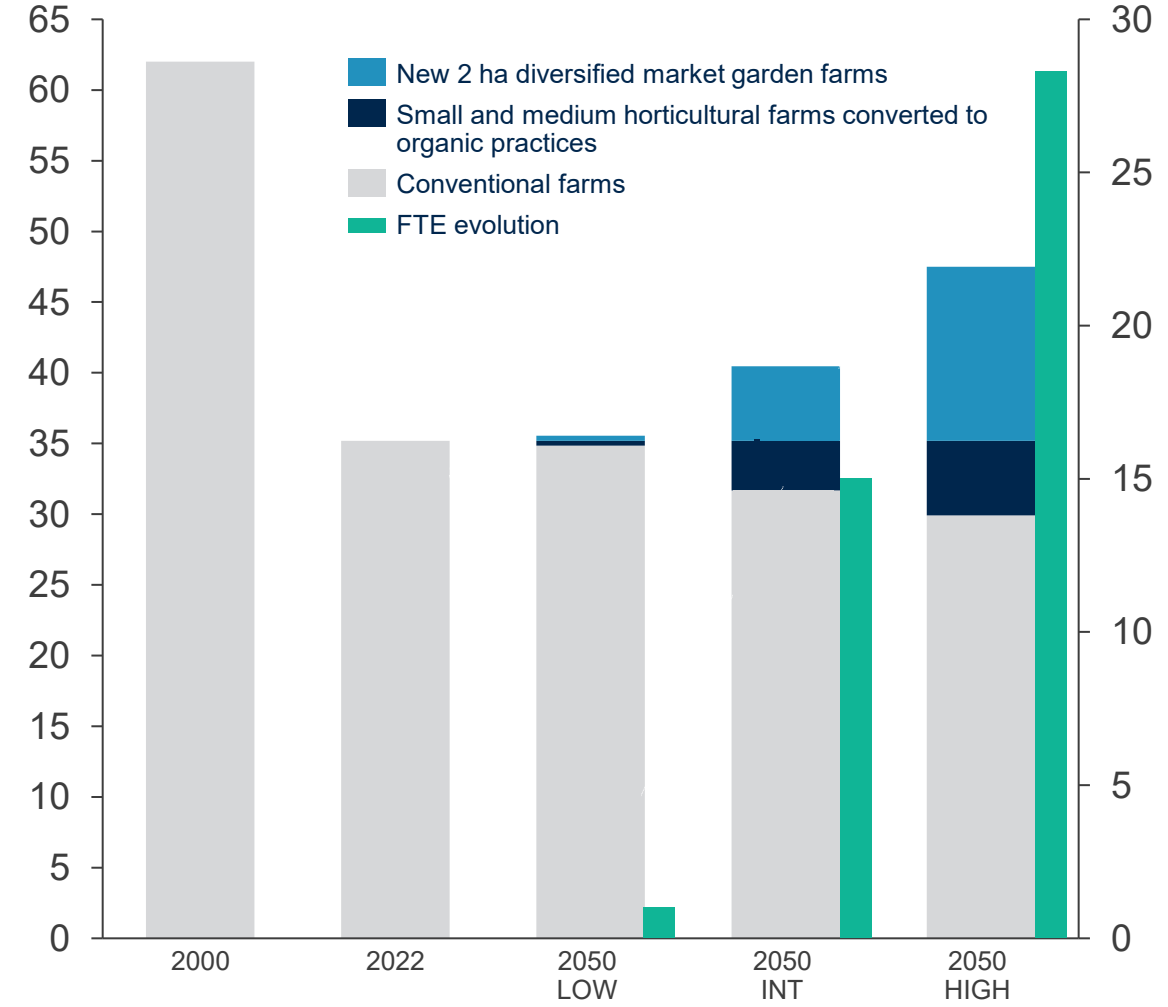
Key takeaways

- **The relocation of fruit and vegetables production can play a key role in the climate transition of the Agriculture sector.** To unlock its full decarbonisation potential**, relocation should be achieved through (1) the creation of new agroecological farms and (2) the conversion (diversification of production, organic farming) of part of the small and medium existing farms.** The exact potential for farm conversion varies between the different studies but is unknown for Belgium.
- **All the relocation scenarios defined in this analysis lead to significant human resources needs for fruit and vegetable farming activities, with high variations (from 1.100 in LOW to 28.000 in HIGH).** Given the current trend in agriculture jobs, achieving any of these scenario ambitions poses key issues for the agriculture training and educational system.

Policy recommendations

- *To be listed through Stakeholders' consultation*

Simulation of the employment evolutions based on the relocation of fruits and vegetable production



The generalization of agroecological practices would lead to a very strong increase in labour demand for agricultural workers

1

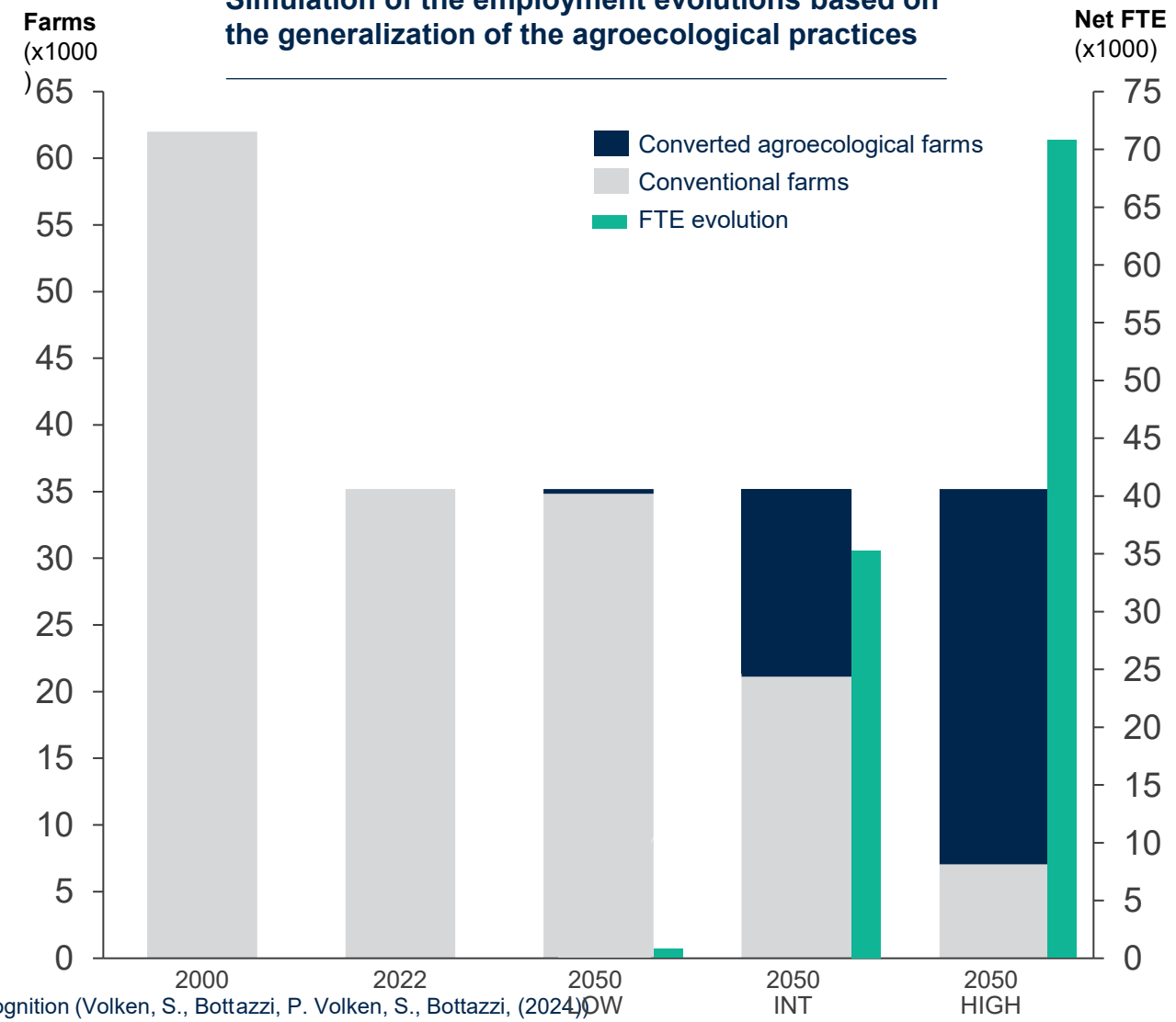
Key takeaways

- **Agroecological farming supposes more activities at the farm and is therefore more labour intensive (~2 FTE/hectare vs. 1,5/farm today, in Belgium) with a higher job quality**[1]: more diverse crops (establishment, treatment, harvest), set up and maintenance of trees and other landscape elements (wetlands, permanent grassland), and increase of the self-production of certain inputs (fertilizers, seeds, animal feed), etc.[2]
- **The level of generalisation of agroecological practices has therefore an exponential correlation with the labour demand and could lead up to 70.000 new jobs (+135%).** This poses significant challenges to the sector and the educational system, given the current trend and the low attractivity for farming jobs.
- **A TECH/LOW scenario leads to almost no development of agroecological practices, and therefore do not generate new jobs opportunities.** However, skills might have to evolve anyway to support the reduction of pesticides and other chemical inputs.

Policy recommendations

- **Reconversion opportunities from other sectors must be further estimated,** if the Core95 or BEH scenario were to be implemented**. Strong support measures** for workers reconversion would be required.
- **Value and promote farming jobs.**

Simulation of the employment evolutions based on the generalization of the agroecological practices



(1) No use of chemical dangerous products, better air quality, more decent working conditions, more recognition (Volken, S., Bottazzi, P. Volken, S., Bottazzi, (2024))
(2) Shift Projects in L'Emploi : moteur de la transformation bas carbone – The Shift Project – Déc. 2021 – Rapport final)

PART 2 Expected socioeconomic impacts

Food processing, preserving and manufacturing is the sector with the highest turnover, the largest number of employees and the highest growth in Belgium[(1)]

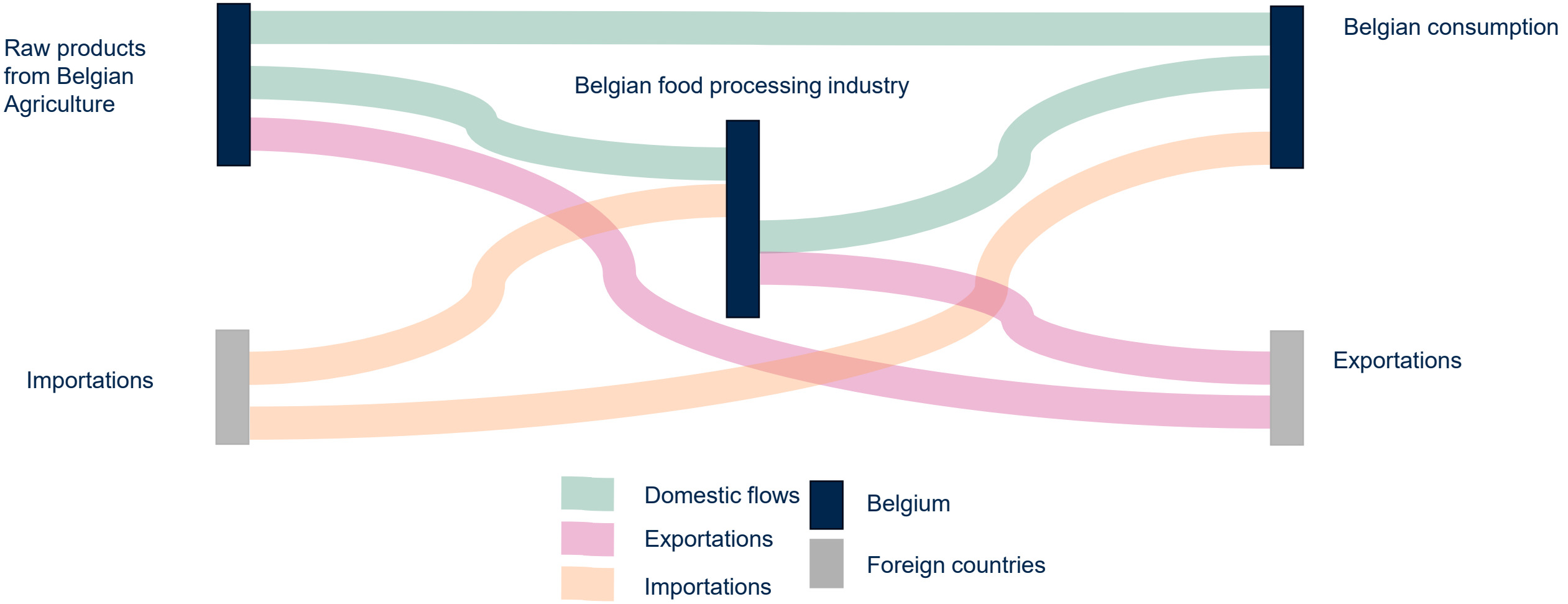
In 2022, it is estimated that around 103,000 people are employed in the food processing industry (compared to 35,000 in agriculture).
The most important jobs in Belgium are related to bakery and farinaceous products and other food products (representing 55% of the jobs). Meat processing and the processing and preserving of fruit and vegetables are also important in the Belgian food processing industry (25% of the jobs)[(2)].
Flanders accounts for 72% of the number of jobs, Wallonia 24% and the Brussels Region 4%[(3)].

Code NACE 3	FTE 2023[(2)]	% FTE	Comments
Processing and preserving of meat and production of meat products	14.300	14%	*Including production of red meat and poultry meat products*
Processing and preserving of fish, crustaceans and molluscs	1.000	1%	
Processing and preserving of fruit and vegetables	11.000	11%	*Including potatoes and juice*
Manufacture of vegetable and animal oils and fats	3.000	3%	*Including margarine*
Manufacture of dairy products	8.500	8%	*Including cheese, dairies, ice cream*
Manufacture of grain mill products, starches and starch products	4.000	4%	
Manufacture of bakery and farinaceous products	35.000	34%	*Including biscuits, cakes and noodles, couscous, macaroni, etc.*
Manufacture of other food products	22.000	21%	*Including sugar, cocoa, chocolate, tea, coffee, condiments, prepared meals and dishes, homogenized food preparations, dietetic food etc.*
Manufacture of prepared animal feeds	4.600	4%	*Including feeds for farm animals and pets*

(1) Source : Rapport économique annuel 2017-2018 Fevia
(2) Source : Statbel

The food sectors (agriculture and food processing industry) are connected by flows of raw and processed food products(1)

(1) The flow weights (the share) are not shown in this figure.



Agriculture and food processing industry scenarios can be applied separately, considering imports-exports

- Both sectors could potentially evolve independently, as domestic agricultural production is not the only inputs of the food processing industry (imports and exports).
- The choice here has been made to link the food processing scenarios with the agriculture scenarios (in terms of volumes of processed food, that could follow the domestic production), to stay coherent with GHG emissions reductions targets. The resulting positive and negative job impacts for INT and HIGH transformation of the food processing industry could be mitigated by higher imported volumes of raw products.

Transformation scenarios for Food processing industry	Transformation scenarios for Agriculture: LOW transformation	INTermediary transformation	HIGH transformation
LOW transformation	Both sectors do **not** undergo **any transformation**	The reduction in domestic production is mitigated by important **increase in importations**.	**Import growth** even higher than for INT
INTermediary transformation	Agriculture follows the past trends (conventional) while volumes of **processed food decrease** – **exportations increase**	Both sectors are coherent and linked to each other, with the **same share of importations**	The important transformation in the agricultural sector is not completely followed as **imports mitigate the job losses / increases in the food processing sector**
HIGH transformation	**Exportations of raw food products** to foreign countries scale up significantly	The share of exportations increases mildly	**Both sectors** are coherent and interrelated, and are undergoing a **profound and fundamental transformation**

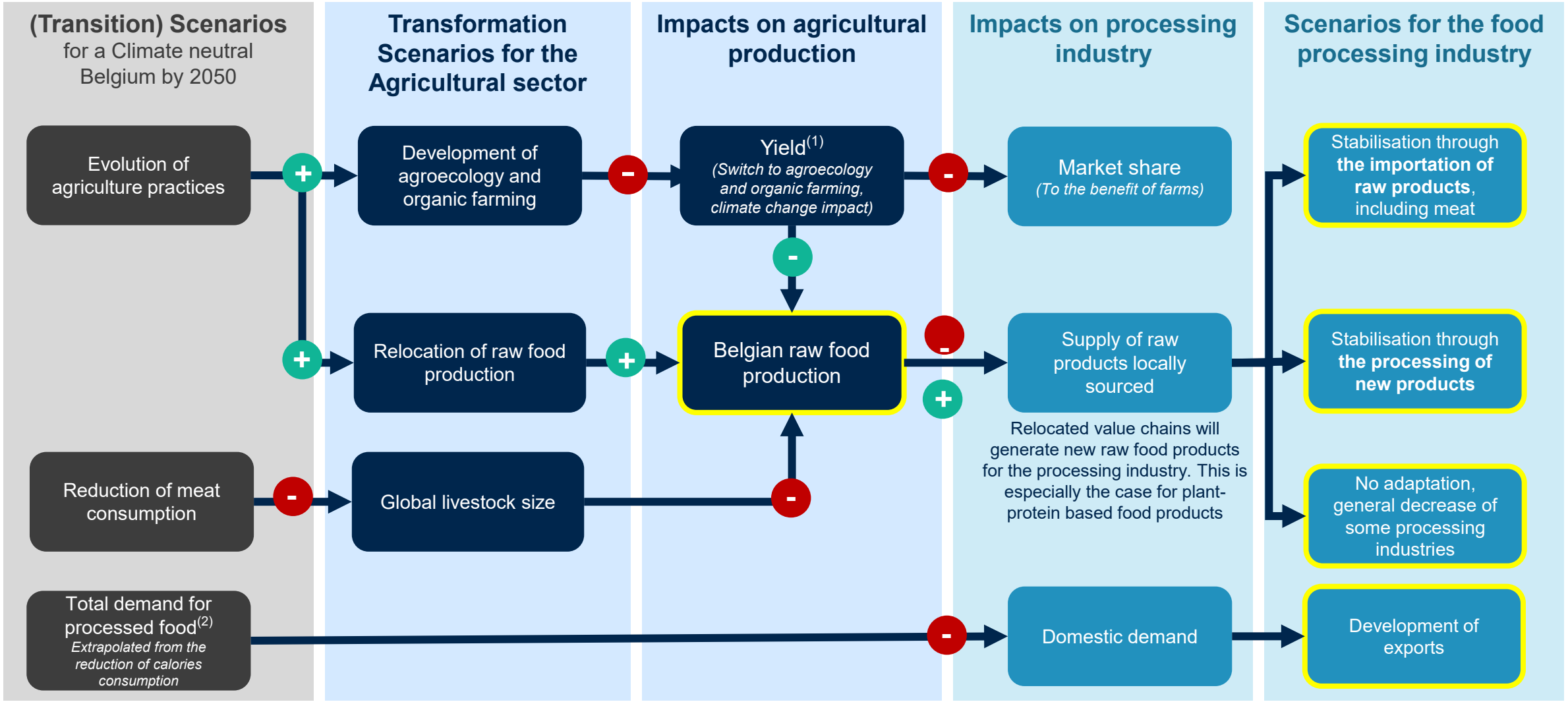
Increase in importations

Increase in exportations

Key takeaways for the food processing industry

- Food processing, preserving and manufacturing is the sector with the highest turnover, the largest number of employees and the highest growth in Belgium.
- A decrease in the domestic meat production could lead to job losses within transformation industries, yet with mitigation options (relocation of alternative raw food products, importations, etc.).
- The relocation of vegetables and fruits production could generate job gains in the processing industry, with nuances
- Diet changes could lead to significant labour needs for bakery and farinaceous products manufacturing, an already dominant sector in terms of employment
- Diet changes may impact jobs in grain mill and starch production, but likely will not affect total food industry employment

The transition's heterogeneous impact on Belgium's raw food production could lead to different (and non-exclusive) scenarios for the food processing industry



(1) According to the scenarios for a climate neutral Belgium by 2050, FPS Public Health (2021). An hypothesis that is more and more challenged as agroecology practices could lead to a same agricultural yield in certain conditions and as economic yield could be better than with conventional agriculture practices (lower intrants costs, more resilience to hydric stresses). Source: Increasing climate change resilience through sustainable agricultural practices, IEEP (2024).

The transformation levers used for the agriculture sector affect some jobs of the food processing industry but there is a need to add levers to estimate the evolutions of other jobs

Transformation scenarios
for the agriculture and **food sectors**

- LOW transformation
- INTermediary transformation
- HIGH transformation

Transformation levers

- Red meat reduction and livestock's size per farm
- Relocation of vegetables and fruits production
- Generalization of agroecology practices
- Diversification of farm activities

Additional levers for the food processing industry
(changes in volumes to be processed)

- Diet change (based on scientific studies and WHO recommendations)

Additional levers based on food diet change are proposed for code NACE 3 that are not directly impacted by the transformation levers

A large number of studies propose dietary changes (in the proportion of food ingested per day) based on health recommendations and the impact of the production of these (mainly processed) foods on the climate (and the environment). The levers proposed for a rough assessment of employment trends in the food processing sector are based on changes in the volumes of food products to be processed.

The ambitions of these levers are to be discussed with the stakeholders (the import-export shares are estimated without modification).

- Vegetable production should be multiplied by 4 (Afterres2050(1)), or by 1.7 (The Shift Project(2)).
- Dairy product production should be halved (Afterres2050) or divided by three (Greenpeace(3)).
- Cereals production should be increased by 20% (Afterres2050) or 50% (The Shift Project)
- Meat production should be halved (Afterres2050), or reduced by 70% (The Shift Project, FPS scenario)

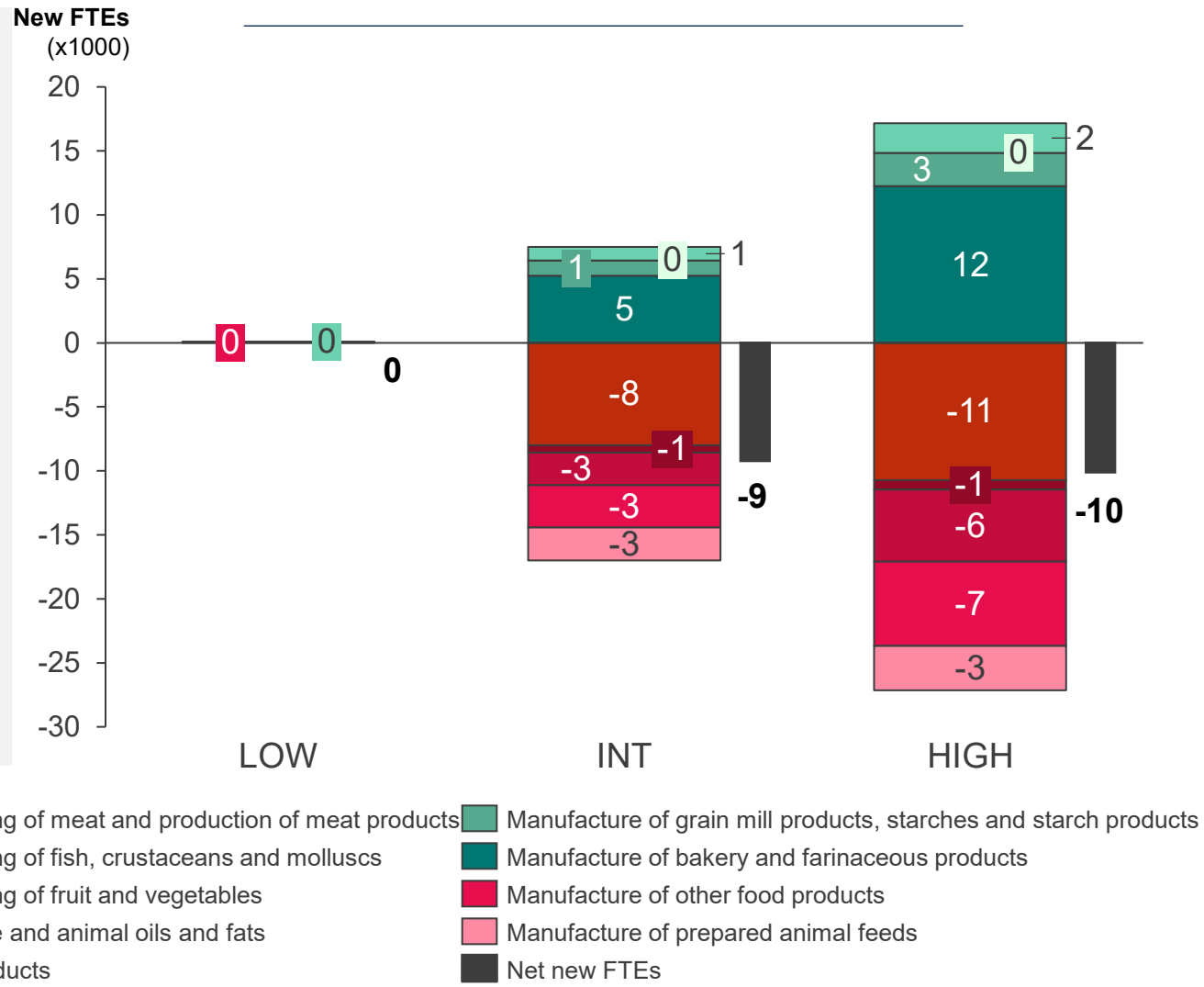
For each NACE 3 code within the food processing sector, an estimate of employment volumes is proposed based on the transformation levers presented in part 2.1 and additional levers more directly related to diet presented above..

(1) Le scenario Afterres2050 version 2016, Solagro
(2) The Shift Project (2021), *L'Emploi : moteur de la transformation bas carbone*
(3) Tirado, R., Thompson, K.F., Miller, K.A. & Johnston, P. (2018) Less is more: Reducing meat and dairy for a healthier life and planet - Scientific background on the Greenpeace vision of the meat and dairy system towards 2050. Greenpeace Research Laboratories Technical Report (Review) 03-2018

Scenarios offer slight contrasted perspectives in terms of their impact on total food industry employment

- **The low transformation (LOW) scenario would not affect the employment**. This scenario assumes amongst else a **30% reduction in red meat production** to be mitigate by more importations.
- **In the intermediary transformation (INT) scenario, around 9.000 jobs would be lost (-9%),** mainly in meat processing. Some 8.000 jobs would be created in gain mill products, bakery and vegetable processing, helping to mitigate the total losses of 17.000 (meat, fish, dairy, and other products production).
- **In the high transformation (HIGH) scenario, a net loss of 10.000 jobs would occur (-10%)**. The total job losses (27.000 FTE) are offset by the job gains (17.000 FTE), particularly in the bakery and flour industries.
- **Details on assumptions and computations are given in the following slides.** Some of the NACE code (3) in the graph are detailed only in the annexes (out of scope of this study).

Simulation of the total number of FTEs within the food industry sector in 2050 for each scenario



The climate transition could have a significant and heterogeneous impact on food processing industry employment volume

In 2022, around 105.000 workers are estimated to work in the food processing industry.

Activities *(NACE Code 3)*	Employment variation LOW	Employment variation INT	Employment variation HIGH
Processing and preserving of meat and production of meat products	0%	-56%	-75%
Processing and preserving of fish, crustaceans and molluscs	0%	-56%	-75%
Processing and preserving of fruit and vegetables	1%	10%	21%
Manufacture of vegetable and animal oils and fats	0%	0%	0%
Manufacture of dairy products	0%	-30%	-66%
Manufacture of grain mill products, starches and starch products	0%	30%	65%
Manufacture of bakery and farinaceous products	0%	15%	35%
Manufacture of other food products	0%	-15%	-30%
Manufacture of prepared animal feeds	0%	-56%	-75%

A decrease in the domestic meat production could lead to job losses within transformation industries, yet with mitigation options

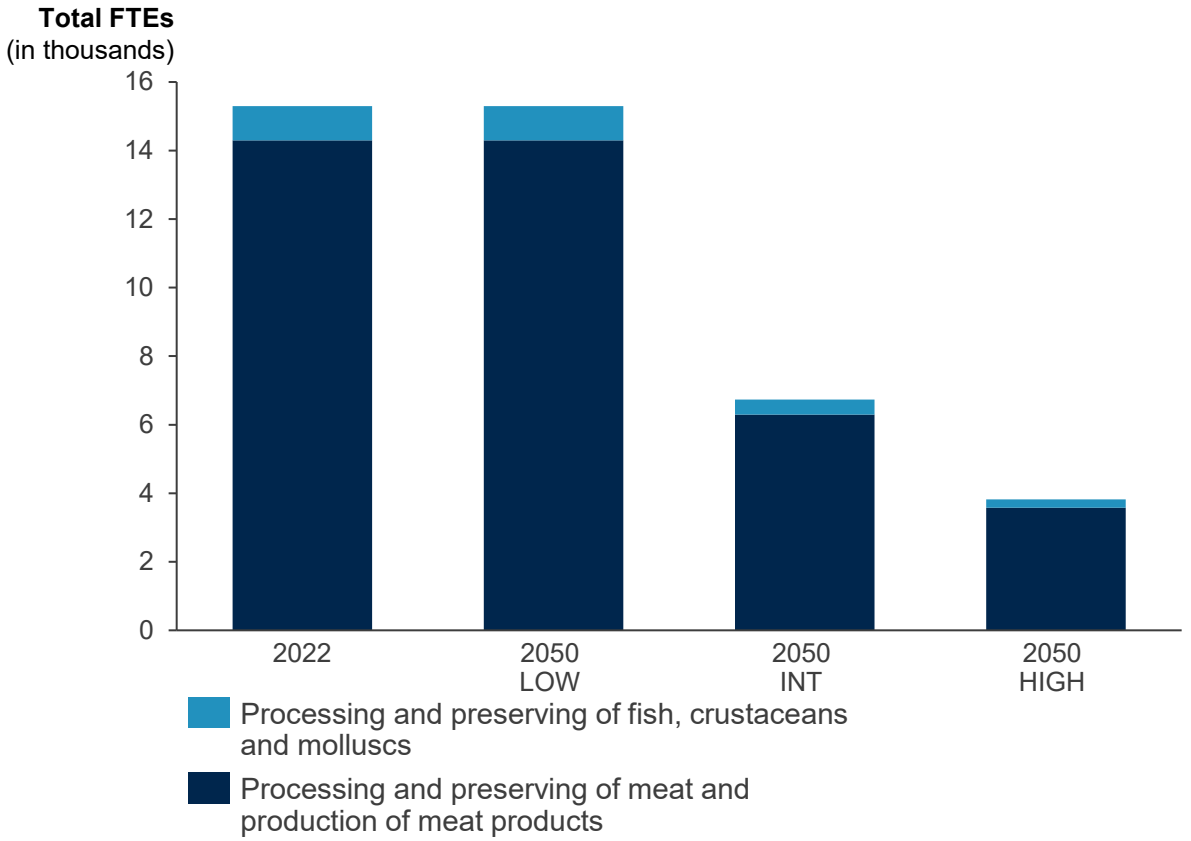
Key takeaways

- **A medium to strong reduction in meat production could lead to a division by ~2,5 to 3,5 of the number of jobs in meat processing industries.** However, the increase of activity in other transformation industries could provide reconversion opportunities (see slide 50 to 51).
- **Importing meat could mitigate the job losses. Nevertheless, all countries are expected to reduce their meat production to achieve EU climate targets.** Balancing the reduction of domestic production with imports is simulated in the low transformation scenario, where the production of red meat is reduced by 30%. “Balancing” a higher level of domestic production reduction do not seem realistic. However, importing meat could impact negatively the GHG reduction effort.
- **Poultry meat processing could also be a reconversion opportunity**. Its production emits much less GHG. Switching from read meat production/consumption to poultry production/consumption could be a first step for a global decrease of GHG emissions due to meat production.
- **It is assumed that the fish industry could be affected similarly to the meat industry, as fish production reduction would also support decarbonisation objectives (amongst others)**. However, the fish processing and preserving industry represents only 1% of the number of jobs in the food industry.

Policy recommendations

- *To be discussed with stakeholders.*

Simulation of the total number of FTEs in 2050 for the production/processing/preserving of meat and fish products, compared to 2022 total



The relocation of vegetables and fruits production could generate job gains in the processing industry, with nuances

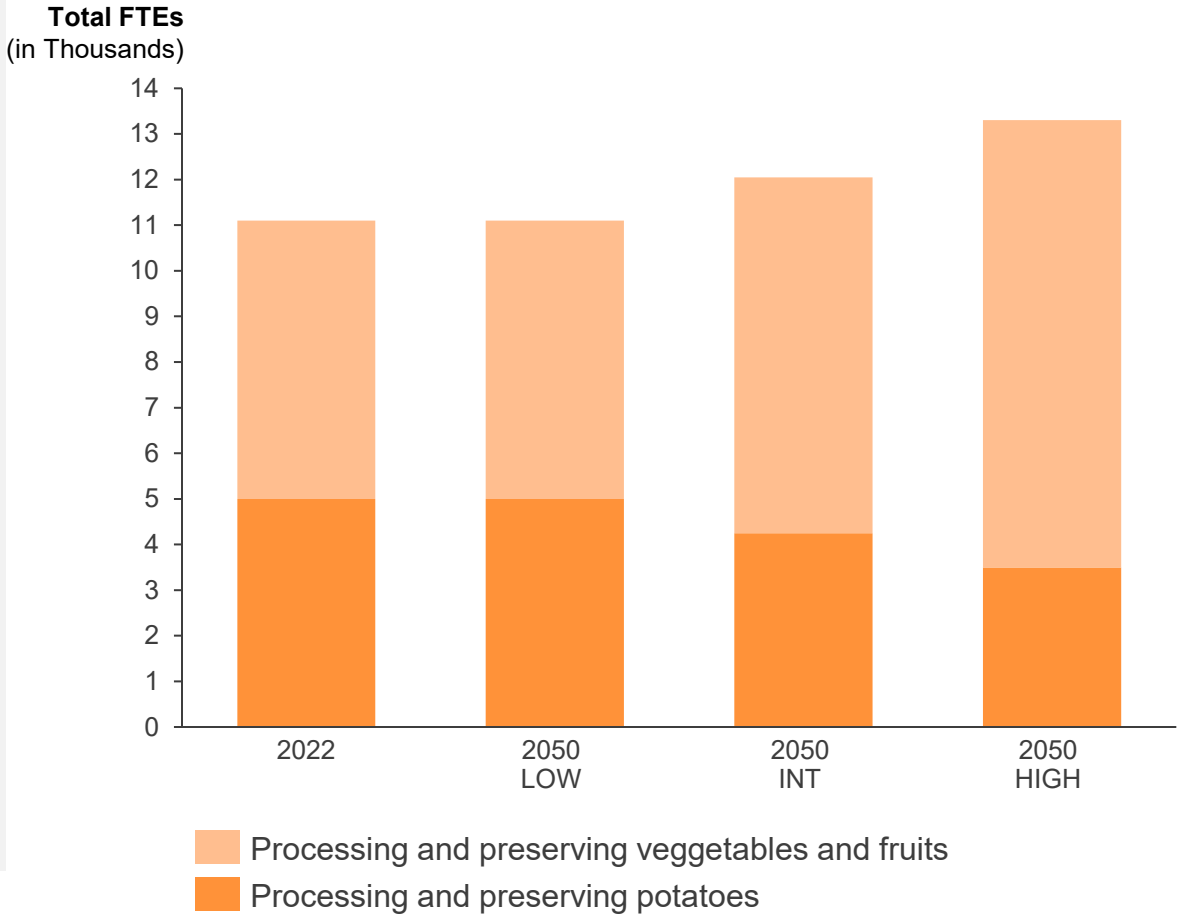
Key takeaways

- **INT and HIGH scenarios lead to respectively 1.050 (10%) and 2.300 (20%) net job gains.** Indeed, the development of local value chains for the relocated productions would generate a market for the transformation industry, with ~20% of the production that would be destined for processing.
- **Nevertheless, the evolution would be nuanced, with job losses within the most intensive and voluminous productions (potatoes).** The generalization of agroecology practices, which involve less intensive farming, would lead to a reduction of potatoes and sugar beets domestic production is expected to reduce. Representing a significant part of the jobs within this code NACE 3, it is estimated that this reduction is partly compensated by greater importations. The jobs in potatoes processing and preserving are expected to reduce of 0% (LOW), 15% (INT) and 30% (HIGH).
- **Type of employers could change**, **with new jobs created at the farm for on-location processing activities**. These jobs would need to be added to the results displayed here.

Policy recommendations

- *To be discussed with stakeholders*

Simulation of the total number of FTEs in 2050 for the processing and preserving of fruits, vegetables and potatoes



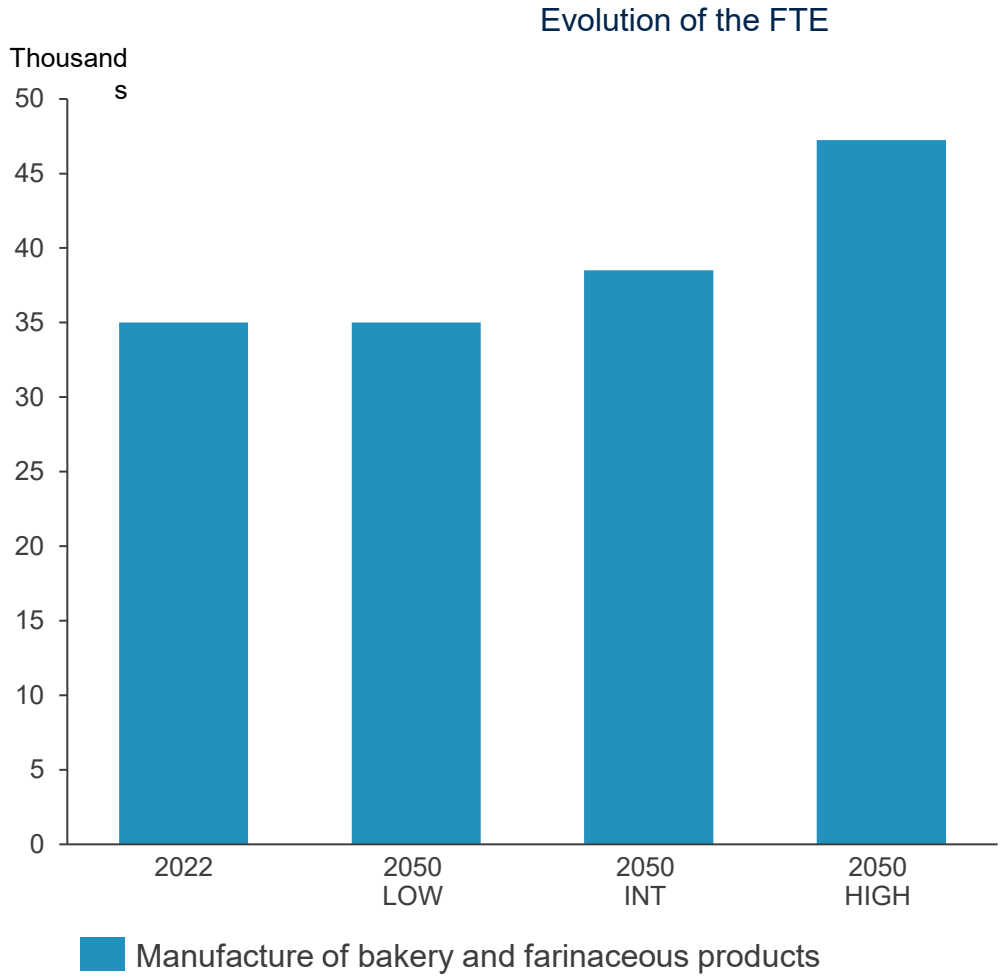
Diet changes could lead to significant labour needs for bakery and farinaceous products manufacturing, an already dominant sector in terms of employment

Key takeaways

- **Labour need in this sector could increase by up to 12.250 (35%) in HIGH,** mainly due to an increased consumption (up to 50%) of bread, pasta, rice, and other cereals, which production already accounts for a high share of the current total employment for the manufacturing of bakery and farinaceous products (specifically bread and pasta production). The increased consumption is due to a change of meat reduction in the population diet.
- **The intermediate transformation scenario would lead to a more moderate impact (+5.250), where the population's diet (both domestic and international) does not shift as significantly as in the high transformation scenario**.
- In contrast, minimal changes in employment are expected under the low transformation scenario, where there is little alteration in the population's diet (LOW).

Questions to be discussed with stakeholders

- What is the share of exports versus domestic consumption?
- What is the number of full-time equivalent (FTE) employees in each subsector (NACE 4 code)?
- What about the proposed estimate of +35% of processed volume for the high transformation scenario?



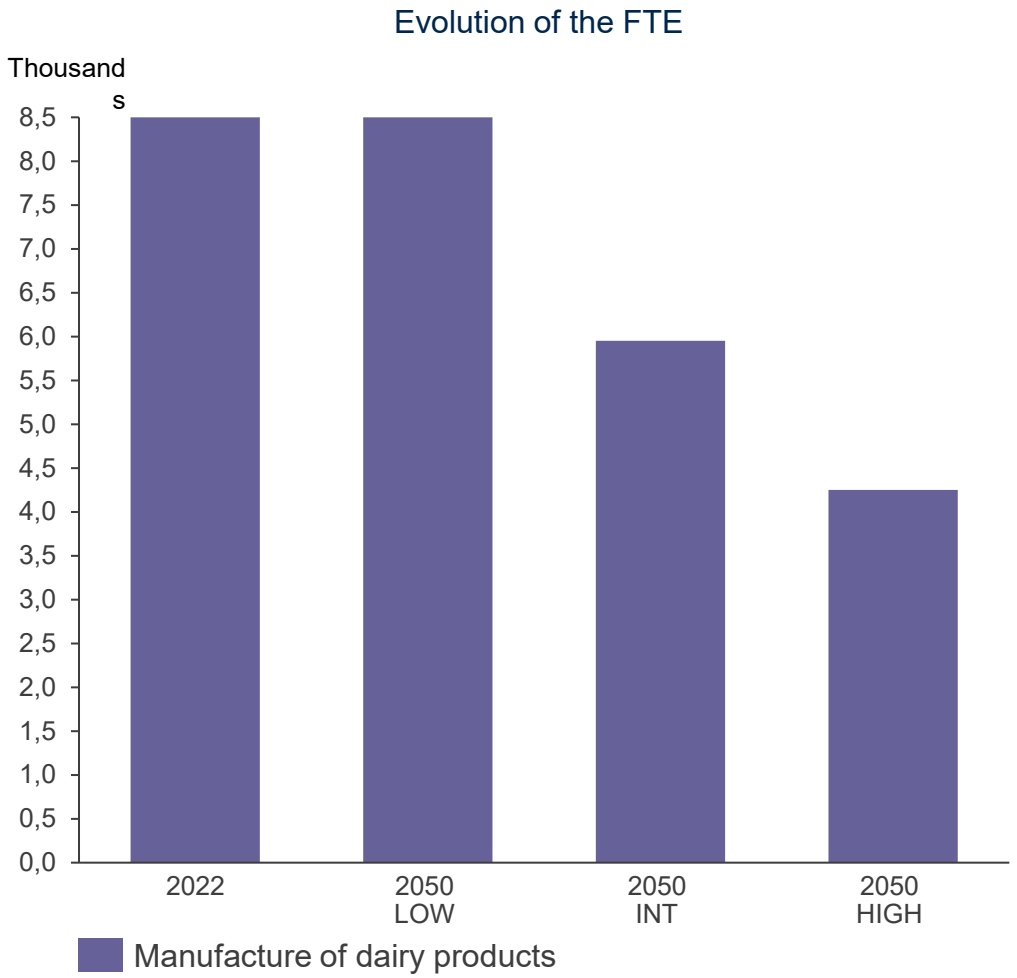
Jobs could be lost within the dairy industry, consequently to a lower dairy product consumption

Key takeaways

- **The EAT-Lancet Report (*Food Planet Health)* recommends to decrease the dairy consumption by 50%.** This reduction is considered necessary to mitigate climate change, support sustainable livestock farming, and prevent a potential health crisis.
- **Employment in the dairy sector is projected to follow a similar trend,** with an estimated 50% reduction due to decreased demand in the case of significant sector transformation (HIGH). The model assumes that the export-to-domestic consumption ratio remains unchanged and that international dietary shifts mirror those in Belgium.
- In the case of intermediate transformation, the reduction in dairy production is estimated not to exceed **one-third**, with little to no change expected under a scenario of minimal transformation.
- This decline could be mitigated by **importing animal products for processing and preservation**, or by converting **businesses to support the return of other sub-sectors**.

Questions to be discussed with stakeholders

- What is the share of exports versus domestic consumption?
- What is the number of full-time equivalent (FTE) employees in each subsector (NACE 4 code)?
- What about the proposed estimate of -50% of processed volume for the high transformation scenario?



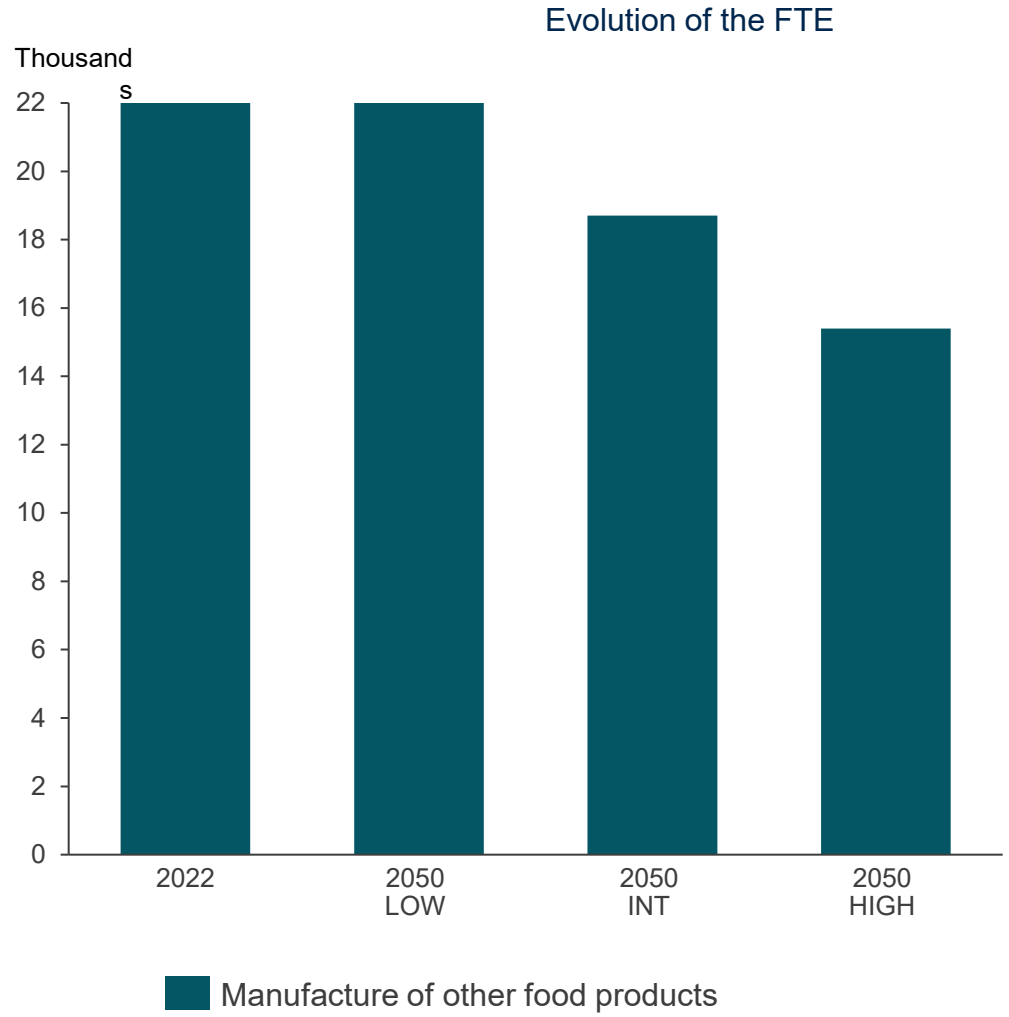
The reduction in sugar consumption recommended for health and climate issues could affect jobs in the manufacture of other food products

Key takeaways

- **Employment in the subsector could fall by 30% in the case of high transformation** (and by 15% in the case of intermediate transformation), depending on trends in sugar consumption in particular.
- **The sub-sector includes the manufacture of sugar** (which must surely account for a major share of employment in Belgium, along with sugar beet**), cocoa, chocolate and other confectionery, as well as prepared meals** (and homogenised foods).
- **It is assumed that the fall in consumption of some of these products is offset by an increase in consumption of other processed products** (in particular alternative vegetable proteins and sustainably produced inputs). Therefore, part of the subsector is not affected by the transition in terms of employment.
- **A reduction in the consumption of confectionery and ready-made meals could be envisaged, in line with the diet recommended by the WHO, which calls for sugar intake to be halved** (to less than 5% of the total diet). The EAT-Lancet Commission on healthy diets from sustainable food systems also recommend a reduction of 50% of highly processed foods and added sugars.

Questions to be discussed with stakeholders

- What is the share of exports versus domestic consumption?
- What is the number of full-time equivalent (FTE) employees in each subsector (NACE 4 code)?
- What about the proposed estimate of +35% of processed volume for the high transformation scenario?



PART 3 Focus on jobs and skills

PART 3.1 Agricultural production

PART 3.2 Food processing industries

Methodology

Scope analysed

- We focus on the impact of the low-carbon transition **primarily in agricultural production.**
- Indeed, this sector is key, as reskilling and upskilling needs will be the most significant here. For the food processing industry, which is expected to decline (with some opportunities for reconversion), the main challenges have already been addressed in previous slides.

On agricultural production, we will explore the skills impacts through three key angles:

- Focus 1 : declining jobs - identifying opportunities for transitioning roles that are shrinking into other sectors.
- Focus 2 : growing jobs - analyzing the skillsets required for roles poised for growth, forecasting workforce demand, and evaluating the capacity of the education system to address these needs effectively
- Focus 3 : existing roles - assessing the upskilling requirements for key occupations impacted by the transition and ensuring their seamless integration into current occupational competency frameworks.

Macro trends

Before delving deeper, it is useful to highlight the major trends currently affecting the sector

- **Labour shortages**: While recruitment needs are currently limited, the sector is ageing, and many farmers lack successors.
- **Land access:** High land costs hinder new installations.
- **Sector image:** Poor working conditions and low income reduce the sector's appeal, complicating recruitment.
- **Current CAP:** Favors larger farms with per-hectare payments, not ensuring minimum incomes for smaller operators.
- **Fundamental transformation:** The underlying trends of mechanisation and digitisation, including artificial intelligence, are transforming agricultural practices by reducing the distinctive value of the sector's traditional inputs, namely labor and land.
- **Recruitment challenges:** In market gardening and horticulture, finding both seasonal and occasional labour is difficult.
- **Informality of the skilling process** : Recruitment channels are often limited to informal networks, farmers are not well informed about available employment assistance, and there is a lack of agricultural training for adults.

In this context, it is extremely difficult to interpret the figures and distinguish what is attributable to the impact of the climate transition, the cyclical adaptation to demand, and finally the job creations and destructions linked to the transformation of production processes.

FOCUS 1 - Decreasing jobs and practices

The current trend seems to contradict the desired transition scenarios

- Jobs are being massively destroyed in the areas of mixed farming, plantations, and non-perennial crops (-8000 jobs)
- They are increasing in animal production, reflecting a rise in activity
- These lost jobs could usefully transition into bio-based activities. However, these sectors are still underdeveloped. Care for the land is another avenue for re-employment, but it requires specific financing arrangements.

FOCUS 1 - Decreasing jobs and practices

Transition scenarios will impact the whole sector

Considering the transition scenarios, once initiated and fully implemented, the following impacts should be addressed:

1. **Decline in domestic meat production**: This will also lead to a reduction in activity within the meat processing industries.
2. **Decrease in potato and sugar beet production**: This is linked to the adoption of agroecological practices, which rely on less intensive farming methods.
3. **Reduction in dairy consumption and employment**: The dairy sector is expected to experience a significant decline, with projections indicating a 66% reduction in activity.
4. **Lower sugar consumption**: This could negatively impact jobs in the manufacturing of various other food products.

As previously discussed, the overall impact on jobs related to agricultural production could be mitigated by the increased demand for labour per hectare in organic farming and by the rising number of smaller-scale agricultural operations.

From an analysis of the NACE code, we can anticipate growth in specific areas:

- poultry meat processing → emits much less GHG (switch from red meat to poultry production)
- relocation of vegetables and fruits production → generate job gains in the development of local value chains

Finally, job losses in the broader food processing industry should be addressed using strategies similar to those applied during other industrial transitions.

FOCUS 2 : Strong increase in labour demand

Current challenge

While projections suggest growth in agricultural production through relocalisation, agroecological practices, and diversification, current job losses in key areas like crop farming and plant propagation persist. Meanwhile, animal production, expected to decline, has slightly increased. The challenge is aligning current trends with future projections and supporting the transition.

Impacted jobs (1) (2)

- **Market gardeners/horticulturists**: Increasing succession challenges and high takeover costs are leading to smaller, more manageable plots. This trend is expected to continue due to the relocation of the productions.
- **Agricultural worker:** Agroecological practices demand 30% more labour per hectare, creating a need for more workers.
  - ➔ Those jobs are currently being destroyed.
- **Agricultural advisor:** Key in guiding farmers through agroecological transitions and diversification.
- **Processing, sales and marketing professionals:** Agricultural workers diversifying will need expertise in these areas. Depending on the situation, they may choose to acquire these skills, consult a specialized advisory organization, or outsource these services

(1) Ministère de agriculture et de alimentation (2019). Actif'Agri : Transformations des emplois et des activités en agriculture
(2) Forem (2022). Anticipation des besoins en competences et formations dans la chaine de valeur agro-alimentaire – de la fourche à la fourchette

FOCUS 2 : Strong increase in labour demand

Focus on agricultural advisor

They are crucial in helping farmers adapt to evolving regulations and sustainability demands. Their expertise includes(1) :

- Conducting environmental impact assessments (LCA, audits, etc.)
- Advising on biodiversity conservation and protective measures
- Identifying and mitigating environmental risks
- Recommending sustainable practices

With a background in environmental science, agricultural law, and sustainable farming, they play a central role in guiding the sector towards a low-carbon future (2).

(1) VDAB (n.d) Profil métier: Conseiller agricole – Competent - VDAB (n.d)
(2) Forem (2022). Anticipation des besoins en competences et formations dans la chaine de valeur agro-alimentaire – de la fourche à la fourchette

Policy considerations

The establishment and renewal of the agricultural population are at the heart of the challenges of the transition

- **Streamline administrative and financial processes for new entrants:** Local authorities should simplify the administrative and financial procedures for new entrants to facilitate easier access to land and agricultural equipment.
- **Guarantee fair compensation for workers :** Develop and implement policies to ensure that agricultural workers receive fair and competitive wages. More specifically, agroecological practices can contribute to fairer compensation by :
  - Reducing production costs through decreased use of chemical fertilizers, pesticides, feed, and veterinary care.
  - Allowing higher sales prices in response to increasing consumer demand for healthy and environmentally friendly products.
  - Increasing the added value captured by agricultural workers by reducing the number of intermediaries in the supply chain.
  - Reducing public expenditures on pollution cleanup and healthcare, thereby enabling savings to be reinvested in subsidies and direct support for farmers
- **Enhance public awareness and communication efforts:** Launch and support comprehensive awareness and communication campaigns aimed at modernizing the image of the agricultural sector. These campaigns should highlight technological innovation and sustainable agricultural practices to attract a younger and more diverse workforce

FOCUS 3 : Adapting agricultural skills to current challenges - reskilling

Agricultural professions require increasingly advanced skills, knowledge, and qualifications (1)

- Skills in agroecology and climate-smart agriculture
- Skills in management and versatility
- Skills in sales, logistics and marketings

Impacted jobs (1) (2)

- Agricultural and horticultural workers
- Agricultural manager

(1) Forem (2022). Anticipation des besoins en competences et formations dans la chaine de valeur agro-alimentaire – de la fourche à la fourchette

FOCUS 3 : Adapting agricultural skills to current challenges - reskilling

Analysis of Skills Development

- In the next slide, we will conduct an in-depth analysis of the skills required by agricultural workers to enable a successful transition towards a more sustainable sector. The term "agricultural workers" is used here in its broadest sense, encompassing both farm labourers and managers. The goal of this analysis is to provide a clear understanding of the essential skills that agricultural workers will need to face the challenges of the low-carbon transition. These skills are highly specialised and will require significant upskilling of the workforce.

Structuring of the tables

- Slide 67 presents the skills we will refer to as "technical and environmental". These are mitigation skills, essential to reducing the sector’s impact on climate change.
- The table is divided into four columns:
  - The first column shows the specific areas to which these skills apply, whether crop or livestock production. For instance, ruminant farming leads to methane emissions, while crop fertilisation releases nitrous oxide during fertiliser application.
  - The second column explains the mitigation goal sought by adopting these skills. Some of these are aimed at reducing greenhouse gas emissions (CO2, methane, and nitrous oxide), while others are focused on carbon sequestration (for example, through land-use changes, management practices, and agroecological strategies, all of which are necessary and need to be reassessed). Additionally, we also address bioeconomic skills related to the use of bio-based materials.
  - The third column concretely demonstrates what these essential skills are.
  - The fourth column shows how well the skills are integrated in the competency profiles (see further)
- Slide 68 outlines the skills needed for the diversification of agricultural activities.

FOCUS 3 : Adapting agricultural skills to current challenges - reskilling

Analysis of competence profiles

- Once these skills have been identified, we will analyze the competence profiles of various agricultural workers, ranging from labourers to farm managers. In principle, these occupational competence profiles are developed by the sectoral social partners and Synerjob (VDAB, Actiris, Brussels-Formation, Le Forem, and ADG) as a reference framework for education and training.
- The aim is to assess to what extent the skills considered essential for the low-carbon transition are already integrated into the competence profiles of the professions analyzed. These profiles guide the content delivered by education and training actors. Aligning this content with emerging needs for climate change adaptation and mitigation is crucial for delivering effective training, education, and continuing professional development

Technical and environmental skills (1)

- The table below presents a non-exhaustive list of required skills regarding the diversification of activities.
- We have thoroughly analysed the competence profiles of both **agricultural and horticultural workers,** along with more strategic roles such as the **agricultural production manager**. The findings of this analysis are summarised in the last column.
- In general, although there are references to what we might call "green skills and knowledge," these are only superficially addressed, lacking in detail and precision.

Domains	Objectives	Key kills to posses	Actual occupational competence profiles
Crop production (annual/perennial) and animal production (1)	Reduction of greenhouse gas emissions (GHG)	Awareness of and understanding of climate changes ,competence in conducting climate assessments, ability to interpret climate diagnostics	**Agricultural and horticultural worker:** only a brief mention of the necessity to "work in compliance with quality, safety, health, and environmental standards: follow quality procedures, adhere to safety and environmental regulations, and apply environmental and quality norms," without further definition or emphasis on these aspects. **Agricultural manager** : more comprehensive reference to the "promotion of sustainable management" (considering environmental and social contexts when carrying out core activities, defining and disseminating a sustainability charter internally, raising employee awareness of sustainable management, establishing a waste management policy, and enhancing knowledge regarding environmental issues).
Crop production (annual/perennial) (1)	Reduction of nitrous oxide (N2O) emissions through adaptation of farming practices and diversification of cultivated specie	Ability to adapt fertiliser doses to crop needs to limit fertiliser input, develop crop/livestock associations, etc.	
Crop production (annual/perennial) and animal production (1)	Carbon sequestration (in cultivated areas, grasslands, forests)	Possessing knowledge and mastering practices that capture carbon (reducing tillage, using TCS techniques, avoiding deep ploughing, increasing the proportion of grasslands in the crop rotation, planting an orchard, etc.) (1)(2)	

(1) Capiat, (2022 Changement climatique : Evolutions et impacts sur l'agriculture
(2) Forem, (2022 Anticipation des besoins en compétences et formations dans la chaine de valeur agro-alimentaire).

Technical and environmental skills (2)

- The table below presents a non-exhaustive list of required skills regarding the diversification of activities.
- We have thoroughly analysed the competence profiles of both **agricultural and horticultural workers,** along with more strategic roles such as the **agricultural production manager**. The findings of this analysis are summarised in the last column.
- In general, although there are references to what we might call "green skills and knowledge," these are only superficially addressed, lacking in detail and precision.

Domains	Objectives	Key kills to posses	Actual occupational competence profiles
Crop production (annual/perennial) (1)	Reduction of greenhouse gas emissions (GHG)	Mastery of agricultural techniques aimed at preserving soils and water (agroforestry, associated crops, organic farming, etc.)	**Agricultural and horticultural worker:** only a brief mention of the necessity to "work in compliance with quality, safety, health, and environmental standards: follow quality procedures, adhere to safety and environmental regulations, and apply environmental and quality norms," without further definition or emphasis on these aspects. **Agricultural manager** : more comprehensive reference to the "promotion of sustainable management" (considering environmental and social contexts when carrying out core activities, defining and disseminating a sustainability charter internally, raising employee awareness of sustainable management, establishing a waste management policy, and enhancing knowledge regarding environmental issues).
Crop production (annual/perennial) (1)	Developing bioeconomy from agricultural origins (via the development of agromaterials and biomolecules production)	mastery of new techniques, knowledge of new biological cycles, competences in identifying + incorporating new corps into rotations,..	
Animal production (1)	Reduction of methane and nitrous oxide emissions through feed ration modifications	Ability to adapt livestock feed (appropriate support in fodder, modifying feed composition, etc.)	

(1) Capiat, (2022 Changement climatique : Evolutions et impacts sur l'agriculture

Skills related to the diversification of activities (1)

- The table below presents a non-exhaustive list of skills essential in order to diversify their activities
- We have thoroughly analysed the competence profiles of both **agricultural and horticultural workers,** along with more strategic roles such as the **agricultural production manager**. The findings of this analysis are summarised in the last column.
- In general, It appears that competencies related to product packaging (such as labelling, packaging techniques, and conditioning methods) are well integrated. However, there is no reference to the need for skills in sales and marketing and versatility particularly needed in the context of developing short supply chains and direct sales to diversify

Domains	Objectives	Key kills to posses	Actual occupational competence profiles
Product transformation (1)	Apply food safety and sanitary regulations	Understanding and applying Hazard Analysis and Critical Control Points (HACCP) to ensure product safety. Familiarity with food hygiene rules, health and safety standards, and regulations governing food production and processing	**Agricultural and horticultural worker:** A clear mention to ability to product packaging (labelling, packaging techniques, using materials economically, applying storage guidelines, handling gestures and postures, ..) + ability to prepare orders (read shipping notes, handling gestures, collects products..) **Agricultural manager** : covers broader safety, hygiene and environmental practices that are relevant across various industries (QHSE procedures , quality, hygiene safety and environment) but no specific focus on food safety.
Product transformation (1)	Processing and packaging techniques	Ability to efficiently process agricultural products while ensuring compliance with safety and sanitary standards. Knowledge of packaging methods that preserve product quality, safety, and freshness.	
Product transformation(1)	Labelling and regulatory compliance	Understanding the legal requirements for product labelling, including ingredient listings, nutritional information, and regulatory compliance.	

(1) Forem, (2022 Anticipation des besoins en compétences et formations dans la chaine de valeur agro-alimentaire).

Skills related to the diversification of activities (2)

- The table below presents a non-exhaustive list of skills essential in order to diversify their activities
- We have thoroughly analysed the competence profiles of both **agricultural and horticultural workers,** along with more strategic roles such as the **agricultural production manager**. The findings of this analysis are summarised in the last column.
- In general, It appears that competencies related to product packaging (such as labelling, packaging techniques, and conditioning methods) are well integrated. However, there is no reference to the need for skills in sales and marketing and versatility particularly needed in the context of developing short supply chains and direct sales to diversify

Domains	Objectives	Key kills to posses	Actual occupational competence profiles
Direct sales (1)	Communication and marketing and adminsitration	Ability to effectively use social media platforms and digital communication tools for marketing and customer engagement. Skills required to handle legal and administrative tasks, particularly for responding to public tenders and complying with regulations	**Agricultural and horticultural worker:** A clear mention to ability to product packaging (labelling, packaging techniques, using materials economically, applying storage guidelines, handling gestures and postures, ..) + ability to prepare orders (read shipping notes, handling gestures, collects products..) **Agricultural manager** : covers broader safety, hygiene and environmental practices that are relevant across various industries (QHSE procedures , quality, hygiene safety and environment) but no specific focus on food safety.
Diversification (1)	Versatility	Ability to adapt to various tasks and roles within the farm,.	

(1) Forem, (2022 Anticipation des besoins en compétences et formations dans la chaine de valeur agro-alimentaire).

Focus on informal learning pathways

Informal learning particularly dominant

- Despite the numerous formal training programs, **informal learning is very important** here because agricultural workers place greater trust in it. 80% of farmers come from agricultural backgrounds and acquire their skills informally, primary within their families[1]
- Knowledge is shared **through formal groups and informal exchange networks**[1][2] which help spread climate-friendly innovations and promote sustainable production, as farmers tend to trust their peers over external advisors.

Formal learning

- Numerous training programs exist, ranging from initial education to continuous professional development, along with advisory services.
- As agricultural models diversify and innovation accelerates , **lifelong learning becomes essential** for agricultural workers. However, compared to other sectors, agricultural workers tend to have **lower levels of formal education despite the increasing demand for higher skills and qualifications** [1] Those with a higher level of initial education are more inclined to engage in continuous training throughout their careers, which is crucial for adapting to the evolving demands of the sector

Support for institutions

- Advisory bodies (research institutes, agricultural chambers, unions, etc.) play a crucial role in supporting the low-carbon transition[1]

(1) Ministère de agriculture et de alimentation (2019). Actif'Agri : Transformations des emplois et des activités en agriculture
(2) Forem (2022). Anticipation des besoins en competences et formations dans la chaine de valeur agro-alimentaire – de la fourche à la fourchette

Policy considerations

Expand access to tailored training programs

- Formal training programs should provide essential technical skills and support diversification through short, seasonal, practical, and accessible formats. Sectoral funds are vital for their development and financing, addressing the needs of both workers and employers.

- Agricultural advisors also require specialized training to offer tailored, farm-specific guidance, ensuring precise assessments and targeted improvements for the sector's transition. An example of this approach is the ‘KLIMREK’ initiative, coordinated by ILVO, Boerenbond, and VITO.

- Provide ongoing training for stakeholders in agro-industrial sectors, distribution, and public actors to ensure that everyone involved in the food value chain is equipped with the knowledge and skills required for a sustainable agricultural transition.

Leverage informal learning pathways

- Informal learning is central to agriculture, as most workers acquire their skills through family or community networks and tend to trust their peers more than formal educators. Strengthening these channels through mentorship programs, cooperative initiatives, and community-based learning will ensure that skill development aligns with the sector's practical realities and fosters trust among participants.

Facilitate access to knowledge, skills, and expertise

- Encourage the development of cooperatives and employer groupings to pool resources, skills, and knowledge. Such structures facilitate collaboration across the value chain, from production to processing and sales, reducing costs and fostering sustainable, diversified business models.

Annexes

The weight of the value chain stages varies by product, but agriculture always has the largest emissions impact

Products	Carbon footprint (kgCO2eq/kg) (1)	Agriculture impact on PEF(2)	Transformation impact on PEF	Packaging impact on PEF	Transport impact on PEF	Distribution impact on PEF
Potato	0,4	43%	0%	25%	27%	5%
Tomato	0,7	67%	0%	0%	26%	4%
Stuffed tomato	4,2	75%	15%	5%	3%	2%
Raw chicken	5,5	83%	11%	3%	3%	1%
Raw ham	13,9	83%	15%	0%	1%	0%
Raw beef	27,3	97%	0%	1%	1%	0%
Braised beef	34,3	97%	0%	1%	1%	0%

Agriculture
- [40% - 70%] for raw vegetables and fruits(1)
- 80% raw chicken and ham
- 97% beef (raw and processed)

Transformation:
- [10% - 15%] for processed products (except for red meat)

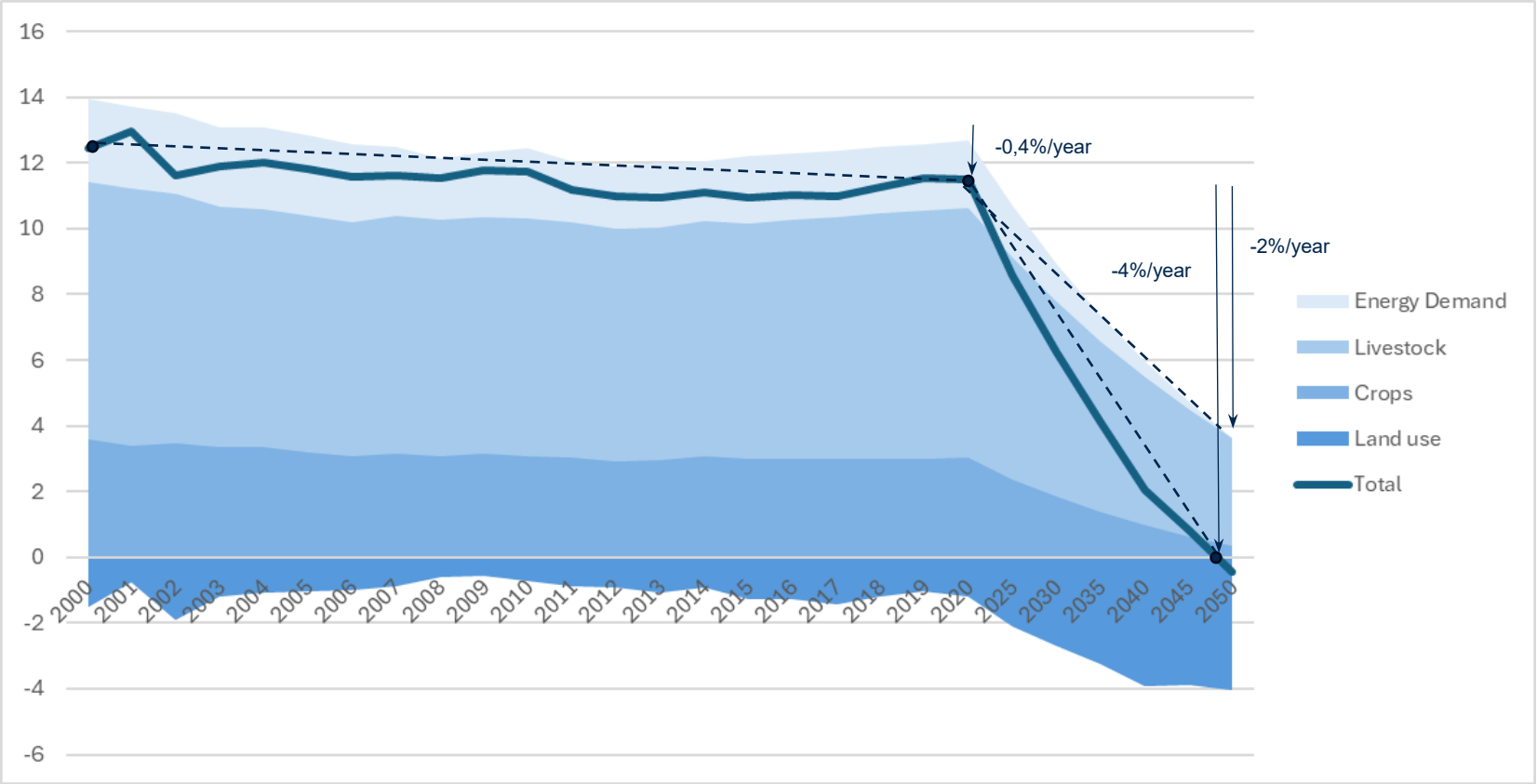
Packaging:
- [1% - 5%] depending on the processing footprint

Transport:
- [1% - 5%] depending on the processing footprint (or 25% for raw vegetables)

(1) All data can be found in the Ademe database *Agribalyse*.
(2) Product Environmental footprint, agrégation of 16 criteria on environment.

In the future, the maximum reduction reachable is -70% of the GHG emissions (with the CORE-95 scenario)

Projected evolution of GHG emissions and sequestration in MtCO2e per agriculture subsector (2000 – 2050) in the Core-95 scenario



Source: Core-95 in Scenarios for a climate neutral Belgium by 2050, FPS Public Health (2021)

- According to the Core-95 scenario, **net-zero is not achievable in 2050**, but a reduction of 75% compared to 2020 emissions is proposed, implying a rate of -2%/year. Livestock remains the main source, increasing to 90% of emissions.
- **Natural sequestration** from land use could allow the sector to decarbonise after 2024, contributing to a rate of -4%/year.
- This is a **huge challenge** as agricultural emissions have only decreased by 0.3%/year over the last 2 decades.
- Moreover, there have been significant **fluctuations** over the last 2 decades and even increases in the intervening years.

Yearly decrease calculated with CAGR formula.

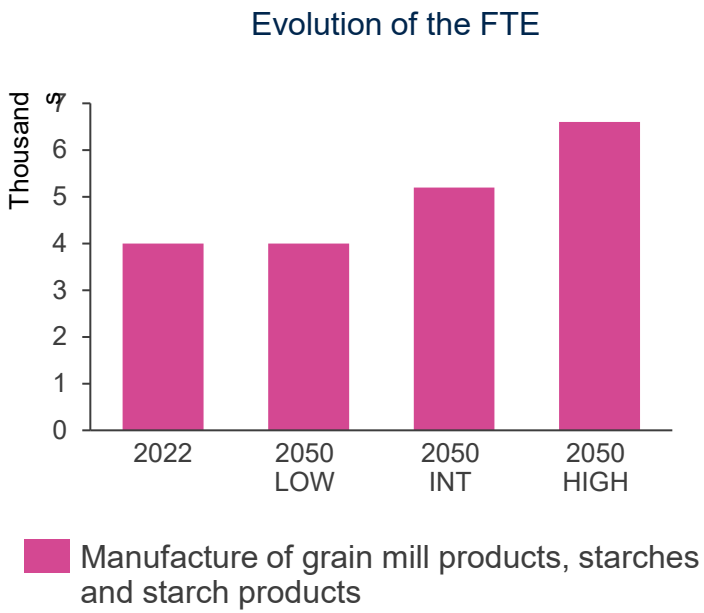
The “LOW” scenario corresponds to a minimal evolution of the sector’s, mainly driven by energy use decarbonisation rather than practices evolution

Volume	• **General decline in agricultural jobs (harvesting),** following the trend, with farms smaller farms being bought by big farms getting bigger • Agricultural support jobs (including field preparation, crop treatment, irrigation, etc.) have seen an increase over the last ten years (but are still in the minority) • Volume is an issue, given the **ageing population** of farmers, and the **quality of jobs** and **the low status** of the profession, which is preventing a new generation of farmers from coming on board
Content	• **Pesticides** and nitrogenous chemical **fertilisers** remain widely used, with the use of technology (mechanisation) making farmers dependent on energy (fossil fuels) and inputs. Farmers' costs follow **market prices** (inflation, economic and geopolitical crises). • **Soils are becoming even poorer**, reducing crop yields and having an impact on climate change, biodiversity, nitrogen and phosphorus cycles as well as water cycles. Farming is a profession that is disconnected from the soil and the environment. • The race for the **largest farmland** area continues, based on CAP subsidies. • The **administrative burden** remains a very high proportion of the work, in order to meet European standards that have been rendered incoherent in the face of international trade in products that do not correspond to these standards (inequality and incoherence).
Quality	• Very **intensive work**, with one full-time shift equivalent to almost 7 days' work. Extremely physical work, despite the machines. • Significant stress due to **low income**, many farmers are unable to pay themselves a salary - they only pay back their expenses and loans. • **Administrative burden** increases pressure and stress on farmers. • **Devaluation** by the rest of society, through the income granted to farmers, in particular due to the high margins paid to suppliers on the sale of products. • **Disinterest** among young people in the quality of employment, due to the pressure imposed by standards. • The economy and the cost of production have been skewed by large CAP subsidies, also **devaluing** the work of farmers.

The “HIGH” scenario corresponds to an ambitious evolution of the sector’s, mainly driven by practices evolution

Volume	• A sharp increase in the number of peasants: farmers working on small plots of land, growing crops and raising livestock (mixed crops and animals), using very little machinery but accessible non-mechanised tools, and using natural fertilisers. • Sharp decline in the number of farmers growing intensive monocultures. • Sharp drop in the number of farmers working in intensive livestock farming. • Decrease in agricultural support activities, as on-farm activities diversify. Or an increase in FTE support staff, working locally on farms.
Content	• Increased production support activities on the farm itself: manure management, production of natural green manures on the farm, crop mixes (protecting crops from other species, fixing atmospheric nitrogen, shade, retaining water in the soil, etc.) • Increased processing and commercial activities on the farm: this allows us to take the edge off the big processing industries and suppliers directly on the farm, guaranteeing local, quality food (and a revaluation of farmers' work).
Quality	• Better general quality of the job of farmer because the intensity is reduced (more FTE on a smaller plot), and the relationship with the soil and the environment is evolving towards better understanding and better care (disappearance of farmers' dissonance). • Better income, much less dependence on fossil fuels and market prices. • Better contact with consumers (who are more aware of the hardships of the profession), more recognition. • The economy recognises the true cost of production.

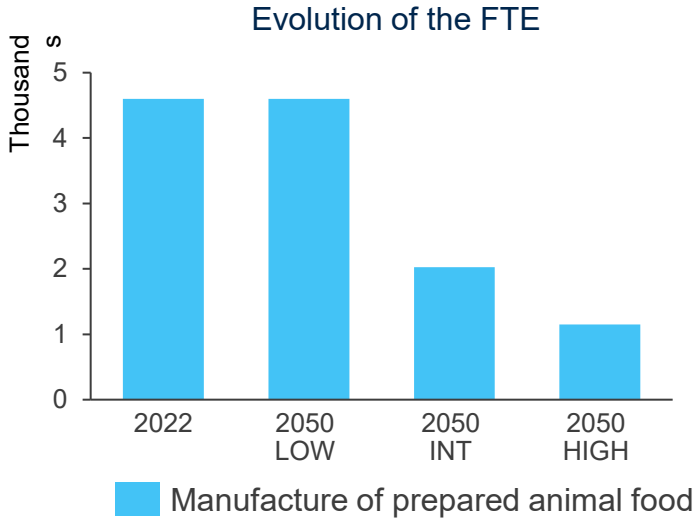
Diet changes may impact jobs in grain mill and starch production, but likely will not affect total food industry employment



Key take aways

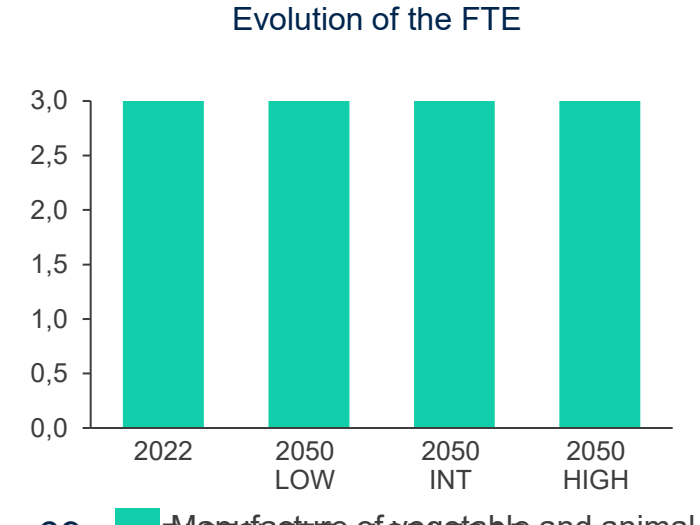
- **Employment in this sector could increase by up to 2.600 (65% for the high transformation scenario**). This estimate is based on a projected increase in demand, with the consumption of bread, pasta, rice, other cereals, and legumes expected to rise from 190 g/day to 350 g/day, alongside a decrease in the consumption of processed products. Currently, nearly 95% of this consumption is processed, and it is anticipated that 75% of the additional consumption will also be processed.
- **A moderate change of 30% in the number of jobs is estimated under the intermediate transformation scenario, where the population's diet (both domestic and international) does not shift as significantly as in the high transformation scenario**. In contrast, minimal changes in employment are expected under the low transformation scenario, where there is little alteration in the population's diet (LOW).
- **This subsector is not critical to the Belgian food industry, as it accounts for only 4% of its total employment.**
- No change in the export-to-domestic supply ratio is considered in the model, which presents an opportunity for improvement.
- Questions raised by the assumptions and results:
  - What is the share of exports versus domestic consumption?
  - What is the number of full-time equivalent (FTE) employees in each subsector (NACE 4 code)?

The production of animal feed should be affected in the same way as the meat processing industry, while the production of edible oils should not be affected.



Key take aways

- **A 75% reduction in employment in the sub-sector could occur in the case of a high transformation of the food industry.** It is estimated that this sub-sector is following the same trend as meat processing and preservation.
- An even greater reduction could be estimated, as a greater proportion of animal feed could be produced on farms with the generalisation of agro-ecological practices.



Key take aways

- **It is estimated that there will be no change in the number of jobs in the animal and vegetable oils and fats manufacturing industry**, as job losses in the production of animal fats could be offset by job gains in the production of vegetable fats.