



Project acronym: SURE-Farm

Project no.: 727520

Start date of project: June 2017

Duration: 4 years

D3.5 Report on future farm demographics and structural change in selected regions of the EU

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Due date	29/02/2020
Version/Date	Final
Work Package	3
Task	T3.2
Task lead	IAMO
Dissemination level	Public



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1 Introduction

Farm structural change and farm succession are areas of focus amongst European agricultural stakeholders. European farm structures have been undergoing large changes in relatively short periods of time (Bijttebier et al., 2018; Coopmans et al., 2019). Between 2005 and 2016 approximately a fourth of European farms closed (Eurostat, 2019). However, the amount of land being farmed remains stable, meaning a simultaneous increase in the size of remaining farms. In addition to the amount of land remaining stable, European agriculture remains diverse across countries. There are many reasons why the number of farms has decreased such as, volatile prices resulting in low profits, land security, the opportunity to earn more elsewhere, and lack of successor (Coopmans et al., 2019).

This report will focus on the effects farm demographics, specifically farm succession, have on farm structural change, specifically the presence of a successor. It will do so using a mixed methods approach to first understand the demographic change in two European farming regions, the Altmark (Germany) and Flanders (Belgium) with focus groups. Based on information from the focus groups and empirical data, we simulate two scenarios in each region using the agent-based model the Agricultural Policy Simulator (AgriPoliS). The scenarios use the demographics extension, which allows the calibration of the model region's farmer age and succession demographics, detailed in SURE-Farm Deliverable 3.4 (Pitson et al., 2019). One scenario is calibrated to empirical data with an EU-based estimation of successor likelihood (European Commission, 2017), and the other which simulates 100% successor likelihood. The simulations are then analyzed with various farm structure indicators to see what effect farm demographics have on farm structures.

2 Methodology

We apply a mixed-methods approach, a combination of both qualitative and quantitative methods, of focus groups and agent-based modelling. The focus groups served as a basis to first understand the demographic situation of each case study region and to adapt the model based on the outcomes. The model allows simulations and projections of future farm demographics and structural change.

2.1 Focus Groups

At the time of the research, autumn 2018, the regions lacked qualitative data which could provide insight into the regional demographic trends and farm labour demands. In order to understand the unique circumstances each region faced with regard to demographic change and its impacts on farming, and to support the implementation of the regions into the model



AgriPoliS, focus groups were employed. The purpose of the focus groups was to understand what was driving the demographic and farm structural change in the region as well as how the changes affect the farm labour.

Focus groups are proven to be a suitable method to provide breadth and depth of information on topics when there is minimal information (Stewart & Shamdasani, 1990) as well as when there are limited resources (Acocella, 2012). In addition to satisfying research constraints, focus groups provide the benefit of the additional information generated through the participants' interactions. Researchers claim the interactions amongst participants foster an environment where participants are more reflective and revealing of information than in an interview with a researcher, whose frame of reference is different than the participants' (Morrison et al., 2001). In opposition to other methods, where generalization is the goal, focus groups seek to grasp the range of responses from participants (Krueger, 2014).

In each region, a focus group workshop was held between November – December 2018. The number of participants varied, but the organizers in each region selected participants based on their expertise of the farming region and topic. In order to minimize one of the main weaknesses of focus groups, the possibility of group think or influence, the moderator prompted participants to write responses to several questions on cards. The cards were then organized and hung up and used as a basis for discussion. By participants writing their initial impressions of each topic before discussing it amongst one another, researchers can capture the breadth of responses even if group influence occurs in the discussion. The moderator in Flanders found the writing to impede the flow and thus altered the approach after the first topic; detailed in the Flanders section. The workshops consisted of four topics; drivers of demographic and structural change, unqualified labour, qualified labour, and management. In Belgium there were additional topics selected by the respondents detailed below in section 4.1. Each topic was a separate discussion, detailed in the summary sections below, and planned to last approximately one hour. For more information on the prompts and the methods of the focus groups, see the focus group script in the appendix.

2.2 Agent-based modelling

Agent-based modelling is a method of computational modelling, used across disciplines, where the actors are autonomous agents and interact with one another within a system based on a set of rules. Agent-based modelling can be called a bottom-up approach, whereby the system is created by the individual agents and their decisions. A unique characteristic of agent-based models that results from the agents' heterogeneous interactions is their ability to capture emergent phenomena, which are otherwise difficult to predict.



The Agricultural Policy Simulator (AgriPoliS) is an agent-based model which simulates farm structural change and the effects of agricultural policies or shocks in specific European farming regions. In AgriPoliS, the heterogeneous agents are the typical farms of a region, scaled up based on the farm structural data, and interact and compete with one another on market, predominantly the land market. At initialization, each agent receives an age, managerial ability, investments, and the location of the farm and its plots. The myopic agents make decisions with the goal of maximizing their household income or profits. Figure 1 displays the agent's decision-making process in AgriPoliS. A full model description is available in the form of an ODD Protocol in Sahrbacher et al. (2012).



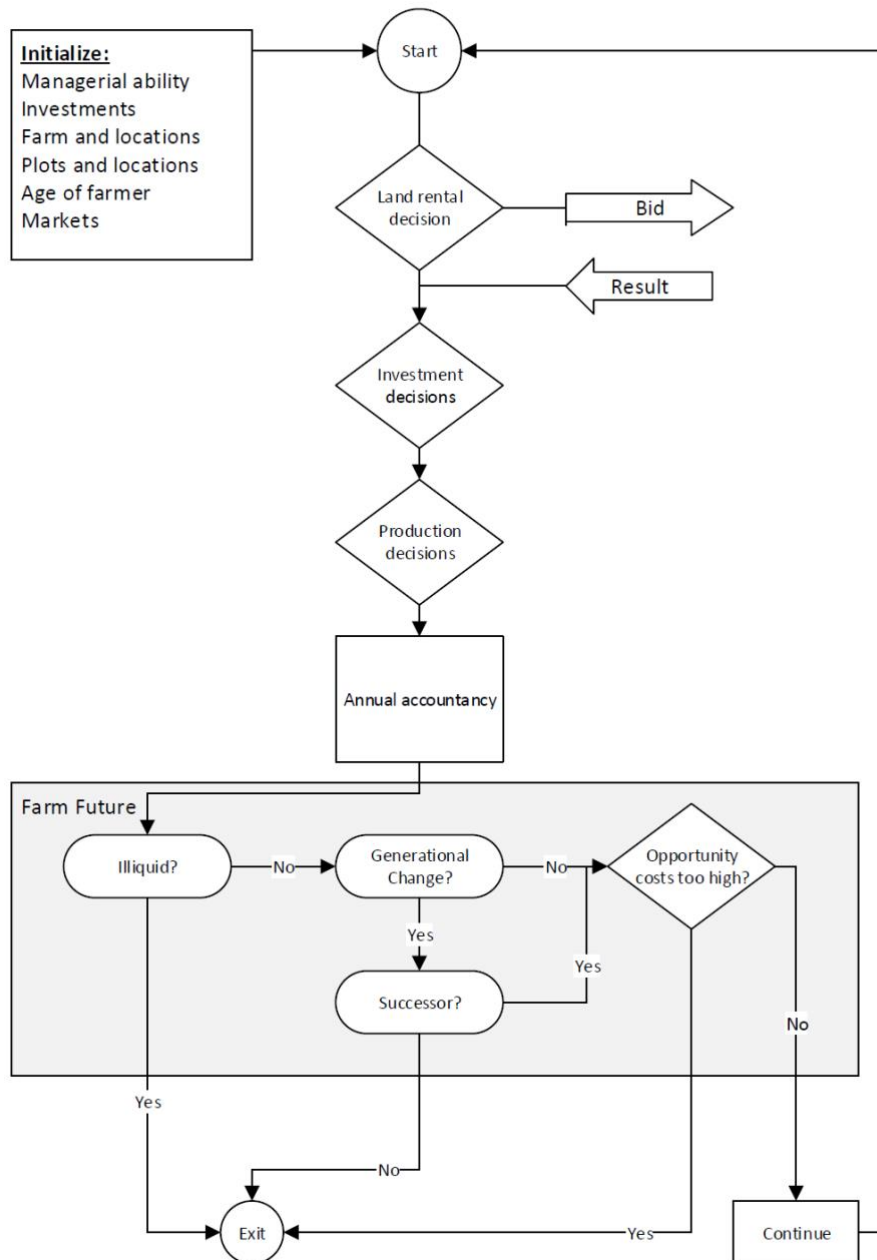


Figure 1 AgriPoliS agent decision making tree



3 The Altmark, Germany

The Altmark is an agricultural region located in the eastern German state of Saxony-Anhalt. It is comprised of two NUTS 3 regions; Stendal and Altmarkkreis Salzwedel. The region is characterized by the very large corporate farms from the former East German co-operatives, which farm ~45% of the land. Additionally, there are many family farms and partnership farms, which make up ~90% of total farms. The scale of farms in the region is generally large in comparison to that of western Germany due to the historical developments between East and Germany in the 50s and 60s. These developments left lasting impacts on the agriculture structure in the region. Despite the large-scale farming, the region is known for relatively low soil quality, resulting in low yields. The high share of grassland, ~27%, has enabled the Altmark to be one of the main milk-producing regions in north-east Germany. Dairy cows are typically in herds from 100 to over 500 cows. Despite farms being heterogeneous in size, production, and legal form, they depend greatly on permanent hired labour.

3.1 Focus group summary – The Altmark

The focus group in the Altmark followed the planned structure with minor deviations. The four participants ranged from family farmers to corporate farm manager to ministry employee. There was also a spread of representation of age, and gender. All participants were from the region and held a stake in farm succession. The following sections summarize the discussion of the topics.

3.1.1 Drivers of Demographic Change – The Altmark

Summary:

The participants were asked to first write down three drivers of demographic change in the Altmark. Their responses were poor infrastructure, lack of non-agricultural (highly paid) jobs, labour emigration in 90s, lack of social and cultural activities, low remuneration in agricultural, and high demands on a farm successor.

In the discussion, the participants elaborated on why they perceived their written responses to be the strongest drivers, in what way these drivers affect the region, as well as the interlinkages between drivers. Generally, the rural areas lack high-paying jobs, including agriculture. The poor infrastructure then increases the burden on commuting to the nearest city where there are higher paying jobs.

The participants stated different examples of how young teenagers who are thinking about where they will live and what they will do in a few years currently have negative associations with agriculture, that it is poorly paid. Additionally, agriculture cannot offer what other

industries offer – stable working hours, flexible work times, working remotely. The young farmer stated that when students first go into these jobs during or directly after their university time, it is less likely that they will return to the farm where the pay and benefits are lower.

The farmers in the group emphasized several times throughout the discussion that they are not able to increase the pay. They are not under-paying their employees given what the businesses earn, but it nonetheless makes the sector unattractive. Given that agriculture is a main source of employment in the rural areas, the unattractiveness of agriculture is directly linked to the region's changing demographic situation.

The combination of the unattractiveness of agriculture, lack of well paid jobs, and poor infrastructure has had a knock on effect to the overall quality of life in the rural area. The decreasing population has resulted in fewer cultural offerings as well as fewer services. For example, the nearest cinema is 50 km away and there is a shortage of doctors. This discourages young families from setting up a life in the region and entices others who are there to leave.

While there was much agreement amongst participants, as seen from their initial reactions on the cards, there was some disagreement about whether agriculture was low paying and for whom. The main point of disagreement was whether 8 euros an hour is attractive to migrant workers, but not to Germans. For migrant workers, the same work in their home country would be paid 2 euros an hour, so the German wages are desirable. For Germans, agricultural work is highly demanding and compared to other jobs with such demands, workers receive a lower compensation.

3.1.2 Unqualified labour

When introduced to the topic “unqualified labour” the participants discussed the definition and choose to redefine it. Unqualified labour was then defined without livestock care, like milking. A milker would need to be trained and qualified to make judgements on animal health. Whereas for the participants, unqualified labour could be any able bodied person without any agricultural knowledge. Given the agreed upon irrelevance of unqualified labour in the region, there was a deviation from the writing portion of the task, where the discussion began after the second question.

Summary:

The participants were asked to respond on cards to the questions “to what extent does an ability to find or maintain unqualified labour affect the region?” and “how does it affect the region?” The participants stated that there is no problem finding and or maintaining unqualified labour in the region, and that unqualified labour does not affect farming in the region.

As with the cards, the discussion was rather homogenous. The discussion allowed the participants to explain why they find unqualified labour irrelevant in the region. Although the farms in the Altmark are generally large, there is never enough work for an unqualified worker to hire that person full time. Participants stated it would be impractical to share one labourer across several farms. Because the majority of farms are arable farms or livestock farms, there is minimal demand for unskilled labour. Even in the harvest season when there is a labour shortage because a person has to be fairly qualified to drive the tractors which are operating in the region. The license alone is a costly investment. Overall, unskilled labour is only demanded on farms which produce asparagus, and they are few in number regionally.

3.1.3 Qualified Labour

The focus group on qualified labour was done without deviation from the moderation guide.

Summary:

To the question “to what extent does the availability of skilled labour affect agriculture in the region?” the participants responded that the region is largely affected. The lack of qualified labour causes changes in farm organization, unfilled jobs, drop in efficiency on farms resulting in lost profits, and a decrease in the quality of work. In response to the shortage of skilled labour the participants are changing the focus of the farm to require less labour (from livestock to crops), looking to recruit workers earlier, investing long-term in trainees, investing in technological labour substitution, and training trainees. The participants suggested that collaborating with schools would improve the availability of qualified farm labour.

The discussion around qualified labour emphasized the shortage and its effect on the region, but the participants differed in the extent to which they think action should be taken.

All participants discussed the need to improve agriculture’s image starting in the schools. Echoing the previous discussion, the participants agreed that if kids were not interested in agriculture, then they would not pursue it as a career. This triggered a discussion on the difference in education currently compared to in the German Democratic Republic (GDR). During the GDR, every child would learn and become connected to agriculture. It was part of the mandatory curriculum. One participant was critical of interventions further than improving agricultural education. They perceived the policy interventions as catering to farmers who were not business-savvy.

A point of contention was with regard to the availability and quality of skilled labour in general. One participant thought that if farms lacked quality qualified labour, the issue was the farm’s motivation in ensuring that they procured quality workers, not lack of people. Other participants



disagreed and one cited the overall downward trend in the number of applications their farm received for traineeships over the past 10 years. They stated that for them, the fact that there is no one interested is the problem. They agreed that the lower quality of work has to do with training the personal motivation of the worker.

The discussion revealed a consideration about labour unique to eastern Germany's sudden transition from a planned to market economy. Unlike other areas, where there is a distribution of farmers' ages, most of the farmers who managed or set up their own farms after reunification were in their 40s. This has led to a situation where there is not a staggering of farm managers reaching retirement, rather they will simultaneously hit retirement age in the coming years, putting more pressure on farms to secure qualified labour to tap as potential managers. The pressure the labour shortage is causing has the large farms turning to labour substituting technology.

3.1.4 Management

On the topic of management, there were no deviations from the planned structure.

Summary:

During the written portion of the focus group, the diversity of opinions revealed itself. In response to the question, "to what extent does the availability of management affect agriculture in the region?" participants' opinions varied between it highly affects the region to it has a minimal effect on the region. The ways in which lack of management affects farming in the region is the opportunity for internships for students, it affects business management, forces changes in business specialty, and creates a live or die situation. In order to improve the availability of managers in the region, the participants think that farms ought to work together with government agencies, increase advertising for highly skilled workers, train their current workers in management roles, as well as change direction of specialization. One participant stated that nothing needed to be done, and if there was not a manager, then the farm should exit production.

The discussion on management emphasized the difference between what having a manager meant for a family for versus a corporate farm. For a family farm, when there is no one in the family interested in managing, the farming cycle stops, the land will be sold and or rented out, but will be farmed. The retired family farmer found this fine, and emphasized their view that in no other industry do politicians attempt to delay structural change to the extent they do in agriculture. The main shortage that family farmers feel is the shortage of qualified labour.



For corporate farms, the question is not whether there is a family member willing to be the successor, but rather if there is a person capable of taking over the management of the farm. For corporate farmers, the pressure of not only finding qualified labour but a potential managerial successor is growing. The corporate farmer stated that farms need to be more proactive in the school age. By the time a young person is in university, they have already decided whether they will work on a farm or not, so there is little chance of recruiting from there. Farms need to increase their connections and public relations to make themselves known.

Both for family farmers and corporate farmers, the need for planning security was emphasized. They expect assistance from the political side in the form of security or reassurance. It is difficult for a person to take on a business worth millions, and to invest great sums, when from the political side there is considerable volatility in policies.

3.2 The Altmark in AgriPoliS

The implementation of the Altmark into AgriPoliS and how the workshops informed model adaptations is documented in SURE-Farm Deliverable 3.4 (Pitson et al., 2019). Through the upscaling process documented by Sahrbacher (2008), the model version of the Altmark consists of 19 heterogeneous farms which are typical to the region. The first column, “statistics” consists of the farm structural statistics of the Altmark. The following column, “adjusted” removes the farms in the region which are run as hobbies and not as businesses, and therefore make them unsuitable to model in AgriPoliS. The sum of the 19 farms and their frequency of appearance in the model region are shown in the third column, “upscaled,” in table 1 of the Altmark’s structural data. The final column, “deviations” calculates the deviation between the “adjusted” column – the structural data of the region – and the “upscaled” column, which are the characteristics of the region in AgriPoliS.



Table 1: The Altmark in AgriPoliS structural data

	Statistics	Adjusted	Upscaled	Deviations in % (from adjusted to upscaled)
Number of Farms	1080	933	928	-0.536
Farm by Farm Type				
Arable crop	461	383	384	0.261
Grazing animals	364	271	268	-1.11
Granivore	43	18	18	0
Mixed	212	261	258	-1.15
Farms by Legal Form				
Corporate	142	142	150	5.63
Family Farms	938	791	778	-1.64
Agriculturally Used Area (UAA)	273694	272935	272135	-0.293
UAA by Land Type				
Arable land	203342	203120	197677	-2.68
Grassland	70352	69815	74458	6.65
UAA by Farm Type				
Arable crop	94397	94191	95430	1.31
Grazing animals	70366	70097	69590	-0.652
Granivore	4102	4086	4120	0.832
Mixed	104829	104561	102995	-1.53
Farms by Land Size Group (from ... up to ... hectares)				
under 5	50	/	/	/
5 – 10	97	/	/	/
10 – 50	296	296	297	0.338
50 – 100	112	112	112	0
100 – 200	148	148	148	0
200 – 500	220	220	221	0.455
500 – 1000	99	99	94	-5.05
1000 or more	58	58	56	-3.45
Livestock (in livestock units)				
Dairy cows	44774	44702	44525	-0.396
Under 200	12102	12030	12040	1.54
200 to 500	17750	17750	17935	-0.113
500 or more	14922	14922	14580	-2.29
Cattle	55820	55820	55706	-0.321
Fattening pigs	11159	11159	11170	0.618
Sows	4556	4556	4565	0.307

3.4 Simulations

There are two scenarios; the “Empirical” scenario and the “100% Successor” scenario. The data in the Empirical scenario in the Altmark is calibrated to the 2013 Eurostat data, seen below in Table 3. The 100% Successor scenario has the same input with the exception of probability of a successor has increased for family farms from 75% to 100%. Additionally, there is no “farming without a successor” section as in the 100% scenario because all farms have a successor.

Table 2: The Altmark Demographic Calibration

Initialization:		
Family Farmer’s age	minimum: 30 years	maximum: 70 years
Corporate Farmer’s age	minimum: 30 years	maximum: 66 years
Family farmer age distribution	average: 51.5 years	standard deviation: 11.83
Corporate farmer age distribution	average: 50.1 years	standard deviation: 11.14
Generational Change:		
Age of generational change	67 years	
New farmer’s age	minimum: 30 years	maximum: 45 years
New farmer’s age distribution	average: 35 years	standard deviation: 1.5
Probability of a Successor:		
Family farms	75%	
Corporate farms	100%	
Farming without a Successor:		
Maximum age of farmer with no successor	75 years	
Productivity decrease past generational change age	1%	

3.4.1 Number of Farms

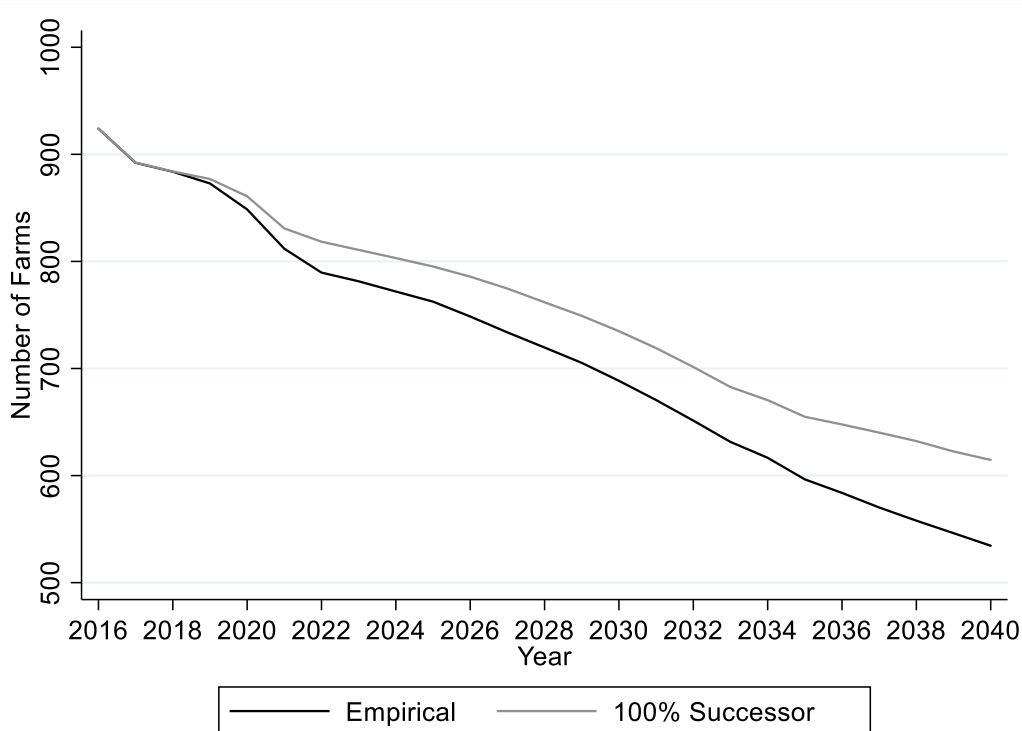


Figure 2: Number of farms overtime

In the Altmark, we observe a continuing decrease of the number of farms over time, regardless of whether there is a successor present or not. Figure 2 shows that overall there are more farms in the 100% Successor scenario, but the downward slope runs relatively parallel to that of the Empirical scenario.

Table 3: Farm operational status at iteration 10

	Operational status	Percentage of farms
Empirical	In operation	79.39
	Closed due to opportunity costs	9.77
	Closed due to opportunity costs at generational change	0.58
	Closed due to illiquidity	5.13
	Closed due to no successor at generational change	5.13
100% Successor	In operation	83.88
	Closed due to opportunity costs	10.76
	Closed due to opportunity costs at generational change	0
	Closed due to illiquidity	5.37



Table 4: Farm operational status at iteration 20

	Operational status	Percentage of farms
Empirical	In operation	61.56
	Closed due to opportunity costs	20.49
	Closed due to opportunity costs at generational change	2.06
	Closed due to illiquidity	5.82
	Closed due to no successor at generational change	10.06
100% Successor	In operation	69.28
	Closed due to opportunity costs	24.67
	Closed due to opportunity costs at generational change	0
	Closed due to illiquidity	6.05

Tables 3 and 4 provide the percentage of farms at the end of the 10th and 20th year which are in operation and the reasons why closed farms ceased to operate. At the end of each iteration, symbolic of one year, the farm calculates not only its yearly earnings against its debts to determine whether it will continue or close, but also its opportunity costs (see Figure 1).

We see that when a successor is present, there are more farms in operation at both iteration 10 and 20, as one would expect. However, the number of farms which closed due to lack of successor in the Empirical scenario, ~10%, is more than the additional farms still in operation in the 100% successor scenario, ~8%. This means that although there would be an increase in the number of farms in operation with the presence of a successor, a farm is not guaranteed to remain in operation with the presence of a successor. Interestingly, the driving reason behind farm closures in the Altmark is not a lack of a successor, rather closure due to opportunity costs. When farmers expect to earn more outside of agriculture and by renting their land, they close due to opportunity costs.



3.4.2 Farms by Size Class

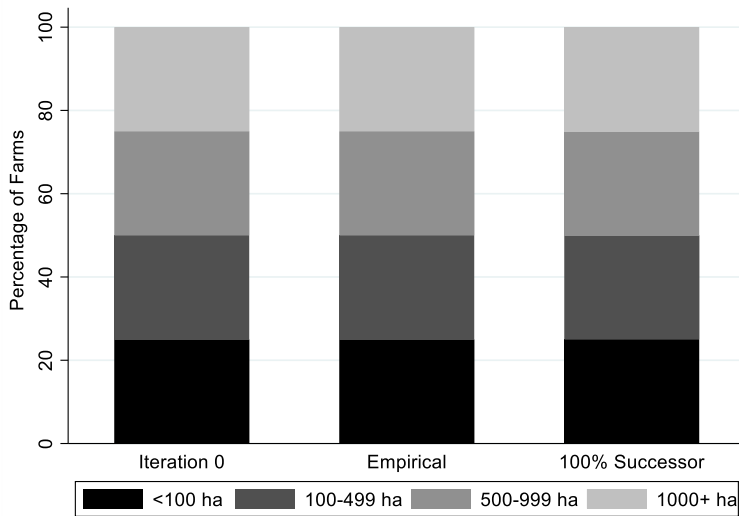


Figure 3: Farms by size class at iteration 10

The presence of a successor has no observable impact on the proportions of the size of farms in the region as seen in figure 3. The first column, Iteration 0, was added to compare the initial shares of farm size classes with those the two scenarios at iteration 10. There is also no observable difference in the share of farms between iteration 0 and 10 in either of the simulated scenarios. However, figure 4 shows that the very large farms, over 1000 ha, farm a larger share of the Altmark’s U.A.A. in iteration 10 in both scenarios than they do at iteration 0, while the medium sized farms, 100-500 ha, decrease their share of U.A.A..

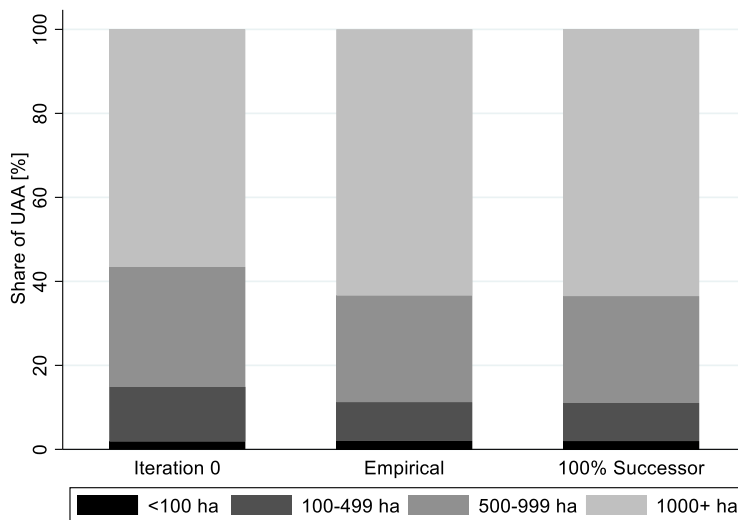


Figure 4 Share of UAA by size class iteration 10



3.4.3 Production Patterns

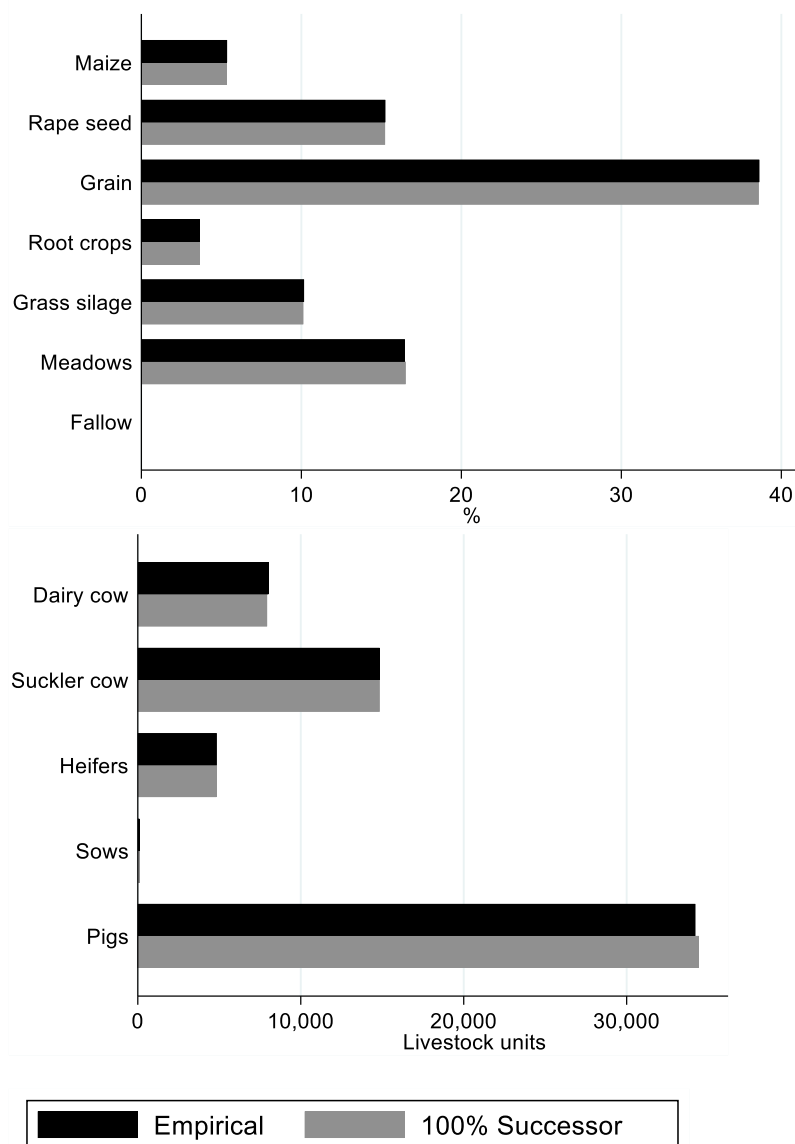


Figure 5: Production at iteration 10

Figure 5 shows the production patterns of the region. It demonstrates that the presence of a successor makes almost no difference in the region’s crop and livestock production.



5 Flanders, Belgium

Flanders, the Northern half of Belgium, is a densely populated area, making it a unique farming region in Europe where urban and rural spaces are highly connected. Due to the population density, only 46% of the area is used as agricultural land. The limited amount of land, increasing costs of farming in Europe and low prices has given rise to intensification, resulting in environmental problems. Flanders is facing issues with the quality of soil and water in addition to loss of biodiversity. Additionally, agriculture in Flanders is experiencing farm structural changes. The number of farms is decreasing while the average farm sizes increase. From 1990 to 2016 farm numbers decreased from 56,560 to 23,980. Through the size expansion the region has maintained its dominant family-farm model. The farm structural changes are expected to continue as average age of farmers in Belgium increases along with the share of farmers without a successor.

5.1 Workshop Summary

The workshop in Flanders deviated from the original plan by including topics with a focus broader than labour and farm demographics in order to better engage the stakeholders. In part, the planned topics, unqualified-, qualified-, and management level labour, are normally one person in Flanders due to their relatively smaller family farm structure. The workshop consisted of eight participants, four female and four male. Their backgrounds ranged from farmers, ministry employees, representatives of the farmers' organization, banker, researcher, and farm accountancy employees. The participants only utilized card responses in the first discussion of the drivers of demographic change. For the following topics, participants verbalized their responses and they were written on flip charts and then discussed. The organizers used the first topic, drivers of demographic changes, to select three additional topics to dive deeper into the planned labour topics.

5.1.1 Drivers of Demographic and structural Changes

The participants had much to say on this topic, and were therefore given more than the planned three cards each. Altogether there were 72 responses which were identified in the following clusters:

- Impact of institutional changes
- Image of farming
- Impact of globalization, markets and economic context
- Farmers have to be real entrepreneurs
- Impact of legislation and government
- Impact of agriculture on the environment, environmental concerns



- Impact of technology and investments
- Impact of family farming
- Impact of labour availability (both family as external labour)
- Impact of high land prices, legislation on land rent and land availability in general

The discussion circled around these clusters, with the exception of labour as this would extensively be discussed at a later stage of the focus group. Land availability, family farms, and investments are detailed in the following subsections as they were discussed separately.

Impact of institutional changes:

Succession is no longer a given, even if the farmer has children. Making the decision to take over the farm is a balanced decision. Being a farmer is a lifestyle, not comparable with most other jobs, with the exception of being self-employed.

Impact of the image of farming:

Some participants state that the public image of agriculture is deteriorating. Agriculture is often in the media being negatively portrayed. This demotivates both farmers and potential successors. However, not all participants agreed on the agriculture having a bad image in general and that it drives farm change. This difference in opinion might be caused by the fact that the image of not agriculture in general but rather livestock production is under scrutiny.

Impact of globalization, markets and economic context:

Price volatility has an impact on structural change of farms; both in times of crisis and in times of prosperity investments and scale enlargement decisions are made. Farmers have to adjust to price volatility. When prices are low and transformation is not possible, the answer is often scale enlargement. Additionally when prices are high farmers invest. The participants believe that this is when farmers should build financial reserves.

Impact of legislation and government:

Participants mentioned the conflicting messages sent by government. For example, they partially subsidize promotion campaigns for meat consumption, while simultaneously advising consumers to limit their meat consumption.

Impact of agriculture on the environment, environmental concerns:

It's becoming more difficult to receive authorization for scale enlargement or building new stables.

Impact of technology and investments:

Agricultural products do not follow inflation, although costs of production do. Scale enlargement



and improving production efficiency (per animal unit, per ha, per labour unit) are the answers on many farms to increase profit margins. To be able to run these growing farms, farmers have to invest in technology to produce as efficient as possible while limiting labour input. At the same time, only farms which are large and profitable enough to repay the cost of investments have the opportunity to invest. Participants acknowledged the close link between scale enlargement and technology although it was undecided whether technology results in scale enlargement or whether it's the other way around. As investments are often very big, farmers often repay the bank over 20 years. This has a large impact on flexibility.

Impact of family farming:

Family farms are perceived as a strength, mainly because family members offer flexible labour support. However, problems might arise when two generations work together on the farm and income for both generations needs to be generated. In Flanders the opportunities to increase farm size by investing in land are scarce, so farming families need to search for alternative strategies to increase farm income (such as on-farm processing). Additionally they need to take into account how they will continue when parents are no longer contributing their labour. As farms are often capital intensive, taking over the farm is not easy, especially if the farmer has several children and the land needs to be divided among siblings. The solution is seen in the rise of partnership farms.

Impact of high land prices and land availability in general:

Average price of land is around 50,000 to 55,000 euros per ha, but there is a lot of variation between regions. There is a lot of competition to buy land, and investors often buy multiple hectares of land at lower prices. But farmers themselves also pay very high prices, as an investment for the next generation. The investment in land can never be compensated by revenues from agricultural production during one generation. Although the participants all agree on the fact that land prices are too high, they are not convinced to the extent to which these prices have an impact on succession. Agricultural land is often used for other purposes than agricultural production. Renting land to farmers by investors does not result in high revenues as rental prices are low.

Points of consensus and disagreement:

In general, there were no strong points of disagreement. There was some discussion on the image of the agricultural sector. Some perceived it as negative, while others stated that this was not as bad as presented by some of the participants. There was often discussion on the actual driving impact of different topics. Although land prices were scored as highly influential, the participants were not unanimously convinced of the impact of land prices' on farm demographic change in general. They discussed how in countries where land prices are much lower, they also



have a generational renewal problem. Young farmers need to be better educated to be able to run the farm, but questioned whether highly educated potential successors not more stimulated to look for a job outside farming.

The group agreed that scoring the drivers separately is difficult, as it is often their co-existence that drives farm demographic change.

5.1.2 Unqualified Labour

Availability of unskilled labour is relevant to the production and season. Contract work for land activities is sufficiently available. But for other activities (grabbing broilers e.g.), farmers need temporary external labour force. Instances when family labour force is insufficient are rare. However, when farms do need external labour it is difficult for a single farm to attract labour because farms are unable to provide a full time contract. A solution for this is to establish a cooperation of employers (multiple farmers) sharing one full-time labour force. One participant knows one example in Flanders. But this was not easy to set up both on the legal and organizational levels.

The horticultural sector attracts most external labour force (seasonal contracts). Often, this work is done by immigrants. The participants did not view a quantity shortage rather a quality shortage amongst unqualified labour. Some of the problems stem from differences in language and cultures. In Flanders, standards for animal welfare are very high. This might not be shared by immigrants. In addition, there is a shift in origin of the immigrants. As some years ago, mainly Polish people dominated, whereas nowadays, the share of immigrants from Ukraine is rising. Flemish people are difficult to attract. This is both a matter of culture and mentality due to low wages in agriculture. Participants suggest this might be partially solved by providing fiscal instruments or advantages.

5.1.3 Qualified Labour

Educational level and agricultural skills of farmers in general are good and continue to improve. However, these skills need to be developed continuously by attending farmers discussion groups, formation, farm visits, seminars, and so on. As farms are getting bigger, farmers have often less time for these initiatives. They are either too busy to leave the farm or, alternatively proposed is, that the farmers' time management is not adequate. There is significant variability in management skills between farmers, resulting in very large differences in performance, thus income.

Some participants think that parts of the agricultural trainings need to emphasize the economic and financial aspects of farming. Farmers have to put a lot of effort in farm accountancy and administrative tasks. They often do not like this task, because they are not capable of



interpreting economic figures. They are not fully aware of the added value for the business-side. An accountant can be employed, but at least a basic level of knowledge is needed. Farmers need to put effort in interpretation of economic figures.

5.1.4 Management

Participants stated that management capacities are highly important for a farmer to achieve good technical and economic results. The income gap between farms with the highest income and those with the lowest income is sizeable. Managerial capacities of the farmers play a major role and explain a substantial part of this income gap.

According to the participants, farmers do not invest sufficient time in understanding the financial side of their operations. Many farmers do not know the cost of production (per ha potatoes, liter of milk). They are not aware of the importance of the economics of production, such as bargaining power, which can make a large difference. Often, larger farms obtain better conditions. Small farms can work together to buy inputs collectively, thereby receiving a reduction in price. This already occurs but not enough, according to the respondents.

Although participants believe that managerial capacities are insufficient on many farms, they do believe there are enough opportunities to acquire more managerial skills. There is a wide spectrum of activities, but the share of farmers attending these activities is too low. Farmers who do not see a return on their investment in the short term drop out of these educational activities. Some farmers are convinced that they can find everything on the internet. This has negatively affected the opportunities to build networks and contact between farmers, which are very important. More and more initiatives for education see the opportunity to network before, during or, after the event. Participants suggest a free drink or bite might additionally attract some farmers to participate in the events.

There is a difference between generations. During educational activities, the share of young farmers is quite high. Young farmers are incentivized to work on their management capacities. In order to gain additional financial support they have to follow a course for starters and/or obtain an agricultural education. They are supported by advisors making an entrepreneurial plan, describing strengths of the farm but also some points of attention.

5.1.5 Land availability

Land is a major cost for a potential successor, which might hamper generational renewal. One part of the discussion dealt with this issue of land and its transfer. With regard to non-agricultural companies purchasing agricultural land, one participant asked why land is never included in the legal business part of the farm, if there is one. Land cannot be amortized.



Moreover, if land is transferred from the company to private capital, one must pay taxes on added value of the land sold.

There was an additional discussion on the legal structure of different companies. One participant was convinced that some farmers would be better off, from economic perspective, with another kind of legal structure. The legal structure of the company is linked to the legislation on land rent. Some legal structures (Landbouwenootschap – Agricultural Partnerships) allow that the contract on land rent is retained during generational renewal, and other legal structures do not.

Another part of the discussion focused on legislation on land rent, and mainly on the issue of ‘pension farmers’. Many retired farmers are still counted as active farmers, and therefore receiving premiums, although a contract worker does all the land work. Moreover, there is a large gap between the prices that a land owner usually receives for long term rent (500€/ha) compared to what they receive for seasonal rent (1500€/ha). Both retired farmers and land owners prefer to rent out their land to other farmers as seasonal rent. This has an impact on the types of crops that are cultivated on these parcels. Only cash crops, e.g. potatoes, provide sufficient revenues to justify the high cost for seasonal rent. Participants are concerned about how this behavior additionally negatively affects soil quality. A participant believes that farmers older than 65 should no longer be acknowledged as active farmers, and they should provide their land as long term rent to other farmers which would require a change current legislation on land rent.

5.1.6 Family farming

Participants stated that they think family farming is the most sustainable agricultural model in Flanders. They perceive agriculture as not financially lucrative for external investors to invest in agricultural production as returns on investment are uncertain.

Participants feel that there should be more collaboration between different actors in the food chain. Risks should be spread among different actors, not only farmers should be dealing with them. Participants do mention the example of Colruyt, a large supermarket that recently invested in a farm. They questioned the role of the farmer in this particular example, who is no longer the sole decision maker on the farm. They believe this feeling of independence is important for many farmers for their proud and pleasure of work. They also questioned the motivation of this supermarket to invest in this farm and perceive this mainly as a marketing trick to improve their image. However, this model might be a solution for farmers who are good workers but lack entrepreneurial and management skills or lack interest in non-agricultural activities.



However, the familial model of farming does result in particular difficulties, especially with regard to generational renewal. As farms are becoming more capital intensive, it is becoming increasingly expensive for a successor to take over the farm. There is a particular focus on land, as land prices are very high. At the moment, farms are addressing this problem by creating partnerships. Partners believe that legislation on land rent and taxation might provide some solutions in dealing with these problems. There is an opportunity for the government to support the farmers with new legislation.

Another aspect of family farming is that it is very difficult for new entrants, those without a family background in farming, to begin farming. For new entrants, it is even more difficult to gain access to land. Often, new entrants are organic farms and/or CSA (community supported agriculture) farms. Low profitability in agriculture is proposed to be the main reason for the low number of new entrants.

5.1.7 Investments and farm development

Scale enlargement is associated with increased investments in agriculture. However, returns on investments are decreasing. This can be explained by rapid technological development. New technology becomes outdated quickly. Additionally legislation requires that existing technology be adjusted and adapted, having an impact on the farmers' bottom lines. Participants expect this tendency will continue and become more pronounced. As a result, farmers no longer automatically adopt the latest technology, but only make sensible, reasonable investments. Farms that are completely out of date or completely up to date are most attractive for a successor. Farms that are completely out of date are less expensive and allow the successor flexibility in determining the farm's future focus.

Participants do not think that the model of family farming is threatened by external investors, especially as they feel that return on investment is too low and risks are too high.

Participants perceive three different development paths for remaining farms, depending on their marketing channel:

- 1) Farms delivering to processing industry will continue scale enlargement (Large farms)
- 2) Farms delivering directly to supermarkets focusing on selling local products (mid-size farms)
- 3) Farms selling directly to consumers (small farms).

5.2 Flanders in AgriPoliS

The implementation of Flanders into AgriPoliS follows much of the same path as the Altmark. For the upscaling phase of the implementation, it was necessary to remove horticulture and



permaculture from the statistics, aspects of agricultural production which are not yet suited to AgriPoliS due to the annual and land-based nature of the model. During the upscaling process, experts found the typical farms resulting from the FADN farms to be an insufficient representation of the region. For this reason, we used a set of typical farms, based on a categorization that is used for reporting statistics on agriculture in Flanders as the pool from which the upscaling programme made its selections. Flanders' upscaling process resulted in 19 typical family farms, the aggregation of which's characteristics produced the "upscaled" column in table 5.

Table 5: Flanders in AgriPoliS structural data

	Statistics (without horticulture and permacrops)	Upscaled	Deviations in %
Number_of_Farms	19753	20309	2.81
Farm by Farm Type			
Fieldcrops	6659	6947	4.32
Grazing Livestock	7941	8110	2.13
Granivores	2850	2897	1.65
Mixed	2303	2355	2.26
Agriculturally_Used_Area (UAA)	571727	574432	0.47
UAA by Land Type			
Arable land	357583	355451	-0.59
Grassland	214144	218981	2.26
UAA by Farm Type			
Fieldcrops	143590	140861	-1.9
Grazing Livestock	268945	268368	-0.21
Granivores	51092	51075	-0.03
Mixed	116613	114128	-2.13
Farms by Land Size Group (from...up to ... hectares)			
under 10	6353	5977	-5.92
10 to 20	4313	4212	-2.34
20 to 50	7165	6843	-4.49
50 to 100	2765	2767	0.07
100 to 200	468	470	0.42
200 to 500	40	40	0
Livestock (in livestock units)			
Dairy Cows	311403	307831	-1.15
under 50	68636	69663	1.5
50 to 100	122089	118468	-2.97
100 or more	120678	119700	-0.81
Cattle	548054	554698	1.21
Broilers	166049	166314	0.16
under 200	19660	20247	2.99
200 or more	146390	146067	-0.22
Laying Hens	174315	174213	-0.05
under 200	9875	9566	-3.13
200 or more	164440	164647	0.12
Fattening Pigs	1155117	1147680	-0.64



The focus group in Flanders provided a rich amount of knowledge with regard to agriculture in general as well as farm succession in Flanders. The discussion revealed that some characteristics of Flanders are not transferable to the model, such as the increasing cost of purchasing land as there is no land buying market. However, much of the workshop provided information not available in statistics and could be adjusted in the model, such as the increasing potato production and current trends and shifts in agricultural production. The discussion around family farm succession and how the decision to take over a farm is about committing to a lifestyle not suited for some, reinforced that the likelihood of a successor should be randomly allocated in AgriPoliS, like it is in the Altmark. However there is indication that larger more profitable farms are more likely to have a successor. Due to the distribution set, and the relatively few larger farms, on average less than 4% of the total farms which closed in Flanders due to lack of a successor belong to the large economic size class farms. Of that size class, on average 3.5% closed due to lack of successor. For this reason, there is no need in Flanders to adjust the model further to account for the higher probability of a successor in the larger farms. With regard to opportunity costs that the participants spoke about, the model already matched

5.3 Flanders Simulations

The table below provides the parameters set for Empirical scenario, which uses the Belgian farm structural data and the rate of successor likelihood from the estimated European average (Eurostat, 2013). As in the Altmark, the parameters remain unchanged for the 100% Successor scenario with the exception of the probability of a successor increasing to 100% and no option of farming without a successor.

Table 6 Parameters of "demographics" input file

Initialization:		
Family farmer's age	minimum: 30 years	maximum: 70 years
Corporate farmer's age	minimum: N/A	maximum: N/A
Family farmer age distribution	average: 52.2	standard deviation: 9.27
Corporate farmer age distribution	average: N/A	standard deviation: N/A
Generational Change:		
Age of generational change	67 years	
New farmer's age	minimum: 30 years	maximum: 45 years
New farmer's age distribution	average: 35 years	standard deviation: 1.5
Probability of a Successor:		
Family farms	75%	
Corporate farms	N/A	
Farming without a Successor:		
Maximum age of farmer with no successor	75 years	
Productivity decrease past generational change age	1%	

5.3.1 Number of Farms

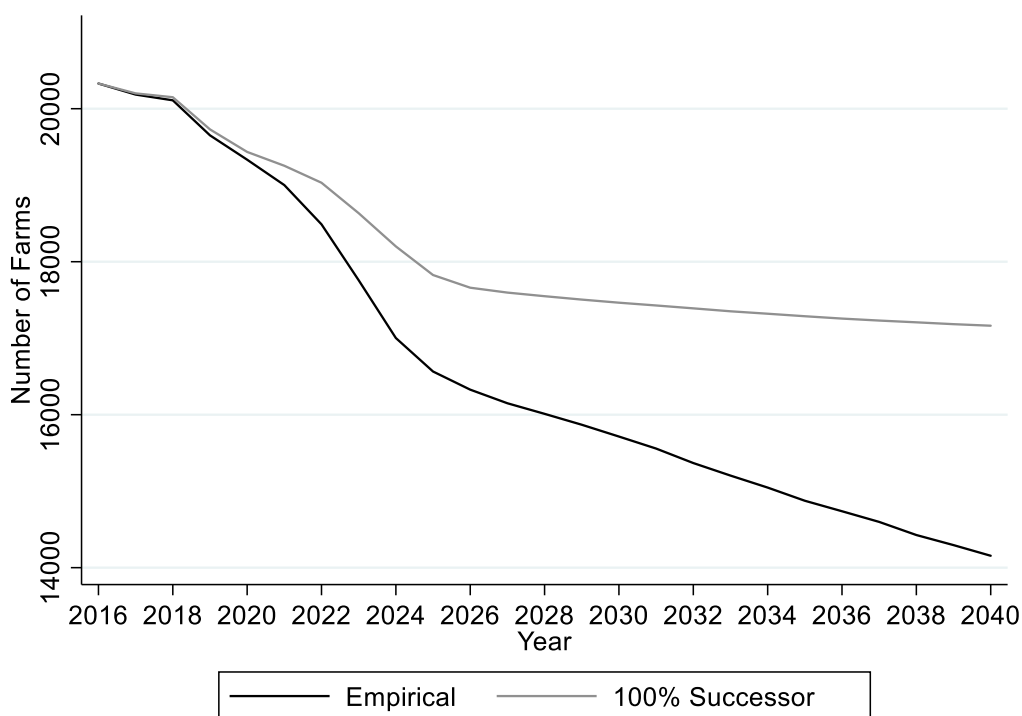


Figure 6: Number of farms

In Flanders the number of farms overtime decreases in both scenarios, as one would expect. Figure 6 indicates that the presence of a successor has a stronger impact on farm closure than it does in the Altmark. When there is a presence of a successor, we observe a sharper elbow bend than we do in the Empirical scenario, where the rate of farm closures continues on a steeper downward trend. Although the number of farms does not reach equilibrium in the 100% Successor scenario, the decrease in the number of farms over time is slight. In the Altmark, farms continue to close due to high opportunity costs, which levels out in Flanders. This is due to the high-dependence on the more expensive hired labour in the Altmark, whereas labour inputs in Flanders are predominantly family labour. In tables 7 and 8, the number of farms which have closed due to opportunity costs between iterations 10 and 20 increases by less than 2% in each scenario. Whereas in the Altmark, seen in tables 7 and 8, the numbers increase by 10 and 15 % from iteration 10 to iteration 20 in each scenario.

Table 7: Farm operational status at iteration 10

	Operational status	Percentage of farms
Empirical	In operation	79.44
	Closed due to opportunity costs	4.61
	Closed due to opportunity costs at generational change	1.91
	Closed due to illiquidity	7.51
	Closed due to no successor at generational change	6.53
100% Successor	In operation	86.55
	Closed due to opportunity costs	5.47
	Closed due to opportunity costs at generational change	0
	Closed due to illiquidity	7.97

Table 8: Farm operational status at iteration 20

	Operational status	Percentage of farms
Empirical	In operation	71.88
	Closed due to opportunity costs	5.67
	Closed due to opportunity costs at generational change	3.94
	Closed due to illiquidity	7.56
	Closed due to no successor at generational change	11.02
100% Successor	In operation	84.76
	Closed due to opportunity costs	7.2
	Closed due to opportunity costs at generational change	0
	Closed due to illiquidity	8.05

5.3.2 Farms by Size Class

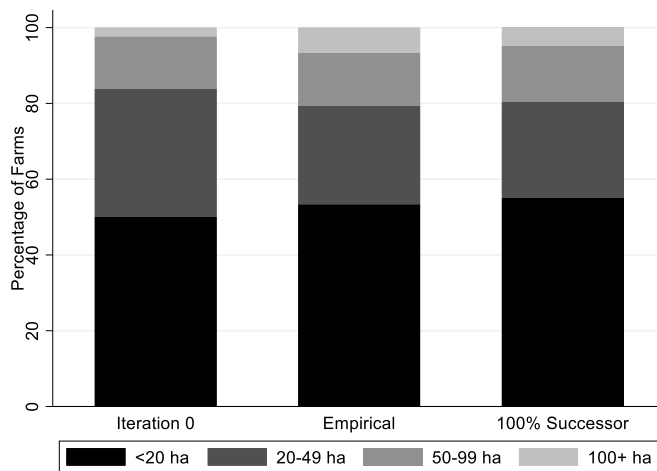


Figure 7: Farms by size class at iteration 10

Figure 7 shows that farm size classes in Flanders are relatively unaffected by the presence of a successor at iteration 10, as in the Altmark. In the 100% Successor scenario, there are slightly more small and large farms, and slightly less medium and very large farms. Figure 7 also includes the size class at iteration 0 for both scenarios for comparison. While there is a shift in farm sizes, and even an increase in the proportion of small farms, figure 8 demonstrates that the share of U.A.A. by size class does not increase for the small farms. Rather, it increases slightly for the 50-99ha farms in the Empirical scenario, and no observable difference is present between the 100% Successor scenario at iteration 10 to that of iteration 0.

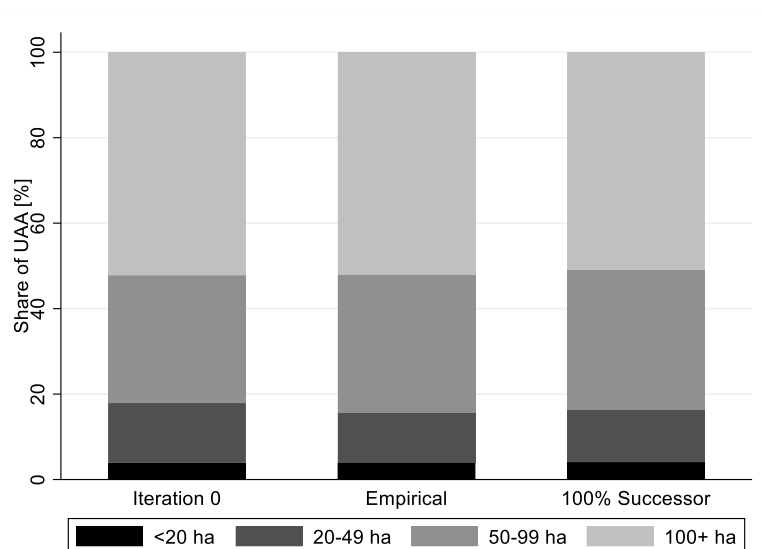


Figure 8 Share of UAA by size class at iteration 10



5.3.3 Production Patterns

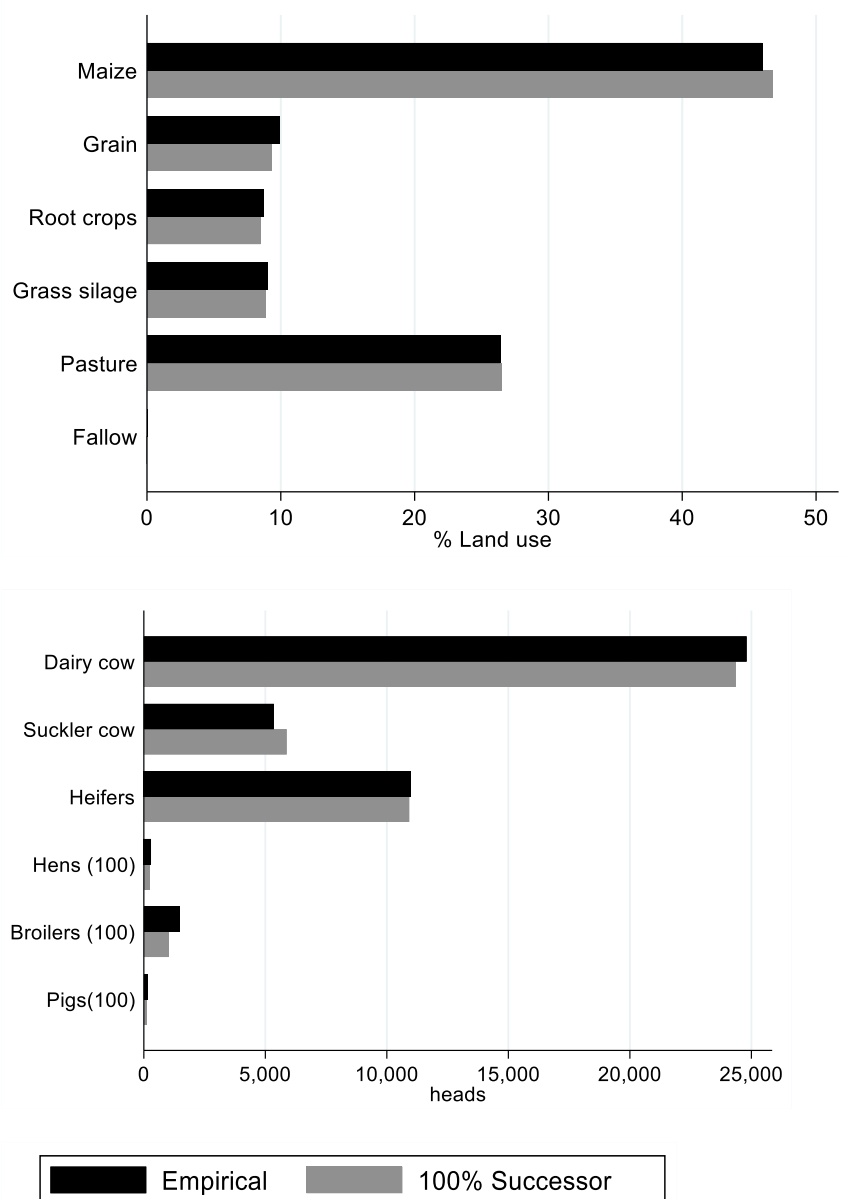


Figure 9: Production at iteration 10

In Flanders, there are slight differences in crop production, seen in figure 9, but the change is no more than 2% between scenarios per crop. For livestock production, there is a small shift from dairy to suckler cows as well as slight decreases in other livestock production in the 100% successor scenario. Overall, whether there is a successor present has a minimal effect on the region’s agricultural production.



6 Conclusion

The focus groups and simulations provide insight into the cause and effects of farm succession in two European agriculture regions. The focus groups provided both a breadth and depth of information on the regions and processes which affect farming and farm succession in each region. This information enabled the adaptation of AgriPoliS to best implement the regions into the model. Additionally, the focus groups provided insight past what is available in public statistics about processes of farm succession in the regions. These insights enabled adjustments and testing of the model's assumptions on farm succession.

The effect of farm demographics on the regions is overall minimal in the two scenarios. One empirically set to the rate of the average European successor likelihood and one with 100% successor presence, we simulated and analyzed in Flanders and the Altmark. In neither Flanders nor in the Altmark is there the expectation that a situation will exist with 100% successor likelihood. However, this scenario serves to act as a contrast to see how structural change would be affected if every farm had a successor.

We found that the presence of a successor has minimal impact on the production of the region. There is almost no detectable difference in the Altmark. The slight shifts in production in the 100% Successor scenario in Flanders are due to farms being constrained by their smaller size and having to produce in a way which maximizes their incomes. However, the change has no significant impact on the region's farm structure. With regard to farm size classes, there is a small shift in the proportion of farms in each size class category in both Flanders and the Altmark. Overall, the changes are insignificant and do not change the regions' farm structure.

Where the presence of a successor has a noticeable effect on farm structures is understandably in the number of farms per region. In the Altmark, there were less farms overall in the Empirical scenario, which is to be expected when a portion do not have a successor. However, in the 100% Successor scenario, the farm closures continued at a rate only slightly lower than that in the Empirical scenario. In Flanders, though, we observed that after a certain point in the 100% Successor scenario that the decrease of farms tapered off. In the Empirical scenario in Flanders, the number of farms continued to decline. Looking at the reasons for closures in both case studies, we observe that a main and continuing driver of farms continue in the Altmark is the opportunity costs. In contrast, the amount of farms in Flanders which close due to opportunity costs levels out around iteration 10. The key difference in opportunity costs between Flanders and Altmark is the extent to which the Altmark relies on hired labour, making it always relatively more expensive for farms to operate than in Flanders where predominantly family labour is used.

We see that the presence of a successor has a significant impact on the number of farms in a region where family labour is predominant. The question remains as to whether there is value in a relatively consistent number of farms. The European Commission places significant attention on farm closure and decreasing farm numbers. Despite the changing number of farms, the regions' agricultural production is unaffected by the successor likelihood. Further research calls for more extreme simulations to investigate whether the system tips at a certain point with lower successor likelihood.

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7 Appendix 1

MODERATOR'S GUIDE

Workshop Checklist:

- Slides for SURE-Farm and AgriPolis introduction (optional)
- Sheets of paper with labour categories defined
- Cards (different colours or marked to differentiate per respondent)
- Pens
- Audio Recording Devices
- Camera

*** Breadth of opinions desirable! ***

Break out groups should have already been pre-determined – no more than 6 people per group

4. Driver's Discussion ---- 60 MIN

- **Moderator:** Without discussing with your neighbours, please take 3 cards and on each card list a driver / cause of farm demographic change in the region
- **Moderator:** Give each card a number on a scale between 1 and 5. (All can be 1 or 5).

1 for most influential and 5 for least influential

- The cards are collected and organized on the wall from 1 – 5. The results will be photographed.
- **Moderator / assistant begins discussion of the results within breakout groups**
 - When appropriate, probe participants to quantify and qualify statements
- **Larger group comes to discuss breakout group results**

Note takers / moderators should have cards, indicated with a colour for group discussion. As more information emerges during the discussion, the responses should be written and pinned.

5. LABOUR DEFINITIONS (Please have a copy of these for each participant) – 10 min

Ask the participants to read and give feedback on the definitions of labour



Management – strategic decision making e.g. general farm management, labour force decisions, investment decisions, new technology implementation; normally higher education

Skilled Labour – direct management of livestock and production (milking); professional agricultural education

Unskilled Labour – animal feeding, harvest workers, tasks requiring no extensive training

6. Availability of and ability to retain Unskilled Labour ---60 MIN

- Moderator(M) states the availability of and ability to retain unskilled labour
- M: Asks to what extent does this theme affect agriculture in the region?
Respond on a scale of 1 – 5; 1 = largely influential 5 = not influential
- Participants (P): Respond on one card
- M: How does the theme affect the participant or region – what are the consequences?
- P: Respond on new card
- M: If they believe that the theme affects farming in the region, what are they doing to address the theme?
- P: Respond on new card
- M: With support or collaboration from other stakeholders, what are potential solutions?
- P: Respond on new card

Assistants collect and pin cards onto wall based on respondent

- Moving and or clustering the responses can be a good way to prompt discussion.

Discussion about responses

(Moderator and or assistants should write the views and reactions which emerge as part of the discussion and pin them where appropriate).

** Please ensure that costs and benefits and or constraints and opportunities are addressed in the discussion, especially in response to solutions**

7. Availability of and ability to retain Skilled Labour --- 60 MIN

- Moderator(M) states topic – availability of and ability to retain skilled labour
- M: Asks to what extent does this theme affect agriculture in the region?
Respond on a scale of 1 – 5; 1 = largely influential 5 = not influential
- Participants (P): Respond on one card
- M: How does the theme affect the participant or region – what are the consequences?
- P: Respond on new card
- M: If they believe that the theme affects farming in the region, what are they doing to address the theme?
- P: Respond on new card
- M: With support or collaboration from other stakeholders, what are potential solutions?
- P: Respond on new card

Assistants collect and pin cards onto wall based on respondent

- Moving and or clustering the responses can be a good way to prompt discussion.

Discussion about responses



(Moderator and or assistants should write the views and reactions which emerge as part of the discussion and pin them where appropriate).

** Please ensure that costs and benefits and or constraints and opportunities are addressed in the discussion, especially in response to solutions**

8. Availability of and ability to retain Management ---- 60 MIN

- Moderator(M) states topic – availability of and ability to retain management
- M: Asks to what extent does this theme affect agriculture in the region?
Respond on a scale of 1 – 5; 1 = largely influential 5 = not influential
- Participants (P): Respond on one card
- M: How does the theme affect the participant or region – what are the consequences?
- P: Respond on new card
- M: If they believe that the theme affects farming in the region, what are they doing to address the theme?
- P: Respond on new card
- M: With support or collaboration from other stakeholders, what are potential solutions?
- P: Respond on new card

Assistants collect and pin cards onto wall based on respondent

- Moving and or clustering the responses can be a good way to prompt discussion.

Discussion about responses

(Moderator and or assistants should write the views and reactions which emerge as part of the discussion and pin them where appropriate).

** Please ensure that costs and benefits and or constraints and opportunities are addressed in the discussion, especially in response to solutions*



