The Transition to Biological Dairy Farming

Final Presentation

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We will discuss the following topics

Agenda

Problem recap

Findings

Calculating the true price of milk

Policy recommendations for the banks and the government

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Policy recommendations for the banks and the government

Banks ignore the effects of externalities in their financing decisions; would financing decisions change when these externalities are included?

The problem

The problem centres around the following points

Banks primarily focus on the current and projected financial performance of the farm when making lending decisions.

Banks may not finance the transition due to negative short-term profitability

The true cost of the farmer to produce milk are not known to the bank

Potential hidden risks in the loan portfolio

Pricing externalities highlights the currently hidden value of biological farming

To draw a conclusion, we looked at five different cases

		Financed?
1	Case A	✓
2	Case B	✓
3	Case C	✗
4	Case D	✓
5	Case E	✓

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The current bank portfolio contains hidden risks due to non-priced externalities; quantifying these externalities could help banks reduce the risk of their portfolio

Conclusion

We find that...

- There are significant hidden risks in the current bank portfolio
- Organic farming significantly reduces the systematic risk of diary products
- There is a trade-off between revenue and profit margins

The average margins before and after including externalities

The banks and the government should...

1. Perform research to fill the current lack of tools
2. Focus on long-term orientation
3. Analyse consumer behavior
4. Inspect subsidies
5. Think outside of the box to find financial support for the biological transition of the farmers

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To quantify the effect of externalities we first calculated the true price for both traditional and biological farming; next we compared profit margins to draw conclusions

The process of finding the true price

What do we mean with the true price?

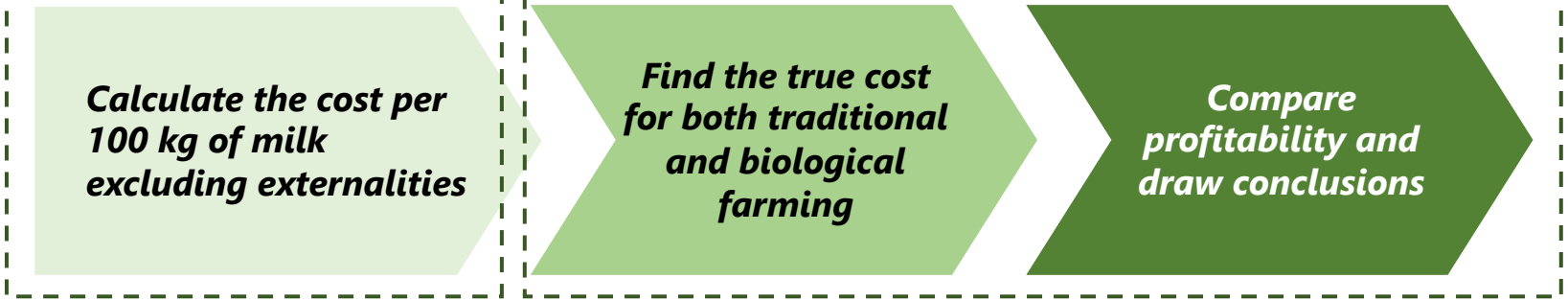
The true price of milk includes negative externalities, such as the amount of greenhouse emissions and the effect of farming on biodiversity

The process of finding the true price

We incorporated the costs of greenhouse emissions and loss of biodiversity. Furthermore, for the transition to biological farming additional costs for regional fodder and land are included.

See excel for detailed calculations

Focus of this report



We took into account both the imputed and unallocated costs

We calculated the true price and compared the profit margins in € and %

First, we will discuss how we calculated the true price for both traditional and biological farming

The process of finding the true price

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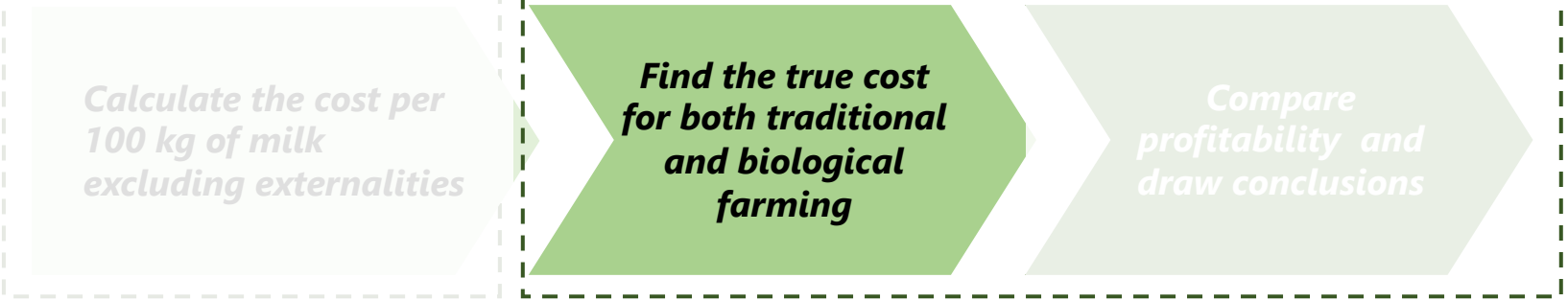

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Why did we only include biodiversity loss and greenhouse emissions as externalities? These are the two most important externalities according to research!

Initially we focussed on seven externalities related to dairy farming, namely (i) greenhouse emissions, (ii) biodiversity loss, (iii) human health effects, (iv) animal diseases, (v) soil subsidence, (vi) income allowance for farmers and (vii) animal welfare. However, based on feedback that we received during the proposal meeting we decided to focus on the two most relevant externalities: Greenhouse emissions and biodiversity loss (Van Duursen and Van Leeuwen, 2016).

If we look at greenhouse emissions, we see that dairy farms emit greenhouse gasses in two ways:

1. During the production of fodder and fertilizer large amounts of CO_2 are emitted into the atmosphere.

2. Cows emit methane as a result of intestinal fermentation. Methane poses a large problem for the environment as it speeds up the warming process of the atmosphere (Environmental Defense Fund, 2021). Scientists argue that it is critical to reduce the emission of methane as it has a larger negative impact on global warming in the short-term.

If we look at biodiversity loss, we see that the biodiversity is impacted in three ways:

1. There is intense land usage by cows. This reduces the biodiversity of the land.

2. The land on which fodder is produced has to be converted. Furthermore, fodder that is used in the Netherlands includes soja, which is harvested in South America. To grow enough soja, deforistation is needed, which reduces the biodiversity.

3. The urine and feces of the cows includes nitrogen. When this nitrogen evaporates it ends up in the atmosphere. Currently, this is a large issue in the Netherlands.

See the next slide for the price calculations of the two externalities!

The following inputs were used to calculate the true price of milk for **traditional farming**

The true cost of traditional farming; the cost of greenhouse emissions and biodiversity loss

Externalities	How does it arise?	Price range (€/kg milk) Min.	Max.	Avg.
1 Greenhouse emissions				
CO_2	• CO_2 is emitted during the production of fertilizer and fodder	0.03	0.28	0.15
Methane	• Methane is emitted directly from the cows as a result of intestinal fermentation			
2 Biodiversity loss				
Land usage by cows	• By using the land as grassland for the cows, the overall biodiversity is reduced	0.04	0.04	0.04
Land conversion	• Conversion of land for the production of fodder, both in the region and abroad (South America)	0.02	0.02	0.02
Nitrogen	• The urine and feces of the cows include large amounts of nitrogen, which evaporates and ends up in the environment	0.02	0.09	0.05

Used in calculation traditional farming

1 **Greenhouse emissions** 0.15

2 **Biodiversity loss** 0.11

Sources: Vakblad V-Focus; Blonk et al (2011); van Reijs et al (2014); van Duursen en van Leeuwen (2016); Monetisation of true pricing (2020); EPA (2015); de Bruyn et al. (2010); Moore & Diaz (2015)

Including the negative externalities increases the cost of milk with **67%** on average; this will have considerable effects on profits

True cost of traditional farming

To determine the true cost, we included the following externalities (as discussed)

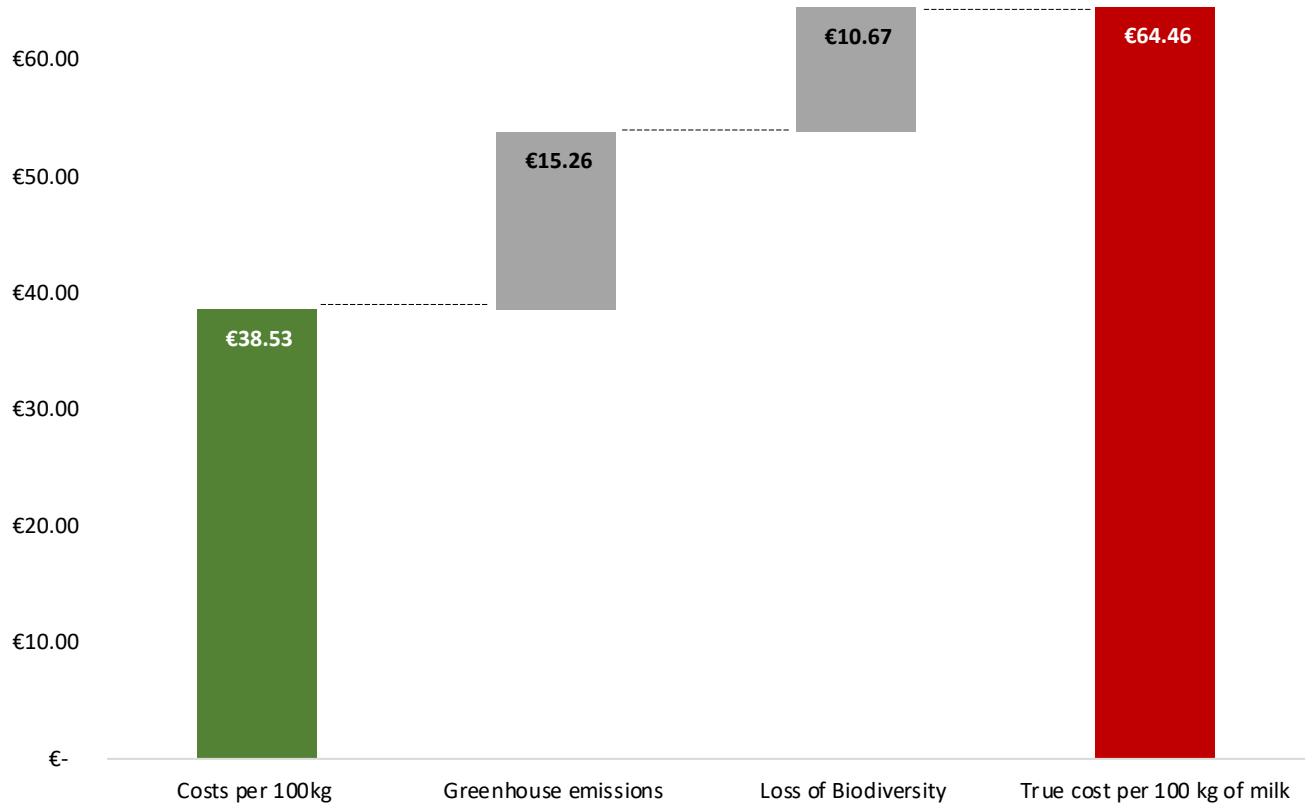
1 **Greenhouse emissions**

- CO_2
- Methane

2 **Loss of biodiversity**

- Land usage by cows
- Land conversion
- Nitrogen

The cost per 100 kg of milk increases with approximately **67%**



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We conducted both qualitative and quantitative research on the additional costs of **regional fodder** for biological farming

The diet of a typical Dutch dairy cow consists primarily (92%) out of roughage ('ruwvoer'), which usually consists of grass and maize, but can also include hay, alfalfa and straw. Additionally, dairy cows also consume concentrates ('krachtvoer'), which consists of maize, soja, citrus, palm kernel, rapeseed, beets, wheat and residues from the food industry.

According to a 2017 study by CLM Onderzoek en Advies, most of the feed of Dutch dairy cows is imported. In 2015, the amount of fodder imported from countries outside of Europe by dairy farms was 61%. The product that is imported most is soja, with 95% of the soja in fodder coming from countries outside of Europe, primarily from South America (Nevedi, 2016).

In order to receive the Skal certification, the feed of dairy cows must comply to certain requirements. Amongst other things, the feed must not contain any GMOs, antibiotics, medicinal substances and growth hormones and may not be treated with chemical pesticides. Roughage ('ruwvoer') should represent at least 60% of the cows' feed while concentrates ('krachtvoer') may not surpass a ratio of 40%. Another important requirement and what we focus on in our analysis is that at least 60% of the biological feed has to come from the dairy farm itself or from the region (including Europe).

In order to measure the difference in costs between traditional and biological farming we measure the additional costs of buying fodder in the region instead of buying fodder (primarily soja) from outside of Europe. The top right table shows these additional costs in different research studies. Following the approach by CLM Onderzoek en Advies, we allocate these additional costs to the business cases based on the amount of milk produced per ha per year. This can be seen in the bottom right table.

Additional costs of regional fodder

	Additional cost	Unit	Source
	0.48-0.90	€/100 kg milk	De Boer, Zom & Meijer (2006)
	0.30	€/100 kg milk	Rougoor, Hemke, Elferink & Van der Schans (2009)
	0.80-1.00	€/100 kg milk	Raad voor Regionaal Veevoer (2016)
Minimum	0.30		
Average	0.60		
Maximum	1.00		

Cost allocation based on kg of milk/ha per year

Categories	Treshhold	Additional cost	Unit
Below average	Max. 14,000 kg milk/ha	0.30	€/100 kg milk
Average	Approx. 16,000 kg milk/ha	0.60	€/100 kg milk
Above average	Approx. 20,000 kg milk/ha	1.00	€/100 kg milk

We conducted both qualitative and quantitative research on the additional costs of **additional land** for biological farming

The switch to biological farming requires farmers to adjust the use of their land to meet the criteria for biological farming as well as the size of the land required, which may include acquisition of new land. These costs for adjusting to biological farming represent the application of manure on the farmers' grassland and the cultivation of roughage. These additional costs are calculated based on the future production of milk/ha of the farm.

According to a 2017 study by CLM Onderzoek en Advies, the additional costs for land are split based on three cut-off production values. No additional costs are added for small biological farmers who produce less than 14,000 kg of milk/ha. Medium farms (approx. 16,000 kg milk/ha) see their costs increase by €1.73 while large intensive farms (approx. 20,000 kg milk/ha) face additional costs of €4.15.

These costs are only found for farms that produce more than 14,000 kg milk/ha since this represents the threshold value where farmers would require additional costs for permitting higher intensity of production whilst keeping the milk produced biological. Low-intensity farmers do not require the additional acquisition of land, while intensive farmers require costs for intensive biological farming which are the costs for acquiring new land and transforming it to make it suitable for organic farming.

Essentially, the methodology used by CLM Onderzoek en Advies to calculate the additional costs of land encompasses three different kinds of costs. The first one represents the costs of acquiring new land (cost of new land) to keep the ratio of cows per ha within the regulations of biological farming. Second, they calculate the interest as well as the principal repayments per year that are associated with the purchase of the land (rent and redemptions). Lastly, they account for the disposal costs per ton of cattle slurry (disposal of cattle slurry).

Additional costs of land

	Additional cost	Unit	Info
Cost of new land	60,000	ha	Average price for grassland in the Netherlands, subject to variation across provinces
Rent and redemptions	2% and 3%	€	Percentage of the cost of new land
Disposal of cattle slurry	17	€ tonne/cattle slurry	

Source: CLM Onderzoek en Advies

Cost allocation based on kg of milk/ha per year

Categories	Treshhold	Additional cost	Unit
Below average	Max. 14,000 kg milk/ha	0.00	€/100 kg milk
Average	Approx. 16,000 kg milk/ha	1.73	€/100 kg milk
Above average	Approx. 20,000 kg milk/ha	4.15	€/100 kg milk

To calculate the true price of **biological farming** we had to adjust some of the externalities; overall, we find a slight reduction in the costs associated with the externalities

True cost of biological farming; the cost of greenhouse emissions and biodiversity loss

Externalities	Assumptions externalities biological farming	Price range (€/kg milk) Min.	Max.	Avg.	Reduced?
1 Greenhouse emissions					
CO_2	• Since biological farming uses biological fodder, we assumed the CO_2 emissions to decrease • The methane emission per kg of milk remains equal as we assume less cows, but also less milk to be produced	0.03	0.25	0.14	✓
Methane					
2 Biodiversity loss					
Land usage by cows	• We keep the land constant. We assume that farmers do not buy additional land, but instead produce less milk with less cows	0.04	0.04	0.04	~
Nitrogen	• The emission of nitrogen decreases due to the use of biological fodder and no use of fertilizers	0.01	0.07	0.04	✓

Used in calculation biological farming

1 **Greenhouse emissions** 0.14

2 **Biodiversity loss** 0.08

Reduction of:

8.3%

Sources: Vakblad V-Focus; Blonk et al (2011); van Reijs et al (2014); van Duursen en van Leeuwen (2016); Monetisation of true pricing (2020); EPA (2015); de Bruyn et al. (2010); Moore & Diaz (2015)

Switching to **biological farming** also increases the cost of milk significantly, namely with **59%**; however, a higher selling price will partially reduce the impact of the transition

True cost of biological farming

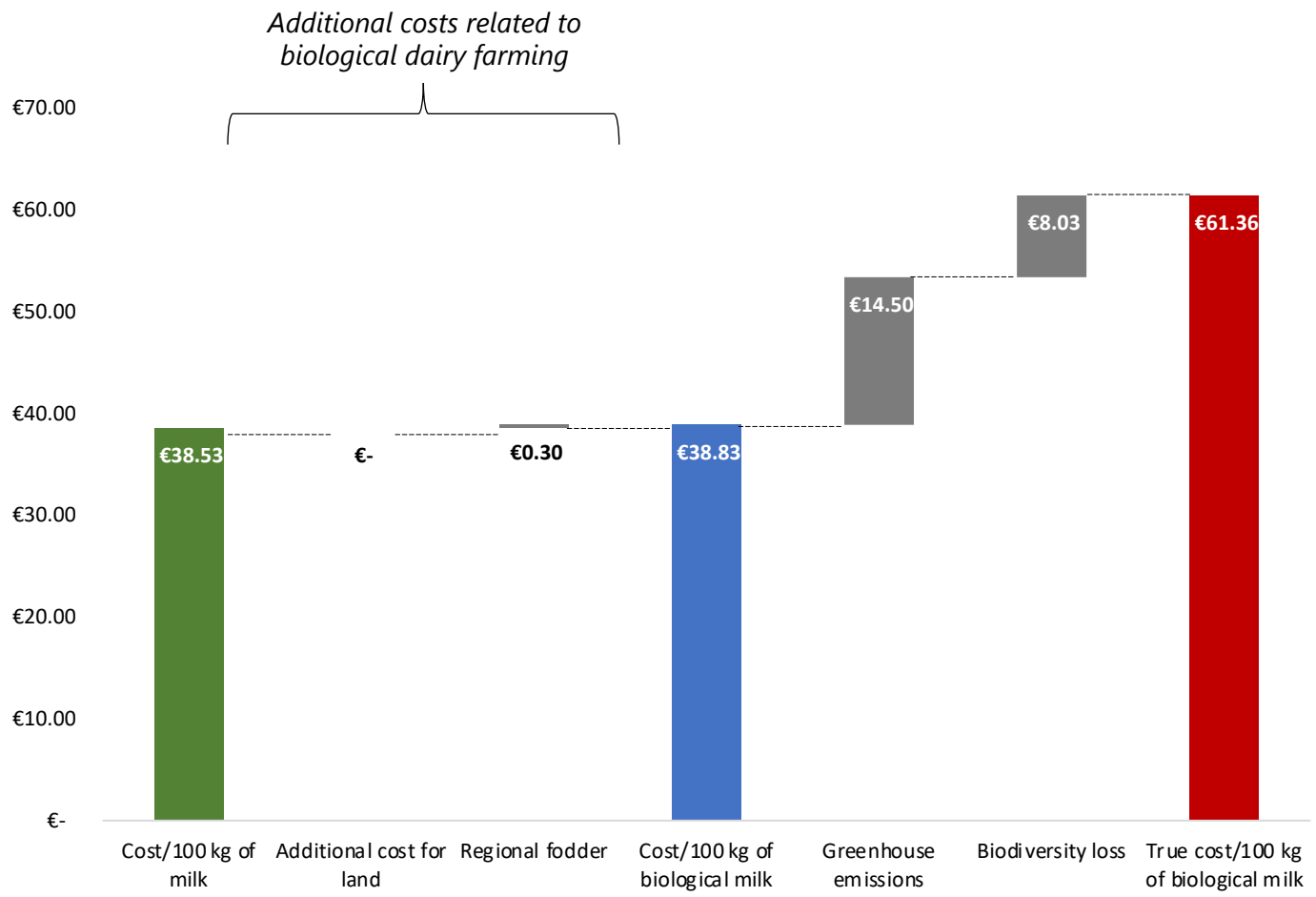
To find the true cost of biological farming we incorporated the following additional costs

1. Regional fodder
2. Land

Next, we included the costs of the negative externalities

1. Greenhouse emissions
2. Loss of biodiversity

The cost per 100 kg of biological milk increases with approximately **59%**



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Next, we investigate the margin differences between organic and conventional farming to draw conclusions

The process of finding the true price

What do we mean with the true price?

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We incorporated the costs of greenhouse emissions and loss of biodiversity. Furthermore, for the transformation to biological farming additional costs for regional fodder and land will be respected.

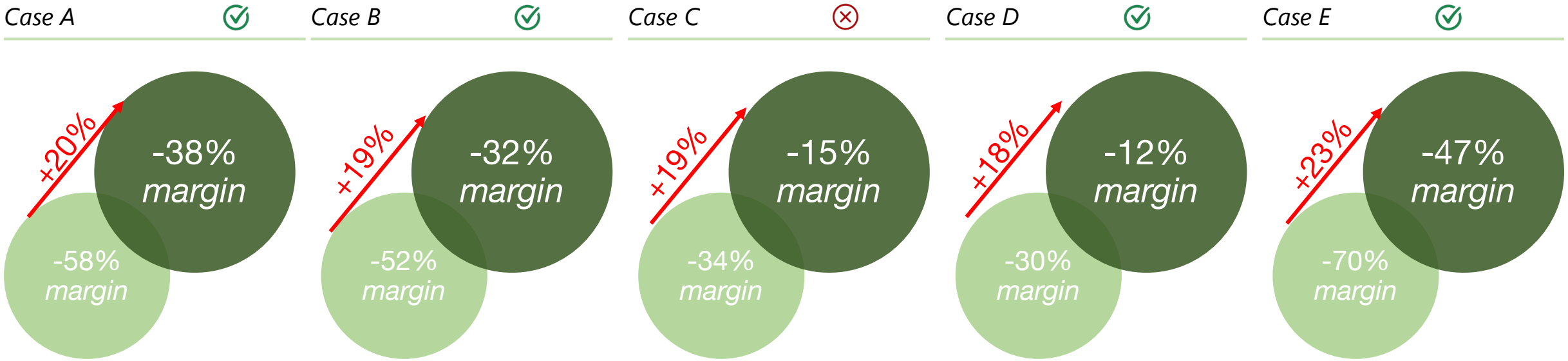
Focus of todays presentation

We took into account both the imputed and unallocated costs

We calculated the true price and compared the profit margins in € and %

Detailed analysis of the profit margin development of the business cases

Comparing the profit margins of the traditional and biological farming cases



Overall findings

There are significant hidden risks in the current bank portfolio

Organic farming significantly reduces the systematic risk of dairy products

There is a tradeoff between revenue and profit margins

Old margin *New margin* *Financed* *Not financed*

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Recommendations for the banks

1 Long-term orientation

- Transition to sustainable milk farming could reduce future potential liabilities.
    - Carbon taxes could pressure margins for farmers
    - Shift in consumer preference for organic milk products
    - Potential significant costs connected to pollution and emissions
- In the long-run banks want to reduce risks; the transition is one path
- However, in the short-run, organic farming might not yet be a viable business option for all farmers.

2 Banks responsibility

- Are banks the institution to finance the transition to sustainability?
    - If business case is not viable in the short-term, banks will not finance the transition.
    - Private banks need to assess their risks and are only have a limited responsibility in financing these projects.
    - Environmental value needs to be assessed. However, there needs to be a business case for the transition. Impact and Economic considerations.

3 Who should finance transition

- If a transition does not make economic sense to a financial institution like a bank, they will not finance the transition.
- Who should?
    - Government: backed loans by government institutions at low interest rates.
        - Artificially lower interest rates will also allow for more economic viability of transition.
    - Crowdfunding: receive products as a return
    - Banks with government subsidies

Policy recommendations for the banks and the government

Recommendations for the government

1 Lack of tools

- Offer frameworks for a transformation to sustainable Milk farming.
- Assess on defining a true price of Milk:
    - What externalities flow into it?
    - Who is paying the price for the externalities
    - How can farmers incorporate a framework of including the externalities?

2 Consumer behavior

- Problem is deeply rooted in consumer behavior. Ultimately, someone has to pay the price of the externalities.
    - Consumers need to be aware of the ”true price”
    - Possible solution: compulsory transparent labeling of products regarding the production and costs of milk production
    - Best-in-practice: Oatly (similar industry) is successfully realizing this strategy of being transparent by labeling their products
- Incentivize a shift of awareness of consumers.
    - Subsidies and taxes can be one solution of steering this consumer behavior.

3 Subsidies

- Milk industry is currently directly and indirectly being subsidized by the government.
- Governments should quantity and assess future liabilities if no transition is happening.
- Offer subsidies for banks to finance transition; if intrinsic business motivation for banks is not given, they need a guarantee from another institution.
- Government should focus more on subsidizing the transition to organic farming.
    - Tax breaks connected to new investments in sustainable farming techniques
    - Price floor for organic milk to prohibit dumping prices. Some companies do this to gain market share.
    - Other monetary incentives to reduce externalities.