


# Cross-country Comparison of Farm Economic Performance

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## Objective

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1. Benchmarking farm performance across countries with harmonized methodology
2. Finding common characteristics of high/low performing farms
3. Finding areas of improvement in each sector (such as resource allocation and technological diffusion)



## Outline

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1. Description of data and methodology
2. Cross-country comparison of farm performance
3. Characteristics high/low performer
4. Factor analysis of high farm performance
5. Conclusion



## Data from 9 countries

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- **Germany, the Netherlands, Belgium (Flanders), Italy and Estonia** : National FADN
- **UK (England)** : Farm Business Survey
- **Australia** : Broadacre and dairy farm survey
- **USA** : Agricultural Resource Management Survey
- **Canada** : Farm Financial Survey
  - Years are 2004, 2006, 2007, 2008 and 2009
  - The data generally covers 90% of production value in each farm type (only 17% of the population in US survey)



## Four Indicators of Farm Performance

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(1) **Output and Input Ratio**

Gross agricultural output / cash expenditure

(2) **Return to Labor**

Net operating income per full-time farmer  
equivalent labour input

(3) **Return to Land**

Net operating income per ha of utilized area  
of land

(4) **Return on equity**

Net operating income per net worth

Output does not include payments



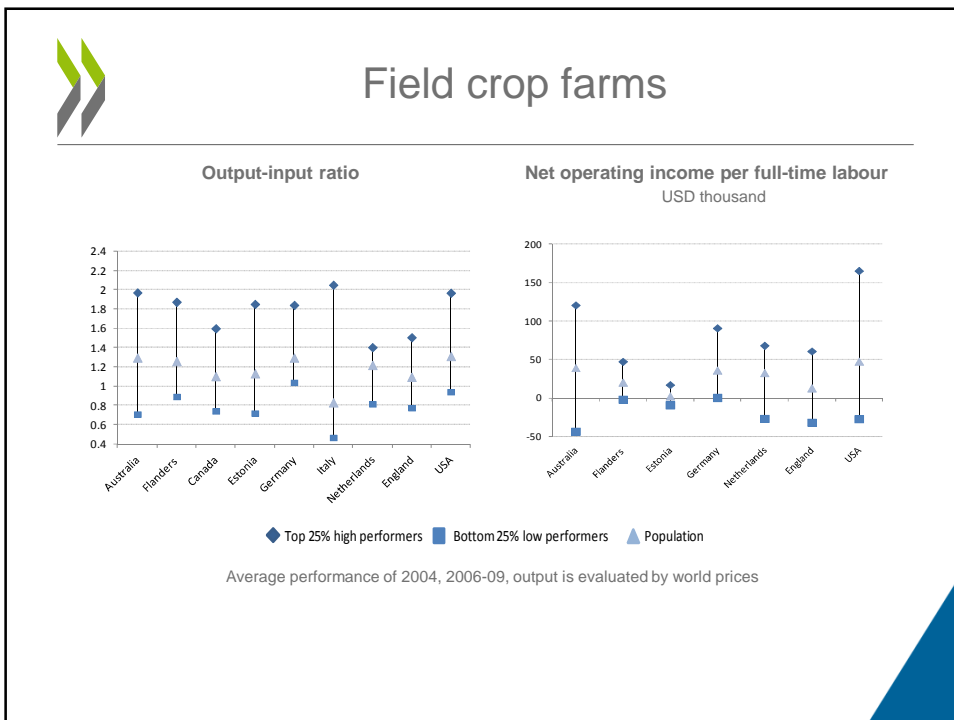
## Sector coverage

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- All farms
- Field crop farm
- Fruits and vegetable farm
- Dairy farm
- Beef and sheep farm
- Non-ruminant farm
- Mixed farm
- Nursery/Greenhouses (only Netherlands and Flanders)



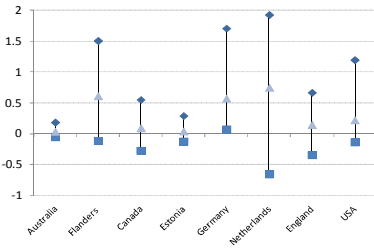
# CROSS-COUNTRY COMPARISON OF FARM PERFORMANCE



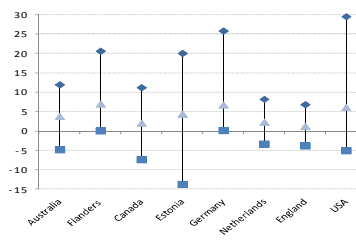


## Field crop farms

Net operating income per hectare of land  
USD thousand



Net operating income per net worth  
Percentage



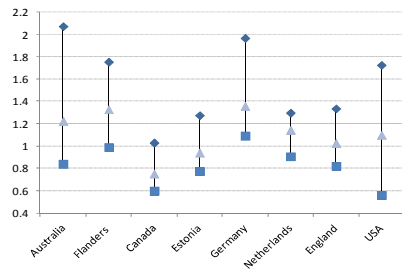
◆ Top 25% high performers ■ Bottom 25% low performers ▲ Population

Average performance of 2004, 2006-09, output is evaluated by world prices

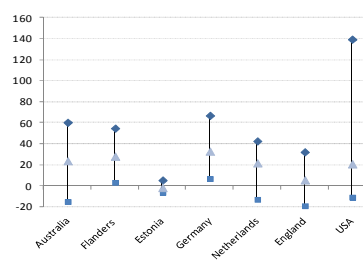


## Dairy farms

Output-input ratio

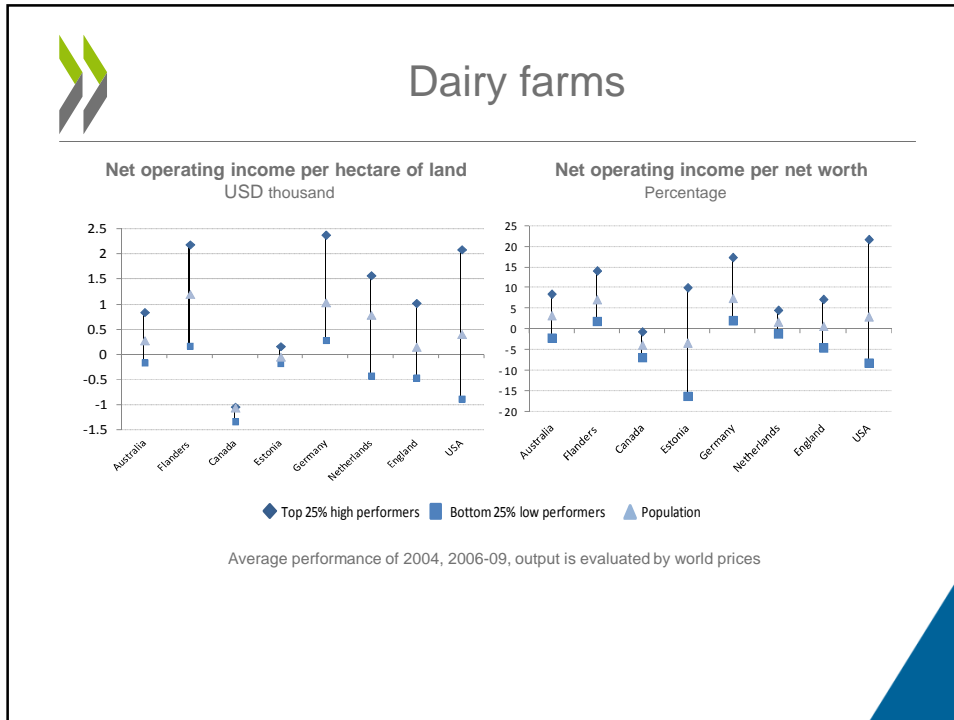


Net operating income per full-time labour  
USD thousand



◆ Top 25% high performers ■ Bottom 25% low performers ▲ Population

Average performance of 2004, 2006-09, output is evaluated by world prices



## CHARACTERISTICS HIGH/LOW PERFORMER



## Characteristics of high/low performer

### Farm characteristics

1. Farm size (Economic, Labour and Land)
2. Support
3. Off-farm activity
4. Operator's characteristics

### Standardized index of farm characteristics

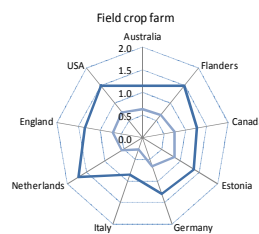
Characteristics of high and low performers are compared relative to the average in the farm type by each farm performance indicator



## Farm size and farm performance: Economic size

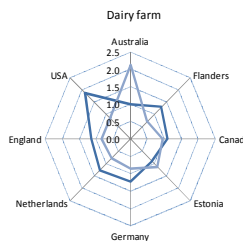
### Field crop farms

Relative to average in the farm type



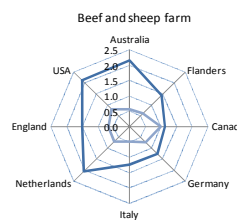
### Dairy farms

Relative to average in the farm type



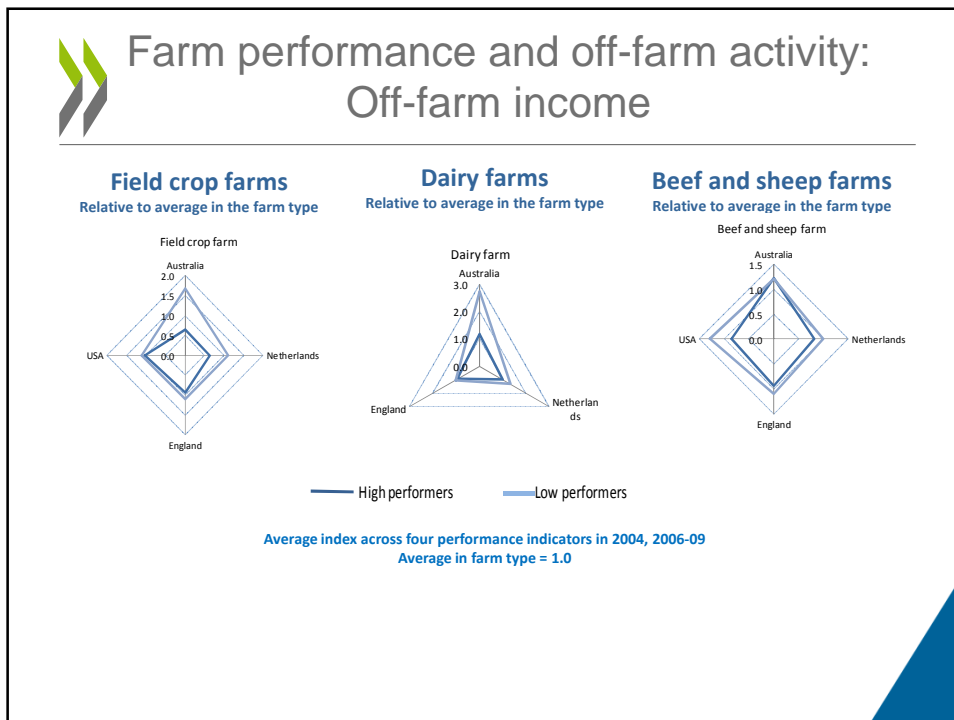
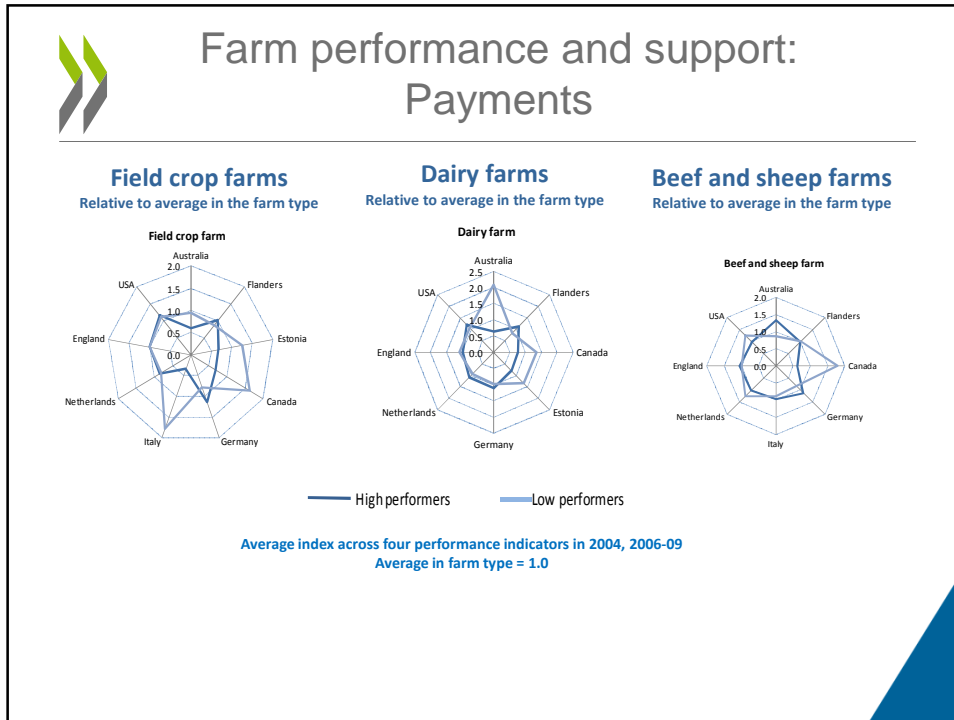
### Beef and sheep farms

Relative to average in the farm type



— High performers — Low performers

Average index across four performance indicators in 2004, 2006-09  
Average in farm type = 1.0







## Farm performance and operator's characteristics: Main operator's age

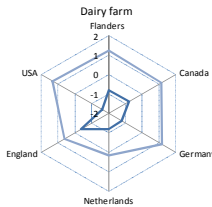
### Field crop farms

Relative to average in the farm type



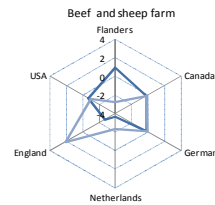
### Dairy farms

Relative to average in the farm type



### Beef and sheep farms

Relative to average in the farm type



— High performers — Low performers

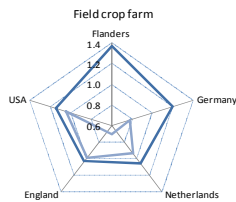
Average index across four performance indicators in 2004, 2006-09  
Average in farm type = 1.0



## Farm performance and operator's characteristics: Attainment of tertiary education

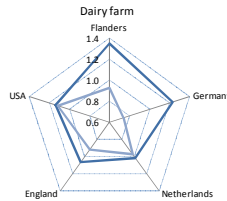
### Field crop farms

Relative to average in the farm type



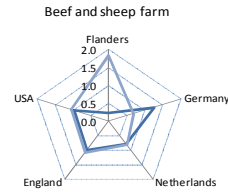
### Dairy farms

Relative to average in the farm type



### Beef and sheep farms

Relative to average in the farm type



— High performers — Low performers

Average index across four performance indicators in 2004, 2006-09  
Average in farm type = 1.0



## FACTOR ANALYSIS OF HIGH FARM PERFORMANCE



### Factor analysis of high farm performance

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- Characteristics of high performance are highly correlated (e.g., large size farm receives larger payment whose operator is younger...)
- **Factor analysis** is a statistical method to find a set of uncorrelated factors in a large dataset
- Factor analysis is applied to find **which factors are consistently explaining high performance across countries** in a specific farm type



## Factors of high performance: Field crop farms

### Factor loadings after rotation

	Factor 1	Factor 2	Factor 3	Uniqueness
<b>Eigen value</b>	3.94	1.61	1.41	
<b>Proportion in total variance</b>	0.36	0.15	0.13	
<b>Factor loadings</b>				
Gross agricultural output	0.87	0.01	0.04	0.24
Annual labor input	0.74	0.34	-0.01	0.33
Utilized area of land	0.89	-0.17	0.07	0.18
Debt ratio	0.71	0.43	0.03	0.30
Gross investment	0.03	-0.06	-0.86	0.26
Total payment	0.88	-0.27	0.12	0.14
Non-farm income	0.20	-0.55	0.30	0.57
Age of the main operator	-0.53	-0.26	-0.05	0.64
Education of the main operator	0.33	-0.12	0.72	0.36
Share of less favored land	-0.25	0.56	0.36	0.49
Adoption of organic practice	0.04	0.70	-0.03	0.51
<b>Factor characteristics</b>				
Factor 1	Large farm size and young age			
Factor 2	Organic practice and less geographical favorableness			
Factor 3	High education and low investment			

### Importance of each factor relative to cross-country trend

0 : In line with cross-country trend  
 ++/+ : more important than cross country trend  
 --/- : less important than cross-country trend

	Factor 1	Factor 2	Factor 3
Australia	--	0	0
Belgian Flanders	0	0	++
Canada	0	0	0
Estonia	0	-	0
Germany	0	0	0
The Netherlands	+	++	0
England	0	-	-
USA	0	0	0

- Farm size factor account for 36% of the total variance
- Compared to the cross-country trend, organic production practice is more important in the Netherlands, but less important in England and Estonia

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## Factors of high performance: Dairy farms

### Factor loadings after rotation

	Factor 1	Factor 2	Factor 3	Uniqueness
<b>Eigen value</b>	4.50	1.48	1.31	
<b>Proportion in total variance</b>	0.41	0.13	0.12	
<b>Factor loadings</b>				
Gross agricultural output	0.78	0.38	-0.14	0.22
Annual labor input	0.92	0.03	0.10	0.15
Utilized area of land	0.92	0.13	-0.07	0.14
Debt ratio	0.48	0.54	0.04	0.48
Gross investment	0.61	0.11	-0.40	0.46
Total payment	0.76	0.45	-0.12	0.21
Non-farm income	0.57	-0.47	0.20	0.42
Age of the main operator	-0.19	-0.81	-0.07	0.30
Education of the main operator	0.24	0.70	-0.06	0.44
Share of less favored land	-0.09	-0.03	0.77	0.39
Adoption of organic practice	0.03	0.05	0.71	0.49
<b>Factor characteristics</b>				
Factor 1	Large farm size			
Factor 2	Young age and high education			
Factor 3	Organic practice and less geographical favorableness			

### Importance of each factor relative to cross-country trend

0 : In line with cross-country trend  
 ++/+ : more important than cross country trend  
 --/- : less important than cross-country trend

	Factor 1	Factor 2	Factor 3
Australia	0	--	0
Belgian Flanders	0	+	0
Canada	0	0	0
Estonia	-	0	-
Germany	0	0	+
The Netherlands	+	0	+
England	0	0	--
USA	+	++	0

- Farm size factor account for 41% of the total variance.
- Compared to the cross-country trend, farm-size is the least relevant in Estonia, whereas it is the most important in USA and the Netherlands.
- Age and education factor is the least important in Australia, while is the most important in USA.

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## Limitations of the methodology

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- Non-economic factor is unaccounted
- Bias coming from different survey design
- Cost includes only cash expenditure
- Quality difference in land or labour
- No causality inferred from factor analysis



## Conclusion

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- Significant differences exist in farm performance within countries as well as across countries
  - Resource reallocation and disseminating the existing technologies can lead to an improvement in the performance of the sector.
- Farm size is an important factor, but there are other important factors...
  - age, education, use of financial leverage
  - geographical condition
- Low performers tend more on payments and off-farm income