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Preliminary Study – Resource Use Efficiency of Grains and Oilseeds Farms in Canada

OECD Network Farm-Level Analysis

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Canada

Purpose of study

- Examine resource use efficiency for grains and oilseeds farms in Canada in order to:
  - Compare technical efficiency of grains and oilseeds farms over time.
  - Identify characteristics of efficient farms.

Data

- Program administrative data, for the years 2003 – 2008, was used for this study.
- This data contains longitudinal information on farm-level output prices, production, inventories, acreages and expenses.
- However, this dataset contains limited balance sheet and farm operator information.

Data Sample

- Only those Saskatchewan grains and oilseeds farms with sales exceeding 50% in each year (2003 – 2008) were retained.

- Afterwards, the data was segmented by crop combination. Four primary crop combination groupings were identified:
  - cereal only
  - cereal and oilseeds
  - cereal and pulses
  - cereal, oilseed and pulse

Methodology

- A stochastic production frontier was chosen to estimate technical efficiency.
- The production function was estimated using a Cobb-Douglas functional form.

Technical Efficiency Estimation Variables

- *Value of Production* – the sum of the value of production for all crops grown in a given year.
- *Crop Inputs* – the sum of yearly expenditures on fertilizer, pesticide and seed.
- *Energy* – the sum of yearly expenditures on machinery fuel, electricity and heating fuel.
- *Capital* – estimated as the flow of capital expenditures on machinery and building repair, machinery lease and depreciation on machinery and buildings.
- *Land* – estimated as the sum of seeded acres for production in a given year.

Preliminary Results – Production Function

	Cereals and Oilseeds	Cereals Only	Cereals and Pulses
ln(energy)	0.21	0.18	0.22
ln(crop)	**0.34**	0.17	0.23
ln(capital)	0.13	0.08	0.20
ln(land)	**0.38**	**0.60**	0.17
constant	2.19	4.19	4.41
Wald chi2	6,142.96	872.76	237.25
Observations	2,658.00	683.00	322.00

- All inputs were found to significant at a 1% level

- The results indicate that land and crop expenditures provided the greatest contribution to technical efficiency for cereals and oilseeds producers, while land was the greatest contributor for cereals farms, and all factors made relatively equal contributions to technical efficiency.

Technical Efficiency Scores

	Cereals and Oilseeds	Cereals only	Cereals and Pulses
mean	0.87	0.31	0.54
std dev	0.77	0.06	0.15
min	0.42	0.20	0.28
max	0.97	0.53	0.86

- Cereals and oilseeds producers had a mean technical efficiency score of 0.87, while cereals only producers had a mean of 0.31 and cereals and pulses producers had a mean of 0.54.

- Variability in technical efficiency scores was also highest for cereals and oilseeds producers.

Mean years of profitability by percentiles of technical efficiency

	Cereals and Oilseeds			Cereals only			Cereals and Pulses		
	unprof	prof md	prof pd	unprof	prof md	prof pd	unprof	prof md	prof pd
0 to10	1.13	1.48	**3.39**	1.65	1.59	**2.76**	0.38	2.00	**3.63**
11 to 50	0.72	2.55	2.73	0.66	2.99	2.35	0.21	3.58	2.21
51 to 90	0.50	3.30	2.20	0.62	3.21	2.17	0.21	4.03	1.76
91 to 100	0.34	**4.30**	1.36	0.78	3.33	1.89	0.11	3.33	2.56

- For all crop combinations, the most technically inefficient farms (0 – 10) had the highest mean years of being unprofitable.
- The most technically efficient farms (91 to 100) had the highest mean years of market driven profitability for cereals and oilseeds and cereals only.
- For all crop combinations, the most technically inefficient farms (0-10) had the highest mean years of program driven profitability.

Mean years of specialization by percentiles of technical efficiency

	Cereals and Oilseeds	Cereals only	Cereals and Pulses
0-10	2.89	2.78	2.82
11 to 50	3.73	2.49	3.16
51 to 90	4.28	2.62	3.10
91 to 100	3.93	2.60	3.06

- Specialization in grains and oilseeds was defined as 80% of market revenue derived from grains and oilseeds in a particular year.
- The results indicated no clear relationship between technical efficiency score and degree of specialization. Besides the cereals and oilseeds group, degree of specialization did not change significantly as technical efficiency increased.

Next Steps

- Estimate resource use efficiency using a cost function
- Expand study to other provinces
- Compare resource use efficiency over time
- Determine the drivers of resource use efficiency