Eco-Efficiency and Human Capital Efficiency: Example of Small- and Medium-Sized Family Farms in Selected European Countries

Jan Polcyn

The aim of this analysis was to determine the relationship between eco-efficiency and human capital efficiency on small- and medium-sized family farms.

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In the conducted analyzes, the following were used:

-value of agricultural production per ha,
-a synthetic measure of human capital,
-a synthetic measure of environment.

Synthetic measures were determined by the TOPSIS-CRITIC method.

The analysis covered farms from:
-Lithuania (960),
-Moldova (532),
-Polish (696),
-Romania(872),
-Serbia(524).

All analyzed countries are characterized by a high fragmentation of farms.

Name of Synthetic Measure	Name of Variable	Type of Variable	Weight
Human capital	Professional experience	Stimulant	0.693
	Education	Stimulant	0.082
	Agricultural qualification	Stimulant	0.030
	Participation in continuing education: farm owner	Stimulant	0.023
	Participation in continuous education: spouse	Stimulant	0.017
	Participation in continuing education: other adults	Stimulant	0.007
	Participation in social/cultural events: farm owner	Stimulant	0.024
	Participation in social/cultural events: spouse	Stimulant	0.028
	Participation in social/cultural events: other adults	Stimulant	0.030
	Membership in any organisation, association, club, etc.: farm owner	Stimulant	0.030
	Membership in any organisation, association, club, etc.: spouse	Stimulant	0.025
	Membership in any organisation, association, club, etc.: other adults	Stimulant	0.012
Environmental	CH_4 emission per hectare	Destimulant	0.221
	N emission per hectare	Destimulant	0.228
	Soil organic matter balance, tonnes per hectare	Destimulant	0.130
	Mineral fertiliser consumption, tonnes per hectare	Destimulant	0.097
	Expenses for plant protection products per year per hectare	Destimulant	0.096
	Fuel expenses per year per hectare	Destimulant	0.099
	Electricity expenses per year per hectare	Destimulant	0.129

$$EE = \frac{economic\ measure}{environmental\ measure}$$

$$HCE = \frac{economic\ measure}{human\ capital\ measure}$$

K	N	P	Measures				
			E	KL	S	EE	HCE
Lithuania							
A	240	7.56	0.0451	0.7676	0.0889	0.8219	0.0638
B	240	8.82	0.1112	0.8040	0.0829	2.5532	0.2120
C	240	12.16	0.2033	0.7352	0.0857	4.0938	0.3487
D	240	12.42	0.4334	0.7132	0.0821	7.0416	0.9399

K-class designated by economic measure; N-number of objects in class;
P - farm area; E - economic measure; KL - human capital measure;
S - environmental measure; EE - eco-efficiency; HCE - human capital efficiency

K	N	P	Measures				
			E	KL	S	EE	HCE
Moldavia							
A	133	4.15	0.0116	0.7080	0.7892	0.0148	0.0194
B	133	4.97	0.0294	0.7115	0.7945	0.0371	0.0508
C	133	5.27	0.0585	0.6562	0.7845	0.0747	0.1154
D	133	6.34	0.1966	0.6643	0.7821	0.2524	0.4139

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K	N	P	Measures				
			E	KL	S	EE	HCE
Poland							
A	174	12.18	0.0300	0.7975	0.7958	0.0392	0.0586
B	174	13.78	0.0512	0.8126	0.8035	0.0649	0.0698
C	174	13.39	0.0785	0.7798	0.8039	0.1000	0.1889
D	174	16.84	0.1872	0.7607	0.7957	0.2425	0.3696

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K	N	P	Measures				
			E	KL	S	EE	HCE
Romania							
A	218	1.39	0.0563	0.7337	0.7286	0.0775	0.1776
B	218	4.06	0.0531	0.7161	0.7414	0.0717	0.1239
C	218	8.11	0.0698	0.7558	0.7441	0.0939	0.1422
D	218	37.08	0.1360	0.7530	0.7447	0.1826	0.2769

K-class designated by economic measure; N-number of objects in class;
P - farm area; E - economic measure; KL - human capital measure;
S - environmental measure; EE - eco-efficiency; HCE - human capital efficiency

K	N	P	Measures				
			E	KL	S	EE	HCE
Serbia							
A	131	3.93	0.0074	0.6906	0.7481	0.0099	0.0179
B	131	3.71	0.0146	0.7080	0.7409	0.0198	0.0231
C	131	4.50	0.0263	0.6919	0.7419	0.0355	0.0440
D	131	4.39	0.0791	0.6701	0.7385	0.1080	0.1445

K-class designated by economic measure; N-number of objects in class;
P - farm area; E - economic measure; KL - human capital measure;
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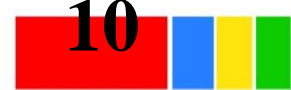
Conclusion

The analysis allowed us to formulate the following conclusions:

1. Eco-efficiency and human capital efficiency indices increased with area for small- and medium-sized family farms.

2. An increase in the eco-efficiency index with an increase in farm area suggests that the smaller the farm area, the more extensive the agricultural production that was carried out.

3. In addition, an increase in human capital efficiency with an increase in farm area indicates that there was inefficiency in the utilisation of human capital resources on the agricultural farms studied.

Thank you for your attention ☺