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ECONOMIC COMPARISON OF FARMS WITH AN AUTOMATIC MILKING SYSTEM AND A CONVENTIONAL MILKING SYSTEM

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Introduction

An automatic milking system (AMS) is an example of a precision dairy farming technique. The economic consequences of investing in precision dairy farming techniques are for most techniques unknown, which is also true for the AMS. The economic comparisons between farms with an AMS and a conventional milking system (CMS) have been mainly based on normative models. The only empirical economic comparison between farms with an AMS and CMS was conducted by Bijl et al. (2007) who concluded based on data from 2003 that CMS farms had more money available for rent, depreciation, interest, labor, and profit than AMS farms. Since that time no additional economic comparisons based on empirical research have been reported. The first objective of this study is to compare quantities of labor and capital of farms with a CMS and AMS. The second objective is to estimate and compare the technical efficiency of farms with an AMS and CMS. These objectives were met by the empirical analysis of farm accounting data.

Material and Methods

The dataset provided by an accounting agency included information from 63 farms with an AMS and 337 farms with a CMS in the Netherlands. The dataset included information on revenues (e.g., revenues from milk and other farm activities), depreciation (e.g., on buildings and machinery), fixed costs (e.g., costs for maintenance of buildings and machinery), variable costs (e.g., costs for feed, breeding, energy, and water), and general farm information such as the number of cows, number of hectares, amount of the milk quota, and the available full-time employees. The technical efficiency estimates were obtained with data envelopment analysis with bootstrapping.

Results

The 63 AMS farms and the 337 CMS farms in the dataset did not differ in general farm characteristics such as the number of cows, number of hectares, and the amount of milk quota. AMS farms have significantly higher capital costs (€12.71 per 100 kg milk) than CMS farms (€10.10 per 100 kg milk). The net outputs for AMS and CMS farms were €27.70 and €28.34 per 100 kg of milk, respectively. Total labor costs and net outputs were not significantly different between AMS and CMS farms (Table 1).

Although the AMS farms have a slightly lower technical efficiency (0.76) than the CMS farms (0.78), a statistically significant difference in these estimates was not observed. This indicates that the farms were not different in their ability to use inputs (capital, labor, cows and land) to produce outputs (total farm revenues).

Table 1. Average of the input and output variables (all in €100 kg milk) used for the efficiency analysis for dairy farms with an automatic milking system (AMS, n=63) and a conventional milking system (CMS, n=337) in 2010.

		AMS	CMS	p-value
Capital costs	Expenses on buildings	1.57	1.58	0.9215
	Depreciation on buildings	2.69	2.51	0.5643
	Expenses on machinery and equipment	4.57	3.48	0.0029
	Depreciation on machinery and equipment	3.88	2.53	<0.0001
Labor costs	Customer work	2.89	2.96	0.7406
	Paid labor	0.46	0.70	0.1165
	Own labor	6.95	7.06	0.8677
Materials costs	Roughage	0.70	0.82	0.2866
	Concentrates	6.51	6.51	0.9935
	Substitutes for concentrates	0.50	0.77	0.0131
	Milk products	0.29	0.22	0.0112
	Minerals	0.34	0.27	0.1085
	Fertilizer and pesticides	1.42	1.48	0.1270
	Breeding and healthcare	2.22	2.16	0.7792
	Energy and water	1.58	1.22	<0.0001
	Miscellaneous	3.61	3.54	0.7651
Revenues	Milk revenues	39.72	40.44	0.7528
	Livestock revenues	2.97	2.96	0.9706
	Other farm activities revenues	1.34	1.05	0.4506
	Miscellaneous revenues	0.84	0.74	0.6067
Net output	Total revenues – total materials	27.70	28.34	0.7675

Discussion and Conclusions

Bijl et al. (2007) concluded that CMS farms had more money available for rent, depreciation, interest, labor and profit. In that study, depreciation was not taken into account, and if depreciation was taken into account, the difference between AMS and CMS farms would have been even greater. The results of the current study show that the net output of CMS and AMS farms did not differ (Table 1). These results indicate that the economic performance of AMS and CMS farms are similar in 2010 in comparison with year 2003 data. This trend might be explained by the improved technical performance of the AMS and improved supervision of farmers that began milking automatically. However, this small difference in economic performance between AMS and CMS farms might only be true for farms in northwest Europe, with farms with a relative small size and high labor costs. For the US, the difference in economic performance between CMS and AMS could be larger.

The results indicate that the economic performance of AMS and CMS farms are similar other than higher capital costs for AMS farms. Also, the use of AMS rather than a CMS does not impact farm efficiency.

References

- Bijl, R., S. R. Kooistra, and H. Hogeveen. 2007. The profitability of automatic milking on Dutch dairy farms. *J. Dairy Sci.* 90:239-248.
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