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The Profitability of Automatic Milking on Dutch Dairy Farms

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ABSTRACT

Several studies have reported on the profitability of automatic milking based on different simulation models, but a data-based study using actual farm data has been lacking. The objective of this study was to analyze the profitability of dairy farms having an automatic milking system (AMS) compared with farms using a conventional milking system (CMS) based on real accounting data. In total, 62 farms (31 using an AMS and 31 using a CMS) were analyzed for the year 2003 in a case control study. Differences between the years 2002 and 2003 also were analyzed by comparing a subgroup of 16 farms with an AMS and 16 farms with a CMS. Matching was based on the time of investment in a milking system (same year), the total milk production per year, and intensity of land use (kg/ha). Results from 2003 showed that the farms with an AMS used, on average, 29% less labor than farms with a CMS. In contrast, farms using a CMS grew faster (37,132 kg of milk quota and 5 dairy cows) than farms with an AMS (–3,756 kg milk quota and 0.5 dairy cows) between 2002 and 2003. Dairy farmers with a CMS had larger (€7,899) revenues than those with an AMS. However, no difference in the margin on dairy production was detected, partly because of numerically greater (€6,822) variable costs on CMS farms. Dairy farms were compared financially based on the amount of money that was available for rent, depreciation, interest, labor, and profit (RDILP). The CMS farms had more money (€15,566) available for RDILP than the AMS farms. This difference was caused by larger fixed costs (excluding labor) for the AMS farms, larger contractor costs (€6,422), and larger costs for gas, water, and electricity (€1,549). Differences in costs for contractors and for gas, water, and electricity were statistically significant. When expressed per full-time employee, AMS farms had greater revenues, margins, and gross margins per full-time employee than did CMS farms. This resulted in a substantially greater (but not statistically significant) RDILP per full-time employee (€12,953) for AMS farms compared with CMS farms. Depreciation and interest costs for automatic milking were not available but were calculated based on several assumptions. Assuming larger purchase costs and a shorter depreciation time for AMS than for CMS, costs for depreciation and interest were larger for AMS farms than for CMS farms. Larger fixed costs should be compensated for by the amount of labor that has become available after introducing the milking robot. Therefore, farm managers should decide whether the extra time acquired by automatic milking balances against the extra costs associated with an AMS.

Key words: automatic milking, economics, profitability

INTRODUCTION

In 1992, the first automatic milking systems (**AMS**) were installed in the Netherlands, with a primary goal of replacing labor. In 2004, more than 2,200 farms worldwide were using AMS (de Koning and Rodenburg, 2004). Today, the reasons for investing in an AMS can be divided into social and economic reasons. The most important social reasons for investing in an AMS are that they allow more free time, provide more flexibility, and require less heavy labor—in general, offering a better quality of life (Mathijs, 2004). The economic benefits of automatic milking are mainly the savings in labor and increased production per cow (Wade et al., 2004).

In a model study, labor savings by using an AMS were estimated to be 38% (Sonck, 1995). More recently, Mathijs (2004) conducted a survey among 107 farmers who had invested in an AMS and found, on average, 18% (17 h/wk) of savings in labor. On the other hand, van 't Land et al. (2000) concluded from different studies that labor savings depended on the management capacities of the farmer, and in some cases, introduction of an AMS led to increased labor. Wirtz et al. (2004) reported that milk production could increase up to 20% if cows were milked 3 times daily with an AMS, whereas Wade et al. (2004) found an average increase of only 2% after the introduction of an AMS.

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Several studies have been published on the economic consequences of automatic milking (Arendzen and van Scheppingen, 2000; Hyde and Engel, 2002; Rotz et al., 2003). With some exceptions, the general trend in these studies was that automatic milking has negative effects on the economic performance of the farm when compared with conventional milking. The results of these studies differed substantially. Wade et al. (2004) described a difference of more than €16,000 in labor income. Others (Dijkhuizen et al., 1997; Hyde and Engel, 2002) found a break-even point of €140,000 for a herd of 125 cows and $374,000 for a herd of 120 cows, respectively, making automatic milking economically beneficial. The actual investment for Dijkhuizen et al. (1997) was larger than the calculated break-even points, making the investment in automatic milking not cost effective. The break-even value in the model of Hyde and Engel (2002) was above the costs of the units, indicating that the investment in automatic milking was cost effective. Armstrong and Daugherty (1997) stated that on large farms, a robotic system must sell for less than $21,000 to compete with a conventional milking system (**CMS**). Rotz et al. (2003) reported losses in annual net return of $0 to 300/cow, depending on farm size. In the latter study, the economic life of an AMS and a CMS were assumed to be equal. Arendzen and van Scheppingen (2000) showed, for a farm with a milk quota of 1,000,000 kg of milk, that the room for investment in an AMS depended on a decreased labor requirement and an increased milk yield—a difference that could be up to €189,091 (0% decrease in labor and no increase in milk yield vs. 30% decrease in labor and 15% increase in milk yield).

The economic studies conducted to date have been based on normative models in which the advantages of automatic milking (labor savings and increased production) were compared with increased costs (depreciation, maintenance, and interest). Introduction of an AMS will not only change the milk production and labor requirements but those of the whole operational management (van Vugt, 2005). It is not possible to study this complete change in farm management in a model study. A study on the economic aspects of automatic milking based on actual farm data is still needed. Therefore, the objective of this study was to analyze the profitability of dairy farms with an AMS in comparison with farms using a CMS based on actual farm data.

MATERIALS AND METHODS

Data

Data for this study originated from a Dutch accounting agency (Alfa Accountants en Adviseurs, Wageningen, the Netherlands). This agency is one of the largest bookkeeping agencies in the Netherlands and has customers throughout the country.

A database of 1,400 dairy farms, which contained 57 farms with an AMS, was available for this research. Because not all data for 2004 were yet available, 2003 was used as the year of comparison. Adoption of an AMS is often accompanied by start-up problems; therefore, installation of the AMS must have occurred before 2003. Nine farms installed their AMS in 2003 or 2004 and had to be excluded for this reason. Two other farms were excluded because they used both an AMS and a CMS. Moreover, data from 5 farms were incomplete and incorrect (not verified by an auditor) and could not be used.

A case control method was used in this study. Each farm with an AMS was matched with a farm that had invested in a new CMS during the same year. Dairy farms with a CMS were selected out of the same database. Matching was based on the year of investment in a milking system, the total milk production per year (maximum difference of 10%), and the intensity of land use (defined as milk production/ha, with a maximum difference of 1,000 kg/ha). Ten farms could not be matched based on the chosen criteria. This resulted in a total of 31 farms with an AMS (referred to as AMS31) and 31 farms with a CMS (referred to as CMS31) used in the study. The principal occupation of these farms was dairy production. On these 31 farms, 55 milking units were in use, an average of 1.77 milking units per farm. Twenty-seven farms (46 units) used a Lely Astronaut (Lely Industries NV, Maasland, the Netherlands), 2 farms (4 units) used a Delaval VMS (De Laval VMS, Tumba, Sweden), 1 farm (3 units) used a Zenith (Zenith GM BV, Emmeloord, the Netherlands), and 1 farm (2 units) used a Liberty (Liberty, Zutphen, the Netherlands).

Technical and financial data on the 62 farms (AMS31 and CMS31) were available for the year 2003. To monitor differences in performance over the years, data from previous years were used. Data from 2002 for 16 of the 31 farms with an AMS (referred to as AMS16) and the matching 16 farms with a CMS (referred to as CMS16) could be used. No 2001 data were available.

In total, 244 variables were analyzed in this study. Data on the structure of the farm (labor, land, and livestock) and on the dairy production (revenues, feed costs, livestock costs, and costs of land) were all specified. By using these data, the gross margin could be determined. The nonaccountable costs (costs not directly associated with cattle husbandry or land use, such as contractor costs; costs for gas, water, and electricity; and maintenance and insurance costs of the machinery, equipment, land, buildings, and installations) were used to calculate overall farm profitability.