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The effect of operational managerial practices on economic, technical and allocative efficiency at Swedish dairy farms

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Abstract

The article aims to investigate how operational managerial practices can contribute to improved farm level efficiency at dairy farms. Operational managerial practices are defined as animal health, breeding, and feeding practices. The main contribution of the article is that it investigates aspects that can be adjusted in the every day management to improve farm efficiency. Aspects describing each of the considered managerial practices were regressed on farm level data envelopment analysis (DEA) input efficiency scores based on farm level data from Sweden. The DEA efficiency scores were based on 507 farms, and the following regression analyses were based on 169 farms. The results showed that changes in breeding and feeding practices can affect efficiency. Breeding exactly the number of heifers that was needed for replacement of the dairy cows negatively affected long-run technical efficiency (i.e. not over-using inputs). On the other hand, analyzing forage positively affected long-run allocative efficiency (i.e. using the cheapest combination of inputs) and analyzing fodder grain positively affected short-run economic efficiency (i.e. a combined measure of technical and allocative efficiencies). Feeding the cows hay instead of only silage, reduced long-run economic efficiency. No significant effects of animal health practices were found. These results suggest that the farms in the sample are homogeneous in terms of animal health practices and that inefficient farms cannot become more efficient by adapting to the animal health practices of more efficient farms.
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1. Introduction

Efficient dairy farm production is a desirable goal if the farms are to become and stay profitable and sustainable. This is naturally important not only to the individual farm owner, but also to the society as such, because farms contribute to work opportunities in the countryside and to biodiversity. When comparing the farms in a sample to the best practice farming in the sample at hand, previous empirical literature shows that inefficiency is present in dairy farming. The average efficiency and consequently profits can increase significantly if production is conducted with more intense use of inputs or with combinations of inputs and outputs closer to optimum (e.g. Lawson et al., 2004; Heshmati and Kumbhakar, 1994; Bravo-Ureta and Rieger, 1991). In this literature, potential increases in efficiency were as much as 30% in terms of the overall economic input

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efficiency, which requires both using inputs as intensely as possible and combining inputs optimally. The potential increase in efficiency from only using inputs more intensely was between 5% and 19%.

A question that arises is how the inefficient farms differ from the best practice farms. Profitable and efficient farming can, in many ways, be said to depend on the so-called managerial factor, canalized through decision making (Rougoor et al., 1998). Both in the long run, when strategic factors are decided on and in the short run when factors adjustable in the day-to-day management are considered, the decisions made will influence the pre-requisites of the farm and thus its efficiency. Strategic factors lay a basis of the future performance of the farm and they are especially important when new farms are started or when old farms consider major changes like buying a neighboring farm. Hansson (2007) investigated the effect of strategic factors on farm level efficiency in dairy farms in Sweden and concluded that factors such as size of fields, distance to fields, barn type and equipment for forage production significantly influenced farm level efficiency.

Even though long-run strategic factors lay a basis for the farm and therefore influence farm efficiency, differences in the short-run operational, day-to-day work and managerial practices of the farmer are particularly interesting because these actions are possible to change on a short-run basis. Consequently, identifying how differences in the operational work contribute to increased farm level efficiency is interesting because it helps us understand if the inefficient farms can rapidly improve their production, and if so, how they can do so. The relationships between economic consequences and managerial practices have attracted attention in some previous literature on dairy and other livestock farms. For example, Lawson et al. (2004) concluded that Danish dairy farmers reporting higher frequencies of lameness, ketosis and digestive disorders were more efficient contrary to what they had expected. On the other hand, farmers reporting higher frequencies of milk fever, were less efficient. Sorensen and Ostergaard (2003) found correlations between dairy farm profits and when the first insemination after calving occurred. Galanopoulos et al. (2006) found that several managerial practices such as insemination method, origin of genotype and how the feed was prepared significantly influenced the technical efficiency of Greek pig farms. These results imply that the less efficient farms can become more efficient by adjusting their choices of insemination method, of origin of genotype and of how they prepare the feed to imitate the practices of the most efficient farms.

The aim of the present article is to investigate how operational managerial practices can contribute to improved dairy farm efficiency. The study is conducted in a sample of Swedish dairy farms. Operational managerial practices are defined as aspects describing animal health, breeding and feeding practices. The study differs from the previous dairy farm efficiency literature in particularly three major respects. First, the focus is on operational managerial practices that the manager can change on a short-run basis; in previous efficiency literature, the authors have not explicitly concentrated on factors that the farmer can easily change in the short run. Second, the effects of the operational managerial practices are assessed on technical as well as on allocative and economic efficiencies. Previous literature focusing on managerial practices and efficiency, e.g. Lawson et al. (2004) and Galanopoulos et al. (2006), have not considered allocative and economic efficiencies. Allocative efficiency considers the ability of the farmer to consider cost aspects when combining inputs. Economic efficiency is a wider measure because it measures overall efficiency, including both technical and allocative efficiencies. Inclusion of allocative and economic efficiencies consequently gives a more balanced view of efficiency and how it is affected by the operational managerial practices. Third, the study is conducted at the whole-farm level, in that it considers all major inputs and outputs at the farm when estimating the farm level efficiencies. Previous literature that studies dairy farm managerial practices and efficiency (Lawson et al., 2004) conducts a partial analysis, focusing only on the milk production. However, the efficiency results at the whole-farm level should be more interesting to the individual farmer. If the study is not focused on the whole-farm level, it may suggest actions that do improve the milk production but that deteriorate the whole-farm efficiency.

2. Operational managerial practices at a dairy farm

Three groups of factors, which all are central aspects of the daily farm work, were hypothesized to be part of the operational managerial practices at a dairy farm: animal health, breeding, and feeding practices. All these groups consist of factors that can, if not be totally changed, at least be changed and improved in the daily work. Therefore, they were considered as operational managerial practices and thus included in the study.

2.1. Animal health

2.1.1. Age at the first calving

The age of the heifer at her first calving can be hypothesized to influence efficiency in two ways. First, a heifer that is older at her first birth will be unproductive for a longer period of time. Second, if the heifer is too young, problems related to a first birth that is too early,

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