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COST-SIZE RELATIONSHIPS FOR LARGE-SCALE DAIRIES WITH EMPHASIS ON WASTE MANAGEMENT

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SUMMARY AND HIGHLIGHTS

Overview

The concentration of large-scale dairy operations in the Chino Basin, located about 40 miles east of Los Angeles, poses interrelated environmental, regulatory, and economic problems. The Santa Ana Regional Water Quality Control Board brought dairies under control in 1972 in response to serious water quality problems caused by waste management. The Phase I and II regulations, which control runoff and the application of manure to land, resulted in higher costs to the regulated dairies. Dairymen are uncertain about the possible nature and enforcement of future regulations and lack knowledge of waste management technology capable of satisfying an environmental quality objective of zero degradation from dairy wastes. The ultimate impact of waste control regulations on the cost structure and future economic viability of Chino dairies is a source of concern and is the focus of this study.

Analysis of efficient large-scale dairy production in the context of environmental quality objectives involves consideration of the role of waste management in the production of milk and the underlying cost structure. To this end, short- and long-run costs for large-scale dairying, including waste management, were estimated. The economic-engineering approach was utilized for the analysis. The dairy was disaggregated into five stages: milking, housing, feeding, waste management, and management and record keeping. Within the first three stages, costs were synthesized from detailed analysis of elemental production specifications and restrictions. Particular emphasis was placed on new semi-automated milking techniques and

alternative feeding programs. Cost estimates for the waste management stage were synthesized largely from published sources. Necessary design parameter modifications, however, were made to assure process compatibility with dairy wastes. On-dairy costs in the form of commercial collection services, additional labor, and dairy facility modifications were estimated for each treatment and disposal method.

The dairies considered in this study were organized as specialized single enterprise units producing only fluid milk. Alternative combinations of milking parlor and housing configurations, feeding programs and rations, and equipment and labor complements yielded over 200 different complete dairies. From these, 14 single parlor dairies with capacities ranging from 375 to 1,200 cows were modeled. Short-run average costs were estimated for each of these model dairies. A combination of these single parlor dairies into multiple parlor configurations yielded 15 dairies in the 1,200 to 3,600 cow herd range for a total of 29 model dairies.

Waste disposal methods selected for analysis included three large-scale treatment methods with material or energy recovery capabilities, one municipal disposal method, and current disposal practices. Energy and material recovery capabilities were found to be advantageous for large-scale treatment methods. We demonstrate that separate analysis of dairy and waste disposal costs can lead to a sub-optimal decision since the waste disposal method utilized must be compatible with dairy housing.

The long-run average cost curve (LRAC) was derived as an envelope to the short-run average cost curves. Both semi-automated milking systems and group feeding programs offer potential

efficiencies to large-scale dairies. The dry lot/incineration system was the least-cost waste disposal alternative considered. The estimated LRAC curve reveals significant economies of size in the 375-750 cow range and only slight cost reductions for dairies in excess of 1,200 cows. Annual unit costs, for example, decrease from $1,065 for 375 cows to $1,001 for 750 cows to about $994 for 3,600 cows.

Conclusions and Implications

Dairymen in the Chino Basin are confronted with the difficult task of managing wastes in compliance with stringent environmental quality controls. Under the present industry structure, these controls place considerable stress on the competitive situation of the Chino dairies. However, it is not clear--as some suggest--that dairies will be forced out of business or will relocate out of the Chino Basin. Based on the analysis presented in this study, enforcement of environmental quality controls need not raise the costs of dairy production in the long run. The recent development of improved dairy production techniques, coupled with scale economies available from regional waste treatment and disposal methods, potentially allow for a substantive change in the Chino dairy industry cost structure. The cost of milk production theoretically could decline from present levels and still comply with environmental quality controls. This will require investment in automatic milking parlor equipment and some increase in the average size of dairy.

Care must be taken not to misinterpret the above conclusions. The LRAC curve derived in this study is an estimate of the level of costs that are theoretically possible, and neither explains nor

implies any particular investment path toward this theoretical efficiency frontier. There is no certainty that costs will decline to the LRAC curve. The potential cost savings, however, suggest incentives exist for adjustments leading to a decline in cost and an increase in average herd size. Conditional upon the ceteris paribus assumption that milk price and input price relations remain relatively unchanged, the adjustments would enhance and perhaps preserve a viable dairy industry in the Chino Basin. Milk production levels could be maintained for some time into the future. A dramatic change in the industry structure, however, would be necessary to support this conclusion. Credit availability and managerial capabilities would probably prevent many of the existing dairies, particularly smaller ones, from making the required adjustments. The displaced resources, however, could be consolidated into larger production units resulting in fewer but larger firms.

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