Feeding Strategies for Rearing Replacement Heifers in Small-scale Dairy Production Systems in the Highlands of Central Mexico

Centro de Investigación en Ciencias Agropecuarias (CICA), Universidad Autónoma del Estado de México, Instituto Literario No. 100, Co. Centro, 50000 Toluca, México
*Correspondence: E-mail: caj@coatepec.uaemex.mx


ABSTRACT

The growth of Holstein heifers in the campesino dairy systems in the highlands of Mexico was evaluated in three feeding strategies. Thirty-three heifers from 11 farmers, grouped according to strategy, were weighed every 14 days for 28 weeks. The live weight change over each 14-day period was estimated by individually regressing live weight over period, taking the regression coefficient as an unbiased estimate of live weight change. Regression coefficients were analysed as a randomized design with feeding strategies as treatments. Strategies were as follows: S1: grazed or cut pasture all year, maize silage and maize straw in the dry season, and 1.0–1.5 kg concentrate/heifer per day. S2: maize straw in the dry season, cut pasture forage, grazing of native grass, weeds from maize fields, and 1.0–1.5 kg concentrate/heifer per day. S3: maize straw in the dry season, grazed native grasses and weeds in the rainy season. Live weight gains were: S1, 0.511 kg/heifer per day; S2, 0.271 kg/heifer per day; and S3, 0.252 kg/heifer per day. Despite the better gains in S1, they are 24% below recommendations, arriving to service at 20 months of age. Not rearing their replacements may be a better alternative for campesino farmers under current economic conditions.

Keywords: cattle, dairy, feeding strategy, growth, heifer, live weight, nutrition, smallholders

INTRODUCTION

Small-scale dairy farming has been identified as a viable option to improve the income and overcome the difficult economic conditions faced by poor smallholder campesino farmers in the highlands of Central Mexico. Milk production is an accessible activity, and offers benefits to campesino families and communities, given the daily earnings and employment opportunities it generates (Arriaga-Jordán et al., 2000). Economic analysis demonstrated that small-scale milk production can generate incomes that are as good as or better than migrant campesinos can get from employment as unqualified labour in the cities (Espinoza-Ortega, 1999).

Despite the importance of campesino dairy production systems, both in terms of their contribution to the national milk supply (Muñoz et al., 1995) and in their
potential to improve rural livelihoods, little research has been undertaken in Mexico towards understanding these systems and enhancing their productive capacity (Caste-
lán-Ortega and Matthewman, 1996).

One aspect of major concern in dairy farming is the rearing of replacement heifers (Peters and Ball, 1986), which has been recognised as a weak point at all levels of the dairy industry in Mexico (Llamas, 1996). The objective in rearing replacement heifers is to attain optimal growth, so that they calve at an appropriately early age, at the lowest cost (Peters and Ball, 1986), and can promptly substitute for culled cows in the lactating herd, so returning the investment in feed, labour and other resources. Success in raising replacement heifers is of major importance to the viability and profitability of a dairy enterprise (Radostits et al., 1995). Several studies have demonstrated that it is important to have heifers first calving at around 24 months of age to meet these objectives (Heinrichs and Hargrove, 1987).

To reach a live weight of 480–500 kg for first calving at 24 months of age, the upgraded Holstein replacement heifers in the campesino systems in central Mexico need to grow at an average rate of between 0.6 and 0.7 kg/day from birth to calving (Peters and Ball, 1986; Heinrichs and Hargrove, 1987), reaching their breeding weight of 320–330 kg by the age of 15 months. Lower growth rates of around 0.5 kg/day should occur during the first five to six months of life, to avoid subsequent depression of milk yields (Peters and Ball, 1986) due to rapid fattening, and higher rates in the latter part of their rearing.

Maize (Zea mays) is the main crop in the highlands of central Mexico, being the staple food crop. It is strongly associated with livestock in mixed crop-livestock farming systems, and its use in feeding dairy cattle evolved from the traditional complementary role that cattle had on campesino systems (Gonzalez et al., 1996), based on feeding maize straw and other roughages. As milk sales have become a main source of income, this diet has required supplementation with concentrates to meet the nutrient requirements of lactating cows, resulting in higher costs than occur with diets based on high-quality forage (Arriaga-Jordán et al., 1999).

A diet based on maize straw and other roughages does not meet the nutrient requirements of growing cattle. On top of that, given the cash restrictions under which campesino farmers operate, replacement stock are seen as ‘unproductive’, even though growing heifers are an investment in the future of the herd.

The work reported in this paper was undertaken within the activities of a larger participatory research project with the goal of improving the livelihoods of campesino families by increasing the productivity of their small dairy herds (Arriaga-Jordán et al., 1999). The project originated from the invitation by members of Ejido San Cristóbal, a campesino village in the Valley of Toluca in the highlands of the State of Mexico, in the central part of the country.

The evaluation of ryegrass/white clover pastures (Lolium perenne and L. multiflorum associated with Trifolium repens) integrated with maize silage comprises one of the main objectives of the broader project, which is undertaken through on-farm trials with participating campesino farmers, within a farming systems research and extension framework (Hildebrand, 1990). Some of the participating farmers in the project have started to use cultivated pastures for feeding their replacement stock.