Dairy Production in developing countries

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ABSTRACT

Lack of breeds suitable for commercial dairying is a constraint in Developing Countries (LDCs); however there is some progress. All Latin American Countries have nucleus herds of Holstein or Friesian, compared to 71% of Asian and 52% of African countries. The potential for more exports of animals to LDCs is high, but success will depend on support from exporters in their management. Holsteins born in LCDs will have a body weight at maturity about 125 kg (500-550 kg) lower than expected, lactation milk yield will be 30-50% lower, calving intervals 10-15% longer, age at first calving 25% later and duration of herd life .5 to 1.2 parturitions less. This breed needs feeding at least the equivalent of 2.2 multiples of maintenance in TDN. At this level milk yield will average near 6000 kg, calving interval 410-420 d, age at first calving 29-31 mo, fertility will be 1.8 services per conception and herd life 2.6-3.0 partitutions. This should still result in acceptable levels in both biological and economic efficiency. Imbalances in feeding, foot problems, seasonal breeding and milking sanitation appear among the most pressing problems.

Key words *Dairy development, tropical, Friesian, milk yield, feeding, foot problems, milk sanitation.*

INTRODUCTION

Since the early 1950's, approximately 3.9 million head of improved dairy breeds have been sent from North America, Europe, Australia and New Zealand to Latin America (2.0 mil), Africa and Asia (Iran east to Japan and south to Indonesia). In Africa, 52% of the countries have at least nucleus herds, compared to Asia with 71% and Latin American countries with 100%. Other breeds were popular up to the mid-1960's but, in recent times Holsteins or Friesians have predominated.

Levels of success with imports appear strongly related to national policy on dairy development to include encouraging investment by the private sector. In the warm climate region (N-S 30° latitudes), acceptable efficiency and 65-80% of expected milk yield of pure dairy breeds have occurred in at least eight countries. There are about 15 additional countries where milk yield is increasing at around 50 kg per cow yearly but is still in the range of 3,500-4,500 kg. There is a third group of 10 countries with slightly lower rates of increase. Unfortunately there is also a group of countries (11) with low economic bases where yield per cow is showing some decline (now < 3,000 kg per lactation).

Where countries want change over a short period and wish to encourage the private sector, there are few options in the short term for stock beyond importation. This is attractive to those from dairying counties. My positions are that our dairy breeds are unsuitable for subsistence farms, but are the best that we can offer for a certain sector of dairying in most countries. Success will be determined by how the genotype-environmental interactions are manipulated. The genes of the imported cow remain constant but the way she and her offspring express these genes will likely differ from expectations.

Holsteins or Friesians born in warm climates, along with those in utero upon arrival, weigh 125 kg less than expected at maturity (500-550 vs 625-675 kg). Female birth weight is 33% lower, lactation milk yield is 30-50% lower, calving intervals 10-15% longer, age at first calving up to 25% later and duration of herd life reduced by 0.5 to 1.2 parturitions. Our challenge for continuation of exports, either as bred heifers or fertilized embryos, is to develop guidelines on the feeding and care of a "different cow."

HOLSTEINS OR FRIESIANS IN THE TROPICS

Birth Weight and Growth Rate

An achievable and acceptable body weight of females at maturity is 500-550 kg. In temperate areas, the birth weight of females (32-42 kg) is 6.1 to 6.3% of the dam's 30-day postpartum weight, but in the tropics heifer calves normally average 5.6-5.9% of their dam's weight (ie 28-32 kg). During poor seasons weight at birth may be 20 kg or less, with high mortality due to general weakness. Those which survive are late breeders and usually are at least 30% below the herd average in milk yield.

By 3 months of age, calves in the temperate areas are expected to increase their birth weight by 230%. Calves in the tropics normally achieve 225% of that birth weight by 3 months. At this age, they remain 28 to 30% below the average of animals born in temperate climates. This indicates little or no acceleration in growth to compensate for low birth weight (McDowell 1987).

We like to breed Holsteins at approximately 50% of mature weight. This is usually reached by 15 months of age or less. In the tropics, even with an expected mature weight of 550 kg, half of the mature weight is not reached until 17 months of age or later. Combined with 1.8 services per conception, 29-30 months at first calving is a practical goal. Further, a great deal depends on level of feeding during gestation if Holsteins are to weigh at least 80% of mature weight at first parturition to avoid a high incidence of dystocia.

Improved feeding in the tropics can increase growth rates by 5-10% over that indicated above, but growth will not reach that for temperate areas. Temperatures >27°C will depress appetite, and the necessity to promote heat loss requires additional energy. This increases maintenance requirements by 10-15% during part of most days of the year (NCR 1981). Suggested guidelines on weights from birth to maturity for the tropics are available in McDowell (1985).

TABLE 1 Acceptable performance levels for Holsteins in the U.S. (645 kg), Taiwan (525 kg) and Indonesia (520 kg).

Trait	Acceptable			Herd av[a]
	U.S	Taiwan	Indonesia	Taiwan
Milk yield (kg)				
1st lactation	6,000-7,000	4,500-5,300	4,500-5,000	4,690
later lactations	8,000-9,080	6,000-7,000	5,400-6,000	6,419
Milk fat %	3.7	3.4-3.6	3.3-3.4	3.3
1st calving (mo)	24-26	29-30	30-31	32
Calving interval (d)	395	410	420	432
Entry rate, heifers (%)	25	25	25	29
No. lactations/cow	3.2-3.4	3.0-3.2	3.0-3.2	2.6
Culling				
Infertility	8	8-10	8-10	10
Other	14	14	14	18
Calving to 1st breeding (d)	<70	<100	<115	137[b]
Preg. 1st serv. (%)	53-55	45	45	41
Serv/Conc.	1.4	1.8	1.8	2.3
Days dry	60-65	70-80	80-85	111
Wt. 1st calving (kg)	515	490	485	480
Mature wt (kg)	630	510-540	510-530	528
Somatic Cells (% < 141,000)	80	70	70	46

[a]1990 average for 128 herds

[b]October - May calvings 111, June - September 156d

Performance

Acceptable rates of performance for Holsteins in the U.S. and in Taiwan or Indonesia for numerous traits are listed in Table 1. To obtain good levels in both biological and economic efficiency, it is recommended that lactating cows in America be fed the equivalent of 2.9 or higher multiples of maintenance requirements in TDN. But in the tropics, a feeding rate of 2.2 multiples of maintenance appears best at this time. This will permit 60-65% of the energy for production. If feeding is lower milk yield will be less, but the effects on correlated traits such as reproduction, will be marked.

The 1990 rolling herd averages for Taiwan (Table 1) show that levels of milk yield approach an acceptable goal for both first and later lactations. For most other traits significant changes are still needed even though progress is being made. Since 1987, milk yield per lactation has risen 600 kg, milk fat % increased from 2.9% to 3.3%, age at first calving declined from 34 to 32 months, calving interval has decreased by 6d on average, heifer entry rate has declined by 2%, number of lactations completed has risen from 2.3 to 2.6, and mature weight has increased by 23 kg. As producers become better trained in the use of records for herd management, further adjustments will transpire (McDowell 1991).

The suggested goals in performance at this time for Indonesia are lower than for Taiwan because of feed resources and lack of farm records to clearly identify problems (McDowell 1989).

Feeding

Major problems for Holsteins are the adequacy or quantity of available nutrients, the quality of feeds and other ration imbalances. Holsteins cannot achieve an acceptable level of biological efficiency on tropical grass pastures or chopped green forages alone, such as Napier grass. Supplementation and ration balancing are necessary. For example, herds in Taiwan were feeding an average of 30-35k kg of chopped Napier grass (15-17% DM), as well as 6 kg each of wet brewery grain, distillers grain and soya waste (all 20-22% DM) and 8 kg of concentrates. According to estimates, this should fulfill the maintenance requirements for 525 kg cows producing 20 kg of milk per day with a 3.4% milkfat test. Realized milk yield was 14.4 kg and, rebreeding was poor as cows could not make efficient use of a ration so low in DM. In addition, 50-60% of most cows were showing severe laminitis in the rear feet. The ration was not only low in dry matter, but the calcium to phosphorus ratio of 1:1.2 was intolerable. Total fibre was considered to be adequate, but the neutral detergent fibre (NDF) level was extremely low leading to low pH in the rumen. Reducing the chopped Napier grass to 24kg, replacing the distillers grain with 3-4 kg of long cut Pangola grass hay and adding calcium equivalent to 0.5% of DM, brought milk yield above 20 kg, essentially eliminated foot problems, and improved rebreeding rate significantly.

The conclusion is that it is best to limit the level of feeding of green cut grasses, add some dry forage, preferably hay, to maintain a mat in the rumen as an aid in rumen function and use a concentrate mix with a minimum of 64% TDN and 18% CP, with supplementary calcium added. In most instances, 35% of the concentrate needs to come from grains, with 60% from cake and bran by-products and 5% from urea and minerals. Use of 35% grains reduced or partially alleviated the problems arising from the calcium-phosphorus ratio cited for herd feeding in Taiwan (McDowell 1991).

Foot Problems

Foot problems in Holsteins in humid areas can often be the highest direct and indirect causes for culling. The most frequent rank of causes are crippling from laminitis due to poor feeding, overgrowth of hooves from near continuous wet floor surfaces (foot trimming is seldom practiced) and infectious organisms. The average length of herd life in Taiwan in 1987 was 2.2 to 2.4 lactations, with many losses attributed to poor feet. Initiation of some foot trimming and adding long cut dry hay to the ration increased herd life to 2.6 calvings in 1990. The goal is to raise the average to 3.0 or better calvings by 1993. Providing access to a dirt exercise lot with a slope to maintain dryness for 2h during the day for cows and heifers and for cows at night for rapid body cooling is strongly recommended.

TABLE 2 Monthly distributions (%) for conception and calving of cows and heifers in Taiwan

Month of Conception	% Calving		Calving Month
	Heifers	Cows	
May	6	9	Jan
June	9	6	Feb
July	9	5	Mar
Aug	8	4	Apr
Sept	15	3	May
Oct	7	7	June
Nov	8	11	July
Dec	10	12	Aug
Jan	6	11	Sept
Feb	9	11	Oct
Mar	9	11	Nov
Apr	5	10	Dec

Reproduction

It is considerably more difficult to sustain a calving interval of even 415-420d in the tropics compared to 395 to 400d in

temperate areas. In North Carolina, Mexico and Puerto Rico the average calving interval is 415d under good management. Seasonal effects are large in all locations as illustrated by records from Taiwan with an annual average of 432d (Table 2). The low proportion of cows calving from February to May in Table 2, indicates conception rate is quite low from June to September. Many of the dairymen in all four locations are either not breeding cows from June to September because a low diurnal level in day-night temperatures prevents restoration of heat balance, or they are using low cost semen due to poor returns for their efforts. To counter the long calving interval, the first priority is good feeding throughout lactation in order to extend the duration of profitable milk yield. Usually heifers show a lower response to season effects. Hence their breeding is emphasized during the hot months to counter the low months for cows.

Recording of estrus of heifers is needed to help in locating problems of delayed breeding. For instance, in Taiwan the average age at first calving was 32 mo. even though 64% calved <30, 8% 31-35 mo and 28% 36-40 mo. This suggests that over half the heifers are doing satisfactorily. Surveys revealed that the majority of the 36-40 mo group were kept in small confined areas or tie stalls with little or no exercise. An opportunity for daily exercise seems to decrease the proportion of slow breeders. Placing cows on dirt lots to check for estrus is especially recommended for Holsteins as standing estrus is about 40% longer than on concrete surfaces.

Providing a modest bonus is a worthy investment for improved breeding efficiency, particularity with the lactating herd when hired labor is used. This is widely practiced in Puerto Rico and Mexico.

Milking Sanitation

Almost without exception during the first decade of dairy development with improved dairy breeds, bacteria counts in the milk offered in the market is so high that rate of acceptance can be disappointing. This arises from inexperience in handling milking machines, poor udder sanitation at milking and general farm sanitation.

On average, the incidence of clinical mastitis for Holsteins in the tropics appears slightly greater than for temperate areas. Estimates from somatic cell counts (SCC) also indicate that the incidence of sub-clinical mastitis can be quite high. For example, 54% of the cows in Taiwan in over 200 milk recorded herds had >142,000 SCC, 42% of these from 142,000-1,130,000 and 13% > 1,130,000. There were indications of seasonal effects, especially for SCC >142,000, varying from 58% from July to September compared to 53% for the other months. Cows with consistent monthly SCC >150,000 averaged 17-19% lower in milk yield than cows <150,000. Sometimes it is a slow process to get producers to recognize that lowered milk yield from high SCCs is costly in feed efficiency.

Some Indications

With few exceptions, the demand for locally produced milk for urban populations will rise at the rate of 2-6% per annum in countries of the N-S 30° latitudes. Private investors alone or those working under some form of government subsidy will be the main innovators. Thus far, the private sector seeks rapid returns. Hence, they are more likely to "plunge" with imported pregnant heifers of dairy breeds. Although this suggests the market for export animals is good, success will depend on careful indoctrination of the buyers on the "minimum needs" for the acceptable efficiency of Holsteins. Imbalances in offered rations, metabolic disorders and milking sanitation are among the most urgent problems.

The tropical environment produces a smaller Holstein or Friesian. Acceptable levels of biological and economic efficiency can be obtained when managed appropriately.

There is a yet little evidence of sire of origin (McDowell *et al.*, 1976). To build good genetic bases, the use of progeny tested sires and/or pedigree selected sires from AI studs appears best (Abubakar 1986, 1987a, 1987b; Camoens *et al.*, 1976; Romero 1986). The keeping or records is crucial in building a dairy program with improved dairy breeds (McDowell 1991).

For the foreseeable future, semen and live cattle offer the best prospects. Private investors do not like to wait 3 or more years for returns and they are aware of possible "permanent maternal effects" when large breed embryos are placed in local cattle (25-27 kg calves).

Another caution is that stabilizing exports will be like playing the piano, alternating and touching new keys produces a tune. Probably the best "steady market" is yearly or biannual purchases of partial herd replacement needs with bred heifers. The best potential is in high land value areas. For example, breeders in Puerto Rico and in Mexico near Mexico City find it profitable to buy well grown heifers from the U.S. and Canada. Dairymen in Taiwan and South Korea are following suit.

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