Status and prospects of the dairy goat industry in the United States

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Status and Prospects of the Dairy Goat Industry in the United States[1]

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ABSTRACT: Among the major classes of U.S. livestock, dairy goats have yet to achieve USDA statistical reporting of their numbers, amounts of milk produced and processed, and cheese and other products marketed. However, the USDA has published buck proofs of approximately 16,000 does annually from Dairy Herd Improvement Association (DHIA) records of the Alpine, LaMancha, Nubian, Oberhasli, Saanen and Toggenburg breeds, thereby encouraging genetic progress. This represents a 1% participation in DHIA of the estimated 1.5 million U.S. dairy goats. Annual breed registrations are led by Nubians (11,000), and the leading states in descending order are California, Texas, Ohio, New York, and Pennsylvania. Breed average milk yields range from 960 kg of milk for Saanen to 726 kg of milk for Oberhasli. Average milk contents range from 4.5% fat and 3.69% protein for Nubian to 3.3% fat and 2.98% protein for Toggenburg. Leading lactation records are 3,023 kg of milk (Toggenburg) and 174 kg of fat (Nubian). Total annual registrations are 45,000+ animals by 16,000+ member breeders. Estimated total U.S. goat milk commercial production is 24,000+ t, with half going into commercial farm goat cheese production of 640+ t. Recent years have seen significantly increased numbers of dairy goat research projects and publications from Oklahoma, Texas, California, Georgia, Alabama, Florida, Louisiana, New York, Connecticut, Delaware, and Massachusetts. Furthermore, annual national and international symposia, annual national goat cheese judging competitions and workshops, an active national goat research foundation, representation on the National Interstate Milk Shippers Committee and Mastitis Council, and formation of a national association and council for the development and promotion of dairy goat products indicate an evolution from former emphasis on purebred breed development to a focus on market development. The conclusion is that dairy goats are emerging as a necessary and recognized U.S. industry.

Key Words: Dairy Goats, Sire Evaluation, Cheese, Production, Records

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Introduction

A world population of more than 590 million goats (FAO, 1991) is kept for the production of meat, mohair fiber, cashmere fiber, and dairy products and for brush control, work and companionship, and as "cash on the hoof." In some countries goats have a significant economic role (Table 1), even exceeding numbers and importance of cattle or sheep. Dual-purpose goat breeds for meat and milk predominate in numbers in many countries, but the Swiss breeds have been developed as single-purpose breeds for milk emphasis and they produce more milk daily and have longer lactations than any other breeds (Haenlein, 1981). Countries in Europe and around the Mediterranean region have the most developed dairy goat industries and dairy goat-focused research (e.g., France, Norway, Germany, Greece, Italy, Spain, Cyprus). In recent years, extensive dairy goat research also has been published from other countries, especially India, Iraq, and Nigeria, which do not have well-organized dairy goat industries but keep great numbers of goats for multiple production purposes.

Goats were among the first arrivals with the early European settlers to the United States but have lagged behind cattle and sheep in breed organization and market development. Often identified with the "small" farmer or hobby farmer, goats in economically difficult times have provided important sustenance, self-sufficiency and survival, earning the nickname of "cow of the poor man," which status in many parts of the developing world is still true (Haenlein, 1992a).

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Table 1. World leaders in goat milk production (1,000 t)[a]

Country	Production	Country	Production
India	2,000	Brazil	135
Iran	897	Italy	125
Pakistan	666	Mexico	125
Somalia	640	Kenya	101
Sudan	528	Ethiopia	99
France	520	Bulgaria	62
Bangladesh	499	Iraq	62
Greece	465	Portugal	43
Spain	410	Germany	35
Turkey	389	Norway	29
Russia	350	Cyprus	23
Algeria	210	Czechoslovakia	19
Indonesia	180	Switzerland	18
Yemen	156	Israel	15
China	155	Tunisia	12
Mali	140	Austria	11

[a]Estimates; no figures for United States (FAO, 1991).

Even *The Wall Street Journal* some years ago called goats an inverse index to economic prosperity, meaning that goat numbers dwindle when a country experiences economic good times. This has been true in several industrialized countries, in which great numbers of goats existed before and during World Wars I and II and the depression years. However, there is a new awareness in industrialized countries that dairy goats provide not only for the starving and poor but also for the affluent. Connoisseurs of gourmet foods are willing to pay high prices for certain goat milk products that often are imported into the United States. In addition, people showing allergic reactions to cow milk or who have other digestive afflictions can benefit from goat milk products (Nestle, 1987).

Statistical Dimensions

Dairy goats are becoming recognized as a U.S. industry (Maxey, 1993). However, they have yet to reach the status of other farm animals of annual or even monthly data reporting by the USDA Statistical and Economic Research Service (FAO, 1991; Campbell, 1992). Important but untabulated data include goat numbers in each state or region, the amounts of milk produced, amounts of goat cheese, milk powder, yogurt, and pasteurized or UHT milk processed and the dollar value of each, exports and imports, and availabilities of semen and embryos. Other, but minor production items include goat butter, goat ice cream, goat soap, and miscellaneous cosmetic products.

Statistical dimensions are derived mostly from the two national dairy goat trade magazines (*Dairy Goat Journal*, Wisconsin; *United Caprine News*, Texas) and records of participating dairy goat breeders in the national Dairy Herd Improvement Association (**DHIA**). The DHIA was established for dairy cattle but expanded a few decades ago to accommodate dairy goat milk record keeping. Cost of participation relative to cost per cow for dairy farmers is high for dairy goat farmers because of the monthly herd assessment for the frequently small goat herd sizes. Dairy goat participation in DHIA of approximately 16,000 does per year in the United States is approximately 1% of the estimated total dairy goat population of 1.5 million. The records are analyzed by the USDA and provide the official annual national buck proofs (NCDHIP, 1985) (Table 2), which are internationally recognized and have aided U.S. dairy goat exports (Wiggans and Hubbard, 1991). Other countries with commercially significant goat milk production have higher record keeping participation (Rubino, 1990) (e.g., 20% in France, 44% in Norway [Table 3]).

Table 2. Leading official U.S. dairy goat buck proofs[a]

Breed	Predicted difference, milk, kg	Reliability, %
Alpine	135	89
LaMancha	103	71
Nubian	146	95
Oberhasli	53	76
Saanen	166	72
Toggenburg	125	80

[a]The USDA-DHIA genetic evaluations of registered dairy goat bucks contain the following data besides registration number and name: number of herds, number of daughters, number of lactations, repeatability, predicted difference for milk, fat, protein, and percentile for milk, fat, protein; based on a long-standing contract between the American Dairy Goat Association and USDA (Wiggans and Hubbard, 1991).

Annual registrations of pedigreed U.S. dairy goats are presently around 46,000 by approximately 12,000 adult and 5,000 junior breeder members (Table 4). The Nubian is numerically the leading dairy goat breed in the United States. States leading in dairy goat numbers are, in descending order, California (by far), Texas, Ohio, New York, Pennsylvania, Oregon, Washington, and Wisconsin. Generally, most of these states also permit raw milk sales by certification license. Major breed activities have been and continue to be breed shows that are officially sanctioned under strict rules of entry and conduct. These breed shows provide pedigree points that aid the sale of breeding stock. The sanctioned shows also may include officially supervised 1-d milk yield and milk composition tests. These tests provide data, in absence of DHIA information, that are converted to lactation credits for pedigrees.

Lactation Records. Official lactation records of 305-d length are published from USDA files in the two trade magazines annually (Table 5). They show the three long-established Swiss breeds (Toggenburg, Alpine, and Saanen) leading in milk production at levels exceeding 10% of body weight per day (e.g.,

Table 3. Participation in goat milk record keeping in major dairy goat countries[a]

Country	Annual official goat milk records, 1,000	Participation of total dairy goat population, %
France	240	20.0
Norway	30	43.8
Spain	16	.7
United States	16	1.1
Italy	8	.8
Netherlands	6	14.5
Switzerland	5	5.5
Cyprus	3	3.0
Czechoslovakia	2	2.9
Israel	1	9.0
Finland	.2	7.8

[a]Rubino (1990).

2,695 kg of milk/305-d lactation of a 68-kg body weight Saanen = 8.8 kg of milk/d and 12.9% of body weight) (Table 5). Oberhasli, another Swiss breed, and the U.S.-developed LaMancha are more recently recognized breeds in the United States. The Nubian—derived from the Indian Jamnapari, the Egyptian-Nubian Zaraibi, and Anglo-Saxon ancestors—has been compared to the Jersey cow, because of their relatively high milk fat contents. Otherwise the Nubian, unlike the Jersey, is a more dual-purpose breed with emphasis on meat and milk. The Swiss goat breeds have been compared to Holstein dairy cattle because of their single-purpose breeding for high milk yields and low milk fat contents.

Breed Averages. United States official breed averages show Saanen highest in levels of milk production and Nubian highest in percentage of milk solids (Table 6). There are no official milk production records for other goat breeds in the United States (e.g., the Pygmy goats, Angoras, Cashmere, Boer, and Spanish goats). The DHIA records of registered and non-registered goats, including monthly management data (e.g., somatic cell counts, breeding and reproductive information), are available from nine approved dairy records processing centers (AgriTech Analytics, Tulare, CA; Mid-States DRPC, Iowa State Univ.; Michigan DHIA Inc., Lansing, MI; Minnesota DRPC, Univ. Minn.; Cornell DRPL, Cornell Univ.; DRPC @ Raleigh, North Carolina State Univ.; Pennsylvania DHIA Service Center, Penn State Univ.; DHI Computing Service Inc., Provo, UT; Wisconsin DHIC, Madison, WI) (Wiggans, 1992).

Commercial Sales. Total milk production by U.S. dairy goats has been estimated at 600,000 t (Haenlein, 1992a), worth approximately $500 million. Approximately 300 farms and businesses presently sell goat milk or milk products, including 35 commercial goat cheese producers and one large goat milk powder processor (Haenlein, 1983; 1986). Mixing goat and cow milk is illegal in the United States, unlike the situation in some other countries with commercial goat milk production. Therefore, U.S. cow milk processors are practically eliminated from also handling goat milk and its products, thereby stifling the dairy goat industry. Nevertheless, approximately 12,000 t of goat milk is commercially processed annually as fluid, evaporated, UHT or powdered milk. Another 12,000 t of goat milk goes into various types of goat cheeses, mostly of the French soft-type chevre (Stern, 1992). This current U.S. goat cheese production has evolved from almost none 15 yr ago (Anonymous, 1992). At an average yield of 15% goat cheese from milk, the present U.S. goat cheese production has reached approximately 640 t/yr, equaling the amounts of imports of goat cheese from France. Other goat cheese exporters to the United States include Spain, Greece, Norway, Israel, and Bulgaria. Goat milk products,

Table 4. United States dairy goat numbers[a]

Item	Year			
	1970	1980	1990	1993[b]
Registrations, total	6,792	46,683	43,181	46,100
Nubian, females				11,000
Alpine, females				7,000
LaMancha, females				4,000
Saanen, females				3,000
Toggenburg, females				2,500
Oberhasli, females				1,000
Transfers	—	—	20,157	22,600
Adult members	1,594	17,690	11,452	11,211
Junior members	—	—	5,043	5,451
Sanctioned shows	134	763	—	1,604
Show entries	15,936	75,000[b]	—	—
DHIA records	—	16,000[b]	—	—

[a]Haenlein (1981), Maxey (1993).
[b]Estimates.

Table 5. United States dairy goat breed leaders in milk production in a 305-day lactation[a]

Breed	Year	Milk, kg	Fat, kg[b]
Alpine	1982	2,916	140
LaMancha	1991	2,454	81
Nubian	1985	2,423	174 (1984)
Oberhasli	1988	1,836	73 (1991)
Saanen	1982	2,695	102 (1984)
Toggenburg	1983	3,023	102 (1986)

[a]Wierschem (1993).
[b]Year in parentheses if different from milk record.

such as butter, ice cream, yogurt, cosmetics, and soaps are smaller in volume but are found mostly in natural food stores. A large but unknown volume of goat milk in the United States goes into feeding milk-finished veal and pigs and for nursing of orphaned farm, pet, and zoo animals.

The goat milk market has three facets: 1) home use, 2) gourmet cheese and natural food stores and fine restaurants, and 3) medical needs. The first is the traditional backbone of the dairy goat industry. The second is a fast-growing new market phenomenon. The third, though not well researched, is widely documented in anecdotal literature (Haenlein, 1992b; Nestle, 1987). It has been estimated that approximately one person in 1,000 in the United States has a medical need for goat milk. At 1 kg of goat milk per week, this translates into a minimum potential goat milk market of 12,000 t/yr (Haenlein, 1986). The development of this market potential depends on capital, appropriate product prices, and promotion.

Prices. Production costs of goat milk exceed those for cow milk by a ratio of at least 2:1 (Anonymous, 1991b), mainly because of the difference in economics of scale. This is in spite of milk production by Swiss dairy goats that frequently exceeds production even by Holstein cows on a body weight basis (Table 5). Unlike cow milk, goat milk is not regulated by an official pricing system or by any regional milk marketing orders in the United States. For grade A 3.5% fat goat milk, the producer farm gate wholesale price range has been from $26.40 (approximately equal to that of cow milk) to $96.80/100 kg (Anonymous, 1991b). The higher price usually is for milk going into processing of gourmet-type goat cheeses. The DHIA records have shown income-over-feed costs for dairy goat farms on 54 Northeast herds to be $289 to $667 per 305-d lactation (Haenlein, 1992a). Corresponding milk production averages were 605 to 1,146 kg. Assuming that feed costs were approximately 50% of total production costs, the gross annual income per milking goat would then be between $500 and $1,300. Under prevailing feed prices and accounting for the value of one kid per doe and the manure, the net cost of producing goat milk was calculated to be $70.40/100 kg (Haenlein, 1992a). This cost of production is above milk sales prices received by many goat farms, possibly explaining the slow emergence of the U.S. dairy goat industry.

As an alternative to the sale of liquid milk, feeding of goat milk to veal and pigs and for the production of heavy kids (approximately 20 kg body weight) is becoming an important market element in metropolitan and in southern U.S. areas. The optimal economics of use of milk either for liquid sales or for feeding to produce meat can be determined on the basis of a formula (Gall, 1988):

Table 6. United States annual dairy goat breed averages in 305-day lactations[a]

Breed	1979	1984	1989	1992
Alpine, kg of milk	840	872	904	860
% fat	3.7	3.5	3.6	3.6
% protein	—	—	3.06	3.09
LaMancha, kg of milk	722	755	778	774
% fat	3.8	3.8	3.8	3.8
% protein	—	—	3.29	3.27
Nubian, kg of milk	687	700	714	740
% fat	4.5	4.5	4.6	4.5
% protein	—	—	3.66	3.69
Oberhasli, kg of milk	—	—	—	726
% fat	—	—	—	3.8
% protein	—	—	—	3.07
Saanen, kg of milk	864	887	944	960
% fat	3.5	3.4	3.5	3.5
% protein	—	—	3.02	3.00
Toggenburg, kg of milk	842	872	870	898
% fat	3.3	3.3	3.4	3.3
% protein	—	—	3.01	2.98

[a]Wierschem (1993).

Table 7. Annual kidding distribution of 3,348 dairy goats on DHIA in western states (United States)[a]

Date	Numbers	Date	Numbers
February 1992	196	February 1993	638
March	972	March	1,138
April	820	April	930
May	524	May	507
June	175	June	175
July	62	July	69
August	22	August	108
September	47	September	31
October	63	October	101
November	93	November	100
December	101	December	43
January 1993	218	January 1994	177

[a]S. Smith, personal communication.

$$R = (\text{kid BW gain} \times \text{BW price})/(\text{milk amount fed} \times \text{milk price}).$$

If R < 1, then goat milk is more economically sold as milk in the market than fed to kids. If the kid price is at least six times the milk price, then feeding milk for meat production is more profitable than selling as fluid milk, based on a minimum milk:meat conversion efficiency of 6.0. The above formula can be used to calculate the price of kid meat that must be received to break even (R = 1) with fluid milk sales prices. If goat milk was $82.50/100 kg, the required price of goat kid for meat would be

$$\$/\text{kg} = (\$82.50/100 \text{ kg of milk} \times 120 \text{ kg of milk})/(20\text{-kg kid}) = \$4.95.$$

When kids sell only for $2.20/kg, as is presently often seen, the value of goat milk ($/100 kg) fed to kids based on kid price would be below production costs:

$$\$/100 \text{ kg} = ([20\text{-kg kid} \times \$2.20/\text{kg}]/[120 \text{ kg of milk}]) \times 100 = \$36.67.$$

Break-even prices for goat milk depend also on lactation length and total production of milk per lactation. Production levels per herd and year at 682, 909, 1,136, and 1,364 kg of milk would require farm gate prices of $51.63, 38.72, 30.98, and 25.81, respectively, to break even (Yazman, 1983). At reasonable milk production costs per goat (feed, buck service, veterinary, and milking supplies) and crediting for manure and two kids per year, a net cost of $282.15 per goat per lactation is $70.40/100 kg milk (Haenlein, 1992a).

A major part of the cost difference between producing cow and goat milk is explained by different labor costs (Kapture, 1991). In a study of looking at the time required by labor for milking of cows vs goats, the range was 57 min to 2.4 h/100 kg of goat milk vs 6.6 min to 31 min/100 kg of cow milk. If labor cost was $6.00/h, the labor cost just for milking cow milk would be $3.08/100 kg vs $15.40/100 kg of goat milk. These data are also useful in determining minimum and break-even prices for goat milk when making goat cheese, assuming a yield ratio of 7 kg of milk for 1 kg of goat cheese.

Infrastructure

In most areas of the United States, dairy goat farms are widely scattered, making the pooling of milk for processing or transport to market costly. Many goat milk producers are located far from processors, resulting in high transportation costs ($3.30 to $3.85/100 kg). When transport is less frequent than alternate days or when in non-refrigerated trucks, milk quality is lowered. Marketing of U.S. cow milk is strictly regulated in each state, but 22 U.S. states do not have regulations that deal with the production, processing, or marketing of goat milk (Haenlein, 1986, 1992a). Approximately 70% of the larger U.S. cities have no supply of fluid goat milk at all. In many counties, the veterinary, equipment and feed supplies, as well as Cooperative Extension Service expertise, are not specifically available for dairy goats. These needs and applications are extrapolated usually from published data of other farm animals of similar size or production, regardless of documented species differences. United States goat milk production is mostly seasonal (Table 7, Figure 1), and only powder and cheeses are available year-round. The goat milk industry has not dealt well with the problem of seasonality compared with many fruit, nut, and vegetable industries that have similar situations.

National Programs

For many years the U.S. dairy goat industry has had at least two national organizations for the

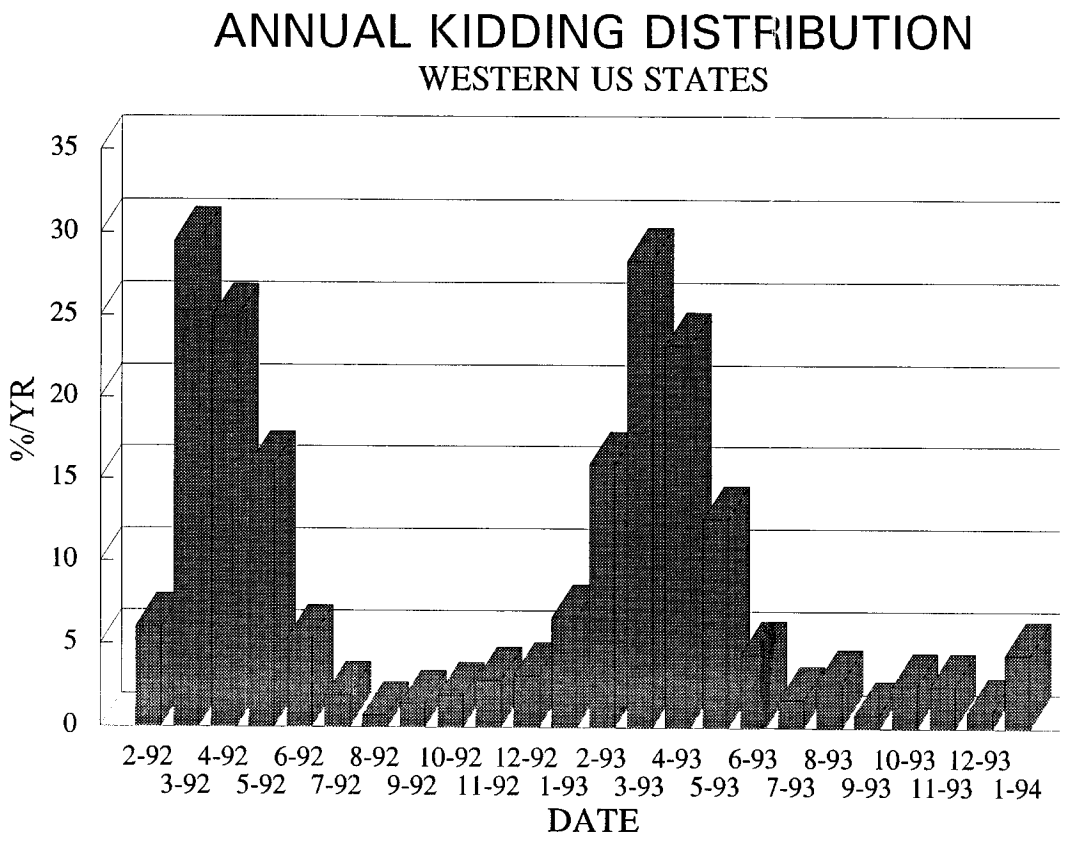

Figure 1. Annual kidding distribution, western U.S. states from February 1992 to January 1994 (S. Smith, personal communication).

purpose of registration and evaluation of purebred pedigreed animals. Considerable success was made in developing internationally recognized high-producing goats. The American Dairy Goat Association (**ADGA**) is similar to U.S. dairy cattle breed associations in function but has evolved as the major organization for all U.S. dairy goat breeds. The ADGA also has the responsibility of supervising DHIA record keeping for registered animals. Unlike the cow milk industry, ADGA and the goat milk industry have no regular funding resources for promotion or research and development programs. The ADGA established a Dairy Goat Council and the American Dairy Goat Products Association (**ADGPA**) with contributions from membership dues (Campbell, 1992) for supporting the fledgling U.S. dairy goat industry. Paralleling these efforts are the activities of the American Cheese Society, which focuses on farm cheeses, including goat cheese production. Through its annual cheese judging contests and workshops, the American Cheese Society has stimulated progress in U.S. goat cheese production in various parts of the country from essentially nothing 15 yr ago to more than 640 t/yr now (Stern, 1992).

These developments were substantially aided by national support for more research in goat husbandry and technology. Dairy goats were benefitting from the economical importance and attention that Angora goats, especially in Texas, had achieved. The National Research Council commissioned the first national bulletin on nutrient requirements of goats; the Cooperative Extension Service contracted for the publication and wide dissemination of the first Goat Extension Handbook; new research centers were established with the sole responsibility for goats in California, Texas, Oklahoma, Georgia, Florida, Alabama, and Louisiana. These new efforts added to established research with dairy goats in Pennsylvania, New York, Illinois, Connecticut, Delaware, and USDA centers. Langston University in Oklahoma has been especially productive in new research publications and attracting visiting scholars for dairy goat research. The ADGA also organized a Research Foundation to attract private money for funding the USDA buck proofs and a few selected research projects. The International Goat Association led by U.S. scientists stimulated a new research focus by sponsoring in 1987 a new monthly Small Ruminant Research journal and every five years an international conference for reporting and reviewing new research (Haenlein, 1992a,b).

Table 8. Somatic cell count (SCC) distribution in milk of dairy goats on DHIA in western states (United States)[a]

Date	No. of goats	DIM	Milk, kg	Fat, %	% low SCC	% high SCC	Avg. SCC
2/92	2,276	189	1.2	4.1	31	24	832
3/92	2,902	121	2.0	4.1	43	16	608
4/92	2,796	91	2.7	3.9	50	15	752
5/92	3,065	99	3.4	3.5	50	12	528
6/92	3,247	120	3.2	3.3	45	14	576
7/92	3,413	147	3.1	3.3	48	13	544
8/92	3,047	169	2.7	3.4	33	21	816
9/92	2,913	194	2.4	3.7	31	22	832
10/92	2,897	218	2.0	3.9	29	25	912
11/92	3,061	239	1.7	4.1	28	25	864
12/92	2,883	255	1.2	4.3	22	33	1,024
1/93	2,795	246	1.1	4.2	27	28	928
2/93	3,292	188	1.2	4.1	35	29	720
3/93	3,161	121	2.1	4.0	46	15	576
4/93	3,404	100	2.8	3.7	47	13	624
5/93	3,978	102	3.0	3.4	50	12	528
6/93	3,737	119	3.1	3.3	36	18	752
7/93	3,903	147	3.0	3.3	37	19	736
8/93	3,549	173	2.7	3.3	33	21	1,000
9/93	3,376	200	2.4	3.6	26	29	992
10/93	3,235	221	2.0	3.9	28	26	880
11/93	3,129	237	1.8	4.3	23	30	1,328
12/93	3,664	244	1.4	4.2	21	36	1,216
1/94	2,750	243	1.1	4.2	26	29	896

[a]S. Smith, personal communication; SCC = somatic cell count; Fossomatic data; DIM = days in lactation; milk $kg \cdot d^{-1} \cdot goat^{-1}$; % low SCC < 283,000; % high SCC > 1.13 million; average SCC in 1,000; rolling herd average 365-d milk production 835 kg/goat.

Milk Quality Standards

United States goat milk production has been subject to the health regulations and standards of the national and state dairy cattle health codes, but research demonstrated reasons for different regulations and standards. In 1993 the U.S. standard somatic cell count for commercial goat milk was kept at 1 million/mL, whereas the maximum level allowed for cow milk was lowered to .75 million/mL (Hinckley, 1994). This was not because of admitted failures in accomplishing desired sanitary conditions (quite to the contrary), but because research had shown species differences in anatomy, physiology, and microbiology between goats and cows. These demonstrated differences in their milk justified different standards for cows and goats without endangering human food safety (Haenlein, 1980; Atherton, 1992). It is widely accepted that somatic cell counts are a valid indication of abnormal milk secretion, milk composition, and mammary disease conditions in cows; however, this does not seem to be the case for goat milk to the same extent. Even the appropriateness of a maximum somatic cell count as a legal indicator of goat milk abnormality has been questioned (Atherton, 1992).

The topic of goat milk quality is complicated by two conditions. Most relevant research has been foreign, from France, Italy, Spain, Finland, Greece, and India. Most U.S. dairy goat breeding and milk production is seasonal (Table 7, Figure 1), and typically, entire herds are in the same late stage of lactation during the fall and winter (Schultz, 1993). Somatic cell counts increase for both cows and goats in the later stages of lactation (Rota et al., 1993). If members of a dairy cow herd are normally in various stages of lactation producing mixed milk, then a single maximum standard of somatic cell counts makes sense. If members of a dairy goat herd, on the other hand, are normally only in one stage of lactation because of seasonal breeding (Table 7), a year-round single maximum standard of somatic cell count for goats discriminates unfairly against goat milk producers.

A survey was conducted of 1,230 bulk tank goat milk samples from 103 commercial goat milk producing farms in 11 U.S. states during 1984 to 1991 (Anonymous, 1991a). Tests using the direct microscopic cell count, the Fossomatic, and the pyronin y-methyl green stain for somatic cell counts (**SCC**) showed large numbers of non-mastitic samples in the presumed "illegal" range above 1 million of SCC/mL and specifically rising during late lactation. The percentages of samples exceeding the 1 million standard by month were as follows: April, 10.1%; May, 12.9%; June, 19.9%; July, 25.0%; August, 41.2%; September, 50.4%; October, 49.5%; November, 51.3%; December, 50.5%; January, 52.7%; February, 29.7%; March, 22.7%. Similar results were obtained when

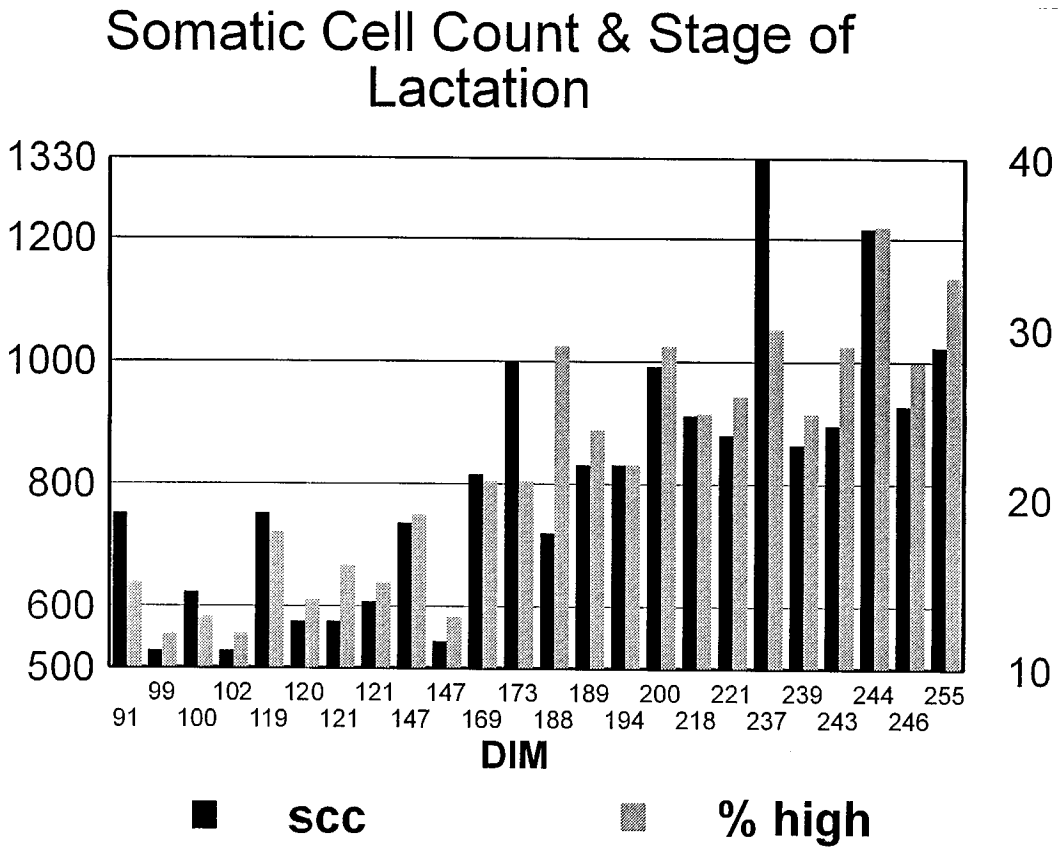

Figure 2. Somatic cell count (SCC), % high SCC above 1.13 million/mL, and stage of lactation by days in milk (DIM) from DHIA records of western states (S. Smith, personal communication).

summarizing monthly DHIA records for 2 yr for individual goats (Table 8, Figure 2).

Present official methods and equipment used to measure somatic cell counts in cow milk, except for direct microscopic, DNA, or pyronin stain confirmation, have been found unreliable and inappropriate for goat milk (Poutrel and Lerondelle, 1983; Maisi, 1990; Hinckley, 1991). Representation of dairy goat concerns on the Interstate Milk Shippers Committee and the National Mastitis Council have been critical for the development of appropriate goat milk standards for sanitary quality, composition, and residue control (Hinckley, 1991; Atherton, 1992).

Prospects

Considering the dimensions and production levels of U.S. dairy goats, the prospects for progress are considerable, because market demands for fluid milk and products (especially cheeses) far exceed supplies. The new organizations for promotion and research are going to aid this progress and will help establish appropriate prices and standards. It seems evident that dairy goats are emerging as a necessary and recognized U.S. industry.

Implications

A developing United States dairy goat industry will bring new and broadened strength to the United States dairy industry as a whole but probably will not replace dairy cattle as the most economical and major milk industry. Dairy goats will be traditional home suppliers but also will fill niche markets. These markets include alternative gourmet and natural food sources and medically indicated alternative food proteins and possibly lipids.

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