**Evolution of Milk Production Systems in the tropics of Latin America and its interrelationship with markets: An analysis of the Colombian case.**

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**Highlights**

- The adoption of improved pastures generated higher profits as well as higher productivity in all five regions in Colombia
- the investment in greater number of grazing paddocks to improve rotational systems generated higher productivity and profits
- The most profitable production system in the lowlands was the dual-purpose system whereas in the highlands was the specialized dairy
- Large farms produced milk at lower costs and had higher net incomes than medium and small farms
- During this decade, dairy farms in Colombia increased productivity and reduced production costs, but net incomes were reduced due to decreases in real terms in the price of milk
- Increasing market concentration in the hands of a few supermarket chains has changed the way milk price is determined with small farmers losing market access

**Rationale**

Dairying in Colombia has been a dynamic activity during the last 30 years. During the 70's grew at an annual rate of 4.7%, then it had a sustained exceptional growth of 6.5% during the 80's, and in the 90's the production of milk grew at 3.8%/yr, producing in 2000 approximately 5,486 million liters of fluid milk. This growth allowed the population to increase milk consumption from 57 liters per capita in 1970 to 130 liters in 2000, a 128% increase. The high growth in milk production obtained during the 80's was due mainly to the incorporation of thousands of herds into the dual-purpose production system.

With regards to trade, Colombia is basically self-sufficient in milk production. During the 90's the country imported an average of 2% of its annual production. On the other side, Colombia has been a net exporter of beef during the last two decades, but with a clear loss of relative importance since the beginning of the 90's. In 1991 only 5% of the domestic production was exported. From then on, exports have been decreasing and since 1996 the country exports less than 1% of its total beef production.

Colombia has a proven capacity to increase its milk production, and socioeconomic reasons to expand the sector. However, there is internal discussion concerning the most suitable technologies to achieve its development, and if these will be sufficient to make the livestock sector competitive within and outside the region under a scheme of open and unsubsidized

economies. Available technologies vary largely with regard to their social, economic, and environmental impact, in the short and long-term. In addition, the information available in different disciplines is scattered and it is not always adequate. It is necessary to systematize it, integrate it, and interpret it so that it facilitates the decision-making process in accordance with the priorities of Colombia.

Objectives of this study were to: (1) identify and quantify the effect of technologies on the increase in milk productivity in dual purpose and specialized dairy systems in different regions of Colombia; and (2) analyze the relationship between productivity, technological level, and profitability.

**Materials and Methods**

Data came from a survey to 545 farms during the period February to November of 2000 in five regions distributed in the following way: (a) 145 farms in the lowlands of the Savannas piedmont (states of Arauca, Casanare, and Meta), (b) 116 in the lowlands of the Caribbean region (Atlantico, Guajira, Magdalena, César, Bolivar, and Córdoba states), (c) 105 in the midland of the coffee growing area (Quindío, Valle, Caldas, and Risaralda), (d) 97 in the mountain highlands of Antioquia, and (e) 82 farms in the Highlands of the Savanna Cundiboyacense (states of Cundinamarca and Boyacá). These five regions produce more than 80% of milk of the country.

The survey was designed to quantify inputs and products in order to determine costs and prices at the farm level that were then utilized to (1) calculate the variable costs of feeding, labor, health, reproduction, fertilization, and irrigation; (2) calculate the gross income from milk and beef sales, and (3) characterize farms according to levels of productivity and management practices.

The surveys were executed through the coordination of the faculties of animal production of the Universidad de los Llanos in the lowlands of the savannas piedmont, of Fundación San Martín in the Caribbean Region, of the Universidad de Caldas in the midland coffee growing area, and of Universidad Nacional (headquarters Medellín and Bogotá) in the mountain highlands of Antioquia and the savanna highlands of Cundinamarca and Boyacá.

**Results and Discussion**

Regardless of the production system utilized or the region where farms were located, the increase in competitiveness was in direct relationship with herd size. Therefore, as herd size increased, the production cost per unit of milk and beef decreased, net income per cow increased, and the annual return to capital invested improved. However, when the increase in competitiveness with associated with productivity, this trend was not observed, which suggested those highly productive farms may not necessarily be profitable (Table 1). In addition, these results confirm the fact that economies of scale exists, which has large implications for the livestock sector in Colombia because 70% of dairy farmers produce less than 100 kg of milk/day. Thus, smaller herds producing milk at higher costs have greater disadvantages to stay competitive given the scale size in which they operate.

The most profitable production system in the tropical lowlands (Lanes and Caribbean regions) was the dual-purpose system whereas in the highlands (Coffee, Antique and the Cundiboyacense savannas) was the specialized dairy. As a result, Colombia should have different strategies for research and technology transfer in order to exploit more efficiently the comparative advantages of each region (Table 2).

With regards to technological change, the adoption of improved pastures generated higher profits (Table 2) as well as higher productivity (Table 3) in all five regions. In addition, the investment in greater number of grazing paddocks for a more efficient use of improved pastures to increase the quality and quantity of biomass generated higher higher productivity (Table 3) in all five regions and higher profits in all regions except the Caribbean (Table 2). The use of strategic supplementation to the basal (forage) diet had mixed effects. The best economic response to supplementation in the lowlands (ie., Llanos and Caribbean) was by offering small quantities to milking cows (ie., < 0.5 kg MS/cow/day) while in the highland regions (ie., Coffee, Antioquia and Cundiboyacense savannas) it was supplementing milking cows with moderate quantities (ie., between 0.5 and 2 kg MS/cow/day).

The use of the fertilization and irrigation increased productivity but not income, except in the Cundiboyacense savannas, which suggested the need for investing resources in research to determine the economic response at various levels of $N_2$ and irrigation methods based on grass species utilized (Tables 2 and 3). A management practice which increased both productivity and profitability was milking twice a day. However, it is necessary to have electricity as well as cooling equipment installed to store milk. Farms, which treated against external parasites and dewormed cattle with low frequency, increased net profits but not productivity when compared to farms that practiced these with high frequency. In addition, farms with more years of experience at producing milk had higher incomes but were not more productive (Tables 2 and 3). This suggest that investing in training could have a large impact on farmer's incomes.

Comparing the evolution of the dairy sector with results from 12 years ago (Table 4), it was observed that milk productivity per hectare increased by 44% in dual purpose systems and by 14% in specialized dairy systems. This increase reduced the cost of milk production by 16% and 10% in dual purpose and specialized dairy systems, respectively, due to an increase in the stocking rate of 15% and 17% in dual purpose and specialized dairy systems, respectively, as well as to the increase in the investment in infrastructure and equipment (ie., adoption of improved pastures, greater number of grazing paddocks, mechanical grass-cutters, irrigation equipment, and other facilities), which increased by 258% in dual purpose systems and by 37% in specialized systems.

However, net income per hectare during this period decreased 27% in dual purpose systems and 69% in specialized dairies due to a reduction in the producer price of milk of 22% in dual purpose systems and of 41% in specialized dairies because adjustments in the milk price were always below the inflation rate (Figure 1). On the other hand, the reduction in the price of milk to the producer was never translated in lower consumer prices because the adjustments in the consumer price were above the inflation rate (Figure 1). Thus, if producers were receiving a lower price and the consumers were paying more, who benefited? Figure 2 shows the percentage of the milk price paid by the consumer that milk producers retained. As shown, this percentage went from 70% in 1989 down to 37% in 2001. The largest portion of this difference was retained in the hands of a sector whose growth has been dramatic in the last decade: the supermarkets. Through informal interviews with managers of milk processing plants and supermarkets in the city of Cali it was determined that supermarkets request from milk plants that: (a) the first two deliveries of dairy products be free; (b) all expenses in advertising and marketing must be paid by the milk plants whose products are on sale; (c) a permanent discount of 5% compared with the price offered to small (ie., neighborhood or "mom and pop") stores; (d) pay leasing space inside the supermarket at USD 400/lineal meter; (e) pay an annual quota equivalent to 1.8% of estimated annual sales at the supermarket. The strategy of the milk plants has been to translate these marketing costs down to the producer. Likewise, and as a reaction to low profit margins, milk plants begun in the mid-90's to promote the installation of milk cooling tanks in farms to reduce

transport and milk collection costs, favoring large and medium producers in detriment of small farms.

Public and private development agencies in Colombia should internalize the fact that policies oriented to markets will increasingly be "oriented towards supermarkets." If one adds that in Colombia three or four chains command up to 50% or more of the supermarket sector the conclusion is that development programs and policies will need to learn how to deal with just a handful of giant companies. This in a huge challenge, and demands an urgent review of ideas and strategies.

Organizations such as FEDEGAN, the most affected by the structural change of the increase in supermarket's control of retail food, have the responsibility to monitor these price relationships and to influence in a proactive manner within the milk agroindustrial chain to facilitate negotiations with public and private entities and to present the appropriate documentation of the impact of these market practices on the livestock sector in Colombia. Otherwise, the new rules of the game could induce a massive exodus of producers in the short term and in a relatively short period of time.

Table 1. Multivariate analysis containing the production cost of milk, net income, annual return on capital invested, and productivity of milk and beef by production system and region based on herd size.

| Multivariate analysis group by production system and region | Number of farms per group | Herd size (# cows) | Milk production cost ($/kg) | Net income ($/cow/yr.) | Annual return to capital invested (%) | Milk productivity (kg/ha/yr.) | Beef productivity (kg/ha/yr.) |
|---|---|---|---|---|---|---|---|
| **Dual Purpose** | | | | | | | |
| 1 | 108 | 20 | 0.24 | - 66 | -0.7 | 894 | 140 |
| 2 | 21 | 35 | 0.21 | 58 | 1.3 | 2193 | 247 |
| 3 | 136 | 83 | 0.16 | 106 | 2.8 | 734 | 134 |
| 4 | 17 | 78 | 0.20 | 87 | 2.6 | 5472 | 173 |
| 5 | 13 | 337 | 0.13 | 164 | 6.0 | 636 | 140 |
| 6 | 5 | 730 | 0.13 | 82 | 6.1 | 226 | 78 |
| | | | | | | | |
| **Specialized dairy** | | | | | | | |
| 1 | 54 | 17 | 0.25 | - 152 | -2.9 | 9100 | 360 |
| 2 | 52 | 24 | 0.26 | - 163 | -3.7 | 2976 | 128 |
| 3 | 35 | 37 | 0.20 | 180 | 4.6 | 15760 | 262 |
| 4 | 24 | 62 | 0.18 | 227 | 6.0 | 7970 | 130 |
| 5 | 31 | 105 | 0.20 | 57 | 1.7 | 3090 | 79 |
| 6 | 13 | 159 | 0.16 | 413 | 6.2 | 14358 | 245 |
| | | | | | | | |
| **Llanos** | | | | | | | |
| 1 | 59 | 19 | 0.19 | 12 | 0.2 | 1099 | 178 |
| 2 | 30 | 23 | 0.30 | -184 | -1.9 | 742 | 75 |
| 3 | 9 | 45 | 0.08 | 463 | 8.5 | 662 | 392 |
| 4 | 29 | 56 | 0.16 | 61 | 1.0 | 728 | 109 |
| 5 | 5 | 56 | 0.28 | -182 | -1.7 | 1463 | 84 |
| 6 | 8 | 108 | 0.17 | 23 | 0.3 | 326 | 109 |
| | | | | | | | |
| **Caribbean** | | | | | | | |
| 1 | 9 | 48 | 0.32 | -130 | -1.8 | 377 | 56 |
| 2 | 27 | 73 | 0.19 | 25 | 0.4 | 750 | 112 |
| 3 | 35 | 111 | 0.14 | 140 | 4.8 | 1028 | 151 |
| 4 | 17 | 175 | 0.11 | 253 | 8.8 | 758 | 152 |
| 5 | 10 | 528 | 0.15 | 84 | 2.9 | 410 | 116 |
| 6 | 1 | 926 | 0.10 | 280 | 9.0 | 108 | 80 |
| | | | | | | | |
| **Coffee area** | | | | | | | |
| 1 | 13 | 8 | 0.30 | -341 | -3.6 | 9300 | 378 |
| 2 | 28 | 19 | 0.24 | -55 | -0.8 | 1460 | 186 |
| 3 | 18 | 28 | 0.24 | -70 | -0.8 | 10100 | 291 |
| 4 | 13 | 76 | 0.15 | 115 | 2.8 | 600 | 157 |
| 5 | 29 | 85 | 0.19 | 179 | 2.8 | 3800 | 99 |
| 6 | 1 | 265 | 0.15 | 210 | 3.1 | 6400 | 114 |
| | | | | | | | |
| **Antioquia** | | | | | | | |
| 1 | 14 | 13 | 0.29 | -361 | -9.6 | 8500 | 428 |
| 2 | 14 | 18 | 0.27 | -195 | -4.8 | 2370 | 105 |
| 3 | 36 | 26 | 0.25 | 48 | 2.7 | 20200 | 385 |
| 4 | 12 | 34 | 0.23 | 21 | 1.5 | 6090 | 153 |
| 5 | 10 | 113 | 0.20 | 90 | 1.7 | 2800 | 80 |
| 6 | 10 | 117 | 0.20 | 255 | 5.6 | 14600 | 197 |
| | | | | | | | |
| **Cundiboyacense Savanas** | | | | | | | |
| 1 | 10 | 10 | 0.25 | -178 | -4.7 | 4900 | 197 |
| 2 | 14 | 21 | 0.22 | -86 | -0.6 | 10600 | 263 |
| 3 | 18 | 38 | 0.19 | 25 | 0.5 | 2100 | 126 |
| 4 | 25 | 72 | 0.16 | 278 | 5.4 | 9400 | 183 |
| 5 | 7 | 170 | 0.15 | 567 | 7.9 | 15800 | 279 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | 1 | 330 | 0.15 | 591 | 8.1 | 12,700 | 263 |

Table 2. Observed variability in profitability, expressed as net income per cow per year, as a function of technological change in different regions of Colombia.

| Technological Change | Category | Region | | | | |
|---|---|---|---|---|---|---|
| | | LLanos | Caribbean | Coffee | Antioquia | Cundiboyacense Savannas |
| | | | | | | |
| Production System | Dual Purpose | 135 a | 111 | 11 b | 53 b | 145 b |
| | Specialized dairy | -140 b | ND | 86 a | 158 a | 236 a |
| Amount of supplement offered (kg of dry matter / cow / d) | Less than 0.5 | 164 a | 118 a | 117 a | -457 c | 238 b |
| | 0.5 to 2.0 | 32 b | 102 a | 58 a | 300 a | 263 a |
| | Greater than 2.0 | -49 c | 47 b | -46 b | 39 b | 163 c |
| Proportion of cows in milk (%) | Less than 60 | 118 a | 72 c | -39 a | -27 b | 212 a |
| | 60 to 80 | 123 a | 126 b | 43 b | 83 a | 177 a |
| | Greater than 80 | 178 a | 234 a | 67 b | 86 a | 242 a |
| Proportion of improved pastures established on farms (%) | Less than 33 | 127 a | 27 b | 29 a | 48 a | -358 a |
| | 33 to 67 | 118 a | 116 a | 37 a | 62 a | 203 b |
| | Greater than 67 | 167 a | 121 a | 49 a | 135b | 316 c |
| Milking frequency (# of times / day) | Once | 126 a | 108 a | 17 a | -68 b | 173 a |
| | Twice | 157 a | 156 a | 83 b | 80 a | 216 a |
| Fertilize pastures | No | 148 a | 140 a | 39 a | 130 a | 266 a |
| | Yes | 72 b | 65 b | 36 a | 74 b | 197 b |
| Irrigate pastures | No | 131 a | 121 a | 42 a | 119 a | 189 a |
| | Yes | -107 b | 79 b | 7 b | -85 b | 231 a |
| Reproductive management | Natural service | 127 a | 128 a | 53 a | 68 a | 177 a |
| | Both | 131 a | 51 b | 1 b | 131 a | 213 a |
| | Artificial insemination | 123 a | 195 a | 16 b | 62 a | 226 a |
| Number of grazing paddocks on the farm | Less than 10 | 126 a | 102 a | -75 b | -4 c | 158 b |
| | 10 to 20 | 148 a | 139 a | 60 a | 112 a | 180 b |
| | Greater than 20 | 194 b | 83 a | 58 a | 102 b | 255 a |
| Experience at producing milk (years) | Less than 5 years | 92 a | 88 b | -42 b | 66 a | 144 a |
| | 5 to 15 | 138 b | 73 b | 50 a | 73 a | 244 b |
| | More than 15 years | 162 b | 136 a | 78 a | 91 a | 236 b |
| Frequency of deworming (# times / yr.) | Less than 2 | 151 a | 112 b | 55 a | 302 a | 399 a |
| | 2 to 3 | 111 a | 179 a | 30 a | 59 b | 173 b |
| | More than 3 | 66 b | -14 c | -27 b | 53 b | 210 b |
| Frequency of treatment against external parasites (# times / yr.) | Less than 6 | 249 a | 139 a | 40 b | 140 a | 201 a |
| | 6 to 12 | 87 b | 59 b | 76 a | 23 b | 223 a |
| | More than 12 | 135 b | 98 b | -2 c | 59 b | 222 a |
| Herd size (# adult cows / farm) | Less than 30 | 101 b | 48 b | -10 b | -11 b | 88 c |
| | 30 to 100 | 168 a | 123 a | 57 a | 166 a | 234 b |
| | More than 100 | 227 c | 109 a | 87 a | 217 a | 422 a |
| Commercial value of land (US$ / ha) | Less than 3,000 | 145 b | 114 a | 37 a | 114 a | 143 b |
| | 3,000 to 6,000 | 182 a | 126 a | 43 a | 102 b | 246 a |
| | More than 6,000 | 26 c | -51 b | 25 a | 3 c | 232 a |

Table 3. Observed variability in productivity, expressed as milk production per cow per day, as a function of technological change in different regions of Colombia.

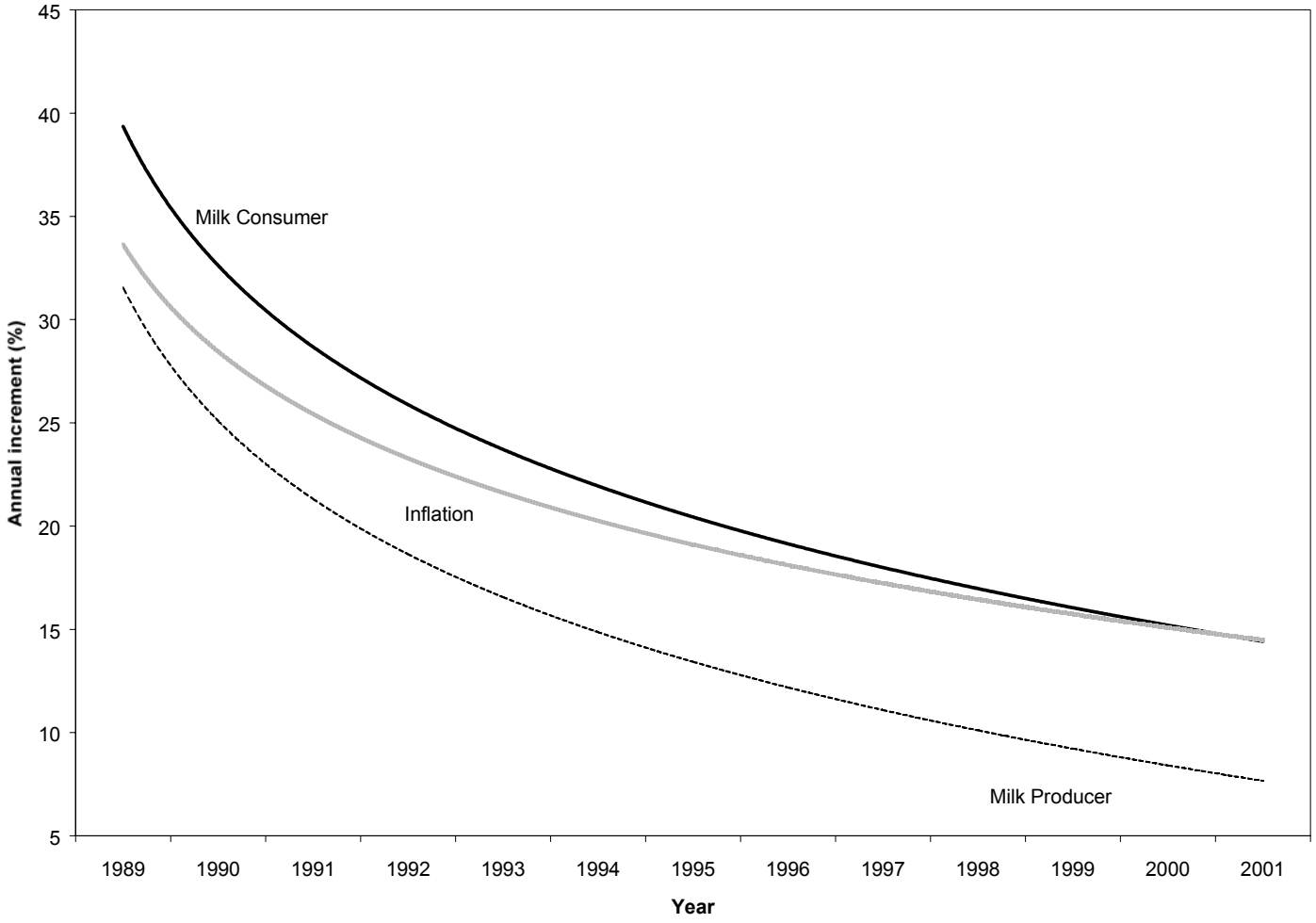
| Technological Change | Category | Region | | | | |
|---|---|---|---|---|---|---|
| | | LLanos | Caribbean | Coffee | Antioquia | Cundiboyacense Savannas |
| | | | | | | |
| Production System | Dual Purpose | 5.1 b | 4.2 | 8.4 b | 12.7 a | 11.0 b |
| | Specialized dairy | 9.7 a | ND | 9.6 a | 14.2 a | 14.0 a |
| Amount of supplement offered (kg of dry matter / cow / d) | Less than 0.5 | 4.8 c | 3.9 b | 5.1 c | 10.0 b | 9.0 c |
| | 0.5 to 2.0 | 6.1 b | 4.8 b | 8.0 b | 10.7 b | 12.1 b |
| | Greater than 2.0 | 8.2 a | 7.0 a | 12.5 a | 14.5 a | 17.2 a |
| Proportion of cows in milk (%) | Less than 60 | 4.9 b | 4.3 a | 6.9 b | 16.0 a | 13.1 ab |
| | 60 to 80 | 5.7 a | 4.1 a | 9.1 a | 14.1 b | 12.0 b |
| | Greater than 80 | 4.3 b | 4.4 a | 9.9 a | 13.2 c | 14.3 a |
| Proportion of improved pastures established on farms (%) | Less than 33 | 3.7 b | 3.4 b | 6.8 b | 10.7 b | 12.3 a |
| | 33 to 67 | 5.2 a | 4.2 ab | 6.6 b | 12.8 b | 14.8 a |
| | Greater than 67 | 5.7 a | 4.4 a | 9.4 a | 15.1 a | 19.1 b |
| Milking frequency (# of times / day) | Once | 5.1 b | 4.1 b | 4.8 b | 8.9 b | 10.5 b |
| | Twice | 6.8 a | 5.2 a | 10.6 a | 14.0 a | 13.5 a |
| Fertilize pastures | No | 5.0 b | 4.1 a | 5.0 b | 8.6 b | 10.8 b |
| | Yes | 5.9 a | 4.4 a | 9.9 a | 14.2 a | 13.9 a |
| Irrigate pastures | No | 5.2 a | 4.2 a | 8.3 b | 13.2 a | 10.5 b |
| | Yes | 5.9 a | 4.2 a | 11.6 a | 16.3 a | 15.6 a |
| Reproductive management | Natural service | 4.9 b | 4.2 a | 7.6 c | 11.6 b | 9.2 b |
| | Both | 5.7 b | 4.3 a | 10.0 b | 15.6 a | 13.1 a |
| | Artificial insemination | 6.9 a | 5.1 a | 12.7 a | 16.0 a | 15.0 a |
| Number of grazing paddocks on the farm | Less than 10 | 4.7 b | 4.2 a | 8.0 a | 12.6 a | 12.2 a |
| | 10 to 20 | 5.3 b | 4.2 a | 8.3 a | 14.4 a | 13.6 a |
| | Greater than 20 | 7.4 a | 4.4 a | 9.3 a | 14.3 a | 13.8 a |
| Experience at producing milk (years) | Less than 5 years | 4.9 a | 3.7 a | 10.3 a | 16.0 a | 13.9 a |
| | 5 to 15 | 5.4 a | 4.5 a | 8.2 b | 12.9 a | 13.2 a |
| | More than 15 years | 5.1 a | 4.2 a | 8.2 b | 13.9 a | 13.1 a |
| Frequency of deworming (# times / yr.) | Less than 2 | 5.1 a | 4.2 a | 8.6 b | 13.7 a | 13.6 a |
| | 2 to 3 | 5.7 a | 4.2 a | 8.0 b | 15.1 a | 11.2 b |
| | More than 3 | 4.9 a | 4.0 a | 10.7 a | 13.2 a | 12.7 ab |
| Frequency of treatment against external parasites (# times / yr.) | Less than 6 | 4.9 a | 4.3 a | 8.4 b | 14.3 a | 13.5 a |
| | 6 to 12 | 5.2 a | 4.0 a | 8.3 b | 14.0 a | 13.1 a |
| | More than 12 | 5.3 a | 4.2 a | 9.6 a | 13.2 a | 12.5 a |
| Herd size (# adult cows / farm) | Less than 30 | 5.2 a | 3.6 a | 8.9 a | 12.4 b | 11.9 b |
| | 30 to 100 | 5.4 a | 4.4 a | 9.0 a | 15.9 a | 13.1 b |
| | More than 100 | 3.5 a | 4.1 a | 7.5 b | 14.3 a | 16.1 a |
| Commercial value of land (US$ / ha) | Less than 3,000 | 5.0 a | 4.2 a | 6.9 c | 12.7 b | 8.9 b |
| | 3,000 to 6,000 | 5.3 a | 4.0 a | 8.8 b | 14.1 b | 13.5a |
| | More than 6,000 | 5.5 a | 5.8 a | 12.4 a | 16.2 a | 15.1 a |

Table 4. Evolution of productivity costs of production, investment, profitability, and product prices in dual purpose and specialized dairy systems in Colombia between 1988 and 2000.

| Parameter | Milk production System | | | |
|---|---|---|---|---|
| | Dual Purpose | | Specialized Dairy | |
| | 1988 [a] | 2000 | 1988 [a] | 2000 |
| | | | | |
| **Productivity** | | | | |
| - Milk production (kg/ha/yr.) | 453 | 654 | 4,132 | 4,708 |
| - Beef production (kg/ha/yr.) | 115 | 107 | 212 | 114 |
| - Stocking rate (AU/ha) | 1.3 | 1.5 | 2.3 | 2.7 |
| | | | | |
| **Production cost** | | | | |
| - Milk (US$/kg) | 0.19 | 0.16 | 0.21 | 0.19 |
| - Beef (US$/kg) | 0.73 | 0.57 | 0.98 | 0.60 |
| - Both (US$/ha) | 172 | 174 | 1,098 | 903 |
| | | | | |
| **Profitability** | | | | |
| - Gross income (US$/ha/yr.) | 239 | 223 | 1,906 | 1,153 |
| - Net income | 67 | 49 | 806 | 250 |
| | | | | |
| **Investment (US$/ha)** | | | | |
| - Land | 1,828 | 2,479 | 7,120 | 5,201 |
| - Livestock | 688 | 461 | 2,868 | 1,042 |
| - Facilities & Equipment | 117 | 419 | 1,126 | 1,544 |
| - Total | 2,632 | 3,359 | 11,114 | 7,786 |
| | | | | |
| **Annual return on capital investment (%)** | 4.2 | 2.7 | 6.8 | 2.8 |
| | | | | |
| **Product prices (US$/kg)** | | | | |
| - Milk | 0.27 | 0.21 | 0.37 | 0.22 |
| - Beef | 1.02 | 0.82 | 1.71 | 1.24 |

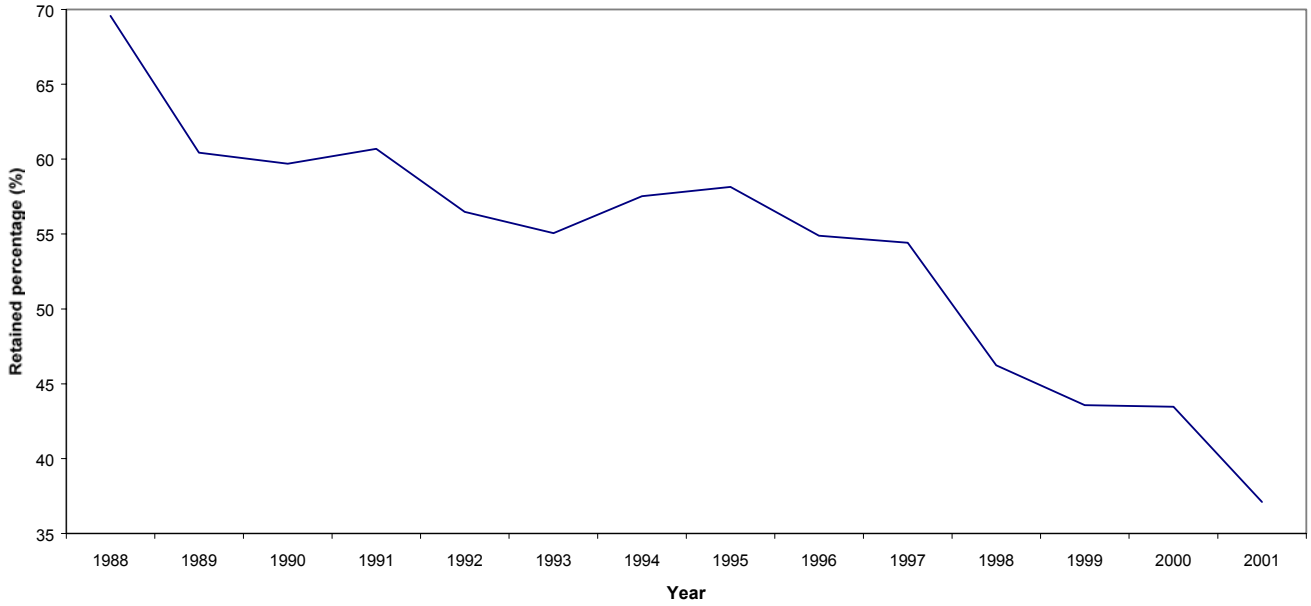
[a] Adapted from Aldana (1990). Currency figures from 1988 were inflated to constant Colombian pesos of 2000 and then expressed in US dollars at the average exchange rate of the year 2000 of 2,084 pesos to the dollar. Productivity figures were estimated from a weighted averaged of both improved and intensive dual purpose and specialized dairy systems.

**Figure 1. Trend in inflation rate and annual increments in the consumer and producer price of milk**




Source: CEGA (2002); DANE (2002)

**Figure 2. Percentage of the milk price paid by the consumer that the Colombia milk producer retains**




Source: CEGA (2002); DANE (2002)