

only 23% of the cattle population, the dairy herd contributes approx. 80% of the total production (2.5 million MT). More detailed district-level analysis of milk production, based on the MoA livestock population figures and research reports on production, have been recently published by Peeler and Omere, (1997).

Trends in milk production published by MoA from 1981 to 1997 are presented in Figure 2. The Figure suggests that MoA milk production estimates have stagnated at about 2.5 million MT since 1989. This seems unlikely since the observed production parameters suggest a positive herd growth rate for all cattle production systems, especially the dairy herd (Peeler and Omere, 1997). A likely underlying reason for the apparent stagnation in dairy production according to MoA is the lack of census reports on which to base cattle population and growth rate, hence more or less the same estimates of cattle population figures have been used over the period.

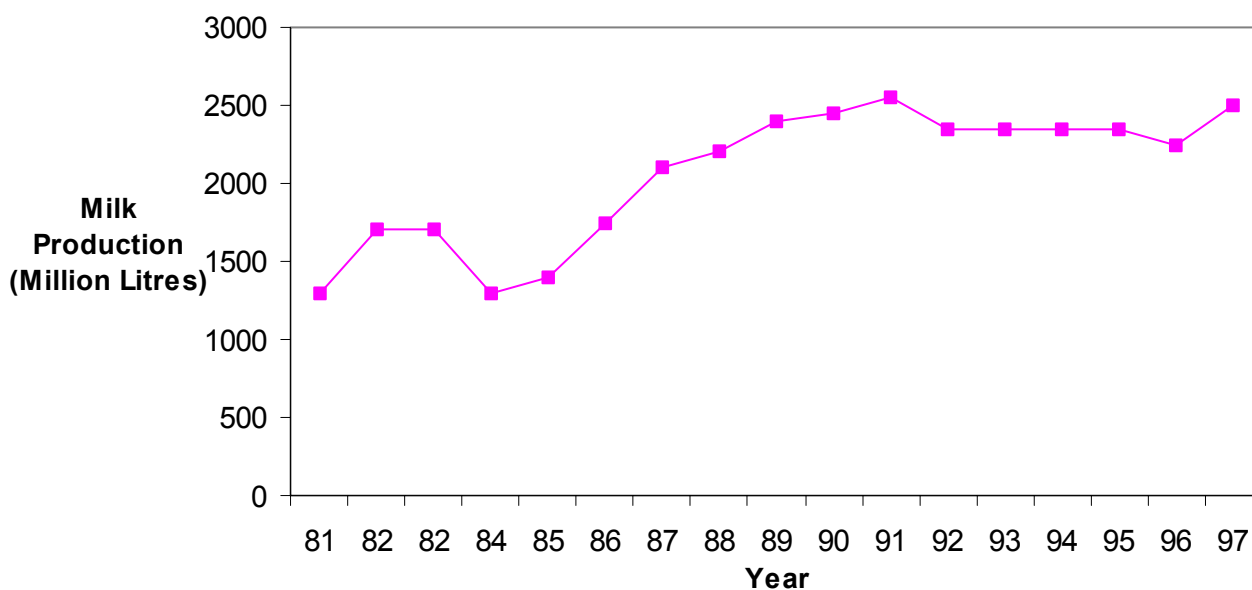


Figure 2. Trend in milk production: 1981-1997

Source: Ministry of Agriculture Annual Reports.

The milk production estimates by Peeler and Omere (1997) are about 20% higher than those by MoA which estimated total annual milk production at 2.5 million MT in 1997 (MoA, 1997) (Figure 1). The major difference is in the estimation of annual production per dairy cow. The MoA estimates milk production at 1,300kg/cow/yr for lactating cows across all dairy production systems, while Peeler and Omere (1997), after reviewing various research reports, estimated higher production of 1750kg/cow/yr and 4000kg/cow/yr for lactating cows

in small- and large-scale dairy production systems, respectively. Milk production estimates for dairy cattle recorded during recent SDP characterisation surveys were 7.2kg/cow/day and 5.0kg/cow/day in Kiambu and the rest of the Nairobi milk shed⁵, respectively. These figures correspond to annual production indices of 2628kg/cow/yr for Kiambu and 1825 kg/cow/yr for the rest of the Nairobi milk shed (actual milk yields per cow per year would be lower depending on the number of days cows are dried off). These figures are similar to those from reports on smallholder dairy production previously reviewed by Peeler and Omore (1997) but significantly higher than MoA production estimates. The total cattle milk production estimate by Peeler and Omore (1997) give an annual per capita milk availability estimate of approx. 106kg, compared to 90kg and 80kg estimated from the MoA production figures and FAO (1996), respectively.

⁵ The seven districts in the Nairobi milk shed selected for the SDP characterisation surveys were: Kirinyaga, Machakos, Nakuru, Narok, Nyandarua, Murang'a and Nairobi.

3. Dairy Marketing and Consumption

This section describes the major findings of the RA regarding recent changes and the current major features of milk marketing in Kenya, particularly milk marketing channels, the actors involved and the amounts of milk passing through them. The role of the emerging milk channels is discussed.

3.1 Projections of Demand and Supply of Dairy Products

Accurate projections in demand and supply of dairy products to determine the production gaps are difficult to make in the absence of reliable data on their key determinants such as cattle population (including its growth rate), and income elasticity of demand for milk products. A previous demand projection contained in the Dairy Master Plan (1991) only considered formally and informally traded milk. Notwithstanding the lack of accurate data, some projections of supply and demand have been made, based on rough estimates of the determinants of supply and demand for traded and non-traded milk.

The demand for milk, like other consumer goods, is a function of population size, income levels and the elasticity of demand for milk, retail price, and to a lesser extent, taste and preference over other products. The supply of milk is mainly influenced by producer prices, access to support services, the size of the national dairy herd and estimated milk yields. The demand and supply of milk can be forecasted based on assumptions about trends in these variables, and the expected rise in dairy demand over time. Indicative estimates of supply and demand based on assumptions about growth rates of population and incomes until 2010 show a continuing widening of the gap between demand and supply. Most of the demand for marketed milk is in urban areas where approx. 15% of the population currently lives (CBS, 1989; 1995)⁶ and where average incomes and population growth rate are higher than in the rural areas. Two scenarios in supply and three scenarios in demand have been compared.

Projections in Supply

The first scenario for projection in supply assumes the current annual milk production growth rate of 4.3% (1.1% for the traditional herd and 5% for the dairy herd⁷), and the second

⁶ The World Bank (1989) gives a higher proportion of urban population of 32%

⁷ The Kenyan dairy herd grew at over 10% annually from an estimated 400,000 heads in 1963 to at least 2.5 million in the late eighties. The growth rate is considered to have dropped remarkably since the collapse of government supported AI services in the early 1980's.

scenario assumes an annual production increase of 3% over and above the current dairy production (Table 3). This increase could be achieved through incentives and modest improvements in services and technologies necessary to increase productivity in intensive production systems. In both supply scenarios, a decrease in herd growth rate of 0.1% is assumed (this will result in the dairy herd growing at a modest 1.6% per annum by 2010). Under these assumptions in supply, the total offtake would rise by 69% and 145% for scenarios one and two, respectively, by 2010. During the same period, the dairy herd production would increase from 83%, to 88% and 92% of total production for scenarios one and two, respectively.

Table 2. Projected dairy supply^a without (Scenario 1) and with (Scenario 2) intervention to improve dairy herd productivity

Supply variable	1998	2005		2010	
		Scenario 1	Scenario 2	Scenario 1	Scenario 2
Traditional herd population ('000)	10,221	11,034	11,034	11,655	11,655
Dairy herd population ('000)	3,173	4,458	4,458	5,372	5,372
Traditional herd prod. (m. litres)	511	552	552	583	583
Dairy herd prod. (m. litres)	2,805	3,715	4,847	4,477	6,771
Total prod. (m. litres)	3,156	4,267	5,399	5,059	7,354

^aProjections are based on cattle population estimates of MoA (1996) and on a rough estimate of traditional herd growth rate of 1.1%, dairy herd growth rate of 5%, and a decrease in both growth rates of 0.1% per annum. Dairy production growth rate is estimated at 4.3%. Scenario 2 is calculated from a 3% increase in annual dairy productivity.

Projections in demand

Estimated annual human population growth rates of 3.3% (3% for rural and 5% for urban populations) (CBS, 1989; 1995), and annual per-capita consumption for 1996 of 101 and 156 litres for rural and urban populations, respectively, are assumed for estimates of demand (Table 3). Each (rural and urban) population's growth rate is assumed to be decreasing annually at 0.05%, resulting in a decreased overall population growth rate to 2.7% by 2010. These rates of growth will result in about 19% of Kenyans living in urban areas by 2010. Annual per-capita real GDP growth rates of 1.0% and 2.0% are assumed for the first and second scenarios, respectively. Income elasticity of demand for milk is estimated at 0.8.

Though Kenya has up to now been considered to be self sufficient in dairy production, projections under these modest assumptions in supply and consumer demand indicate

future shortfalls in production. The demand for dairy products would rise to about 5.8 million MT by 2010, 15% higher than the expected production if there is no intervention. The projected demand and production gap is due to Kenya's high rate of population growth rate of 3.3% per annum and a reduced dairy herd growth rate. Most of the projected increases in demand for marketed milk are going to be in urban areas, where average incomes and the population growth rate are higher than in the rural areas.

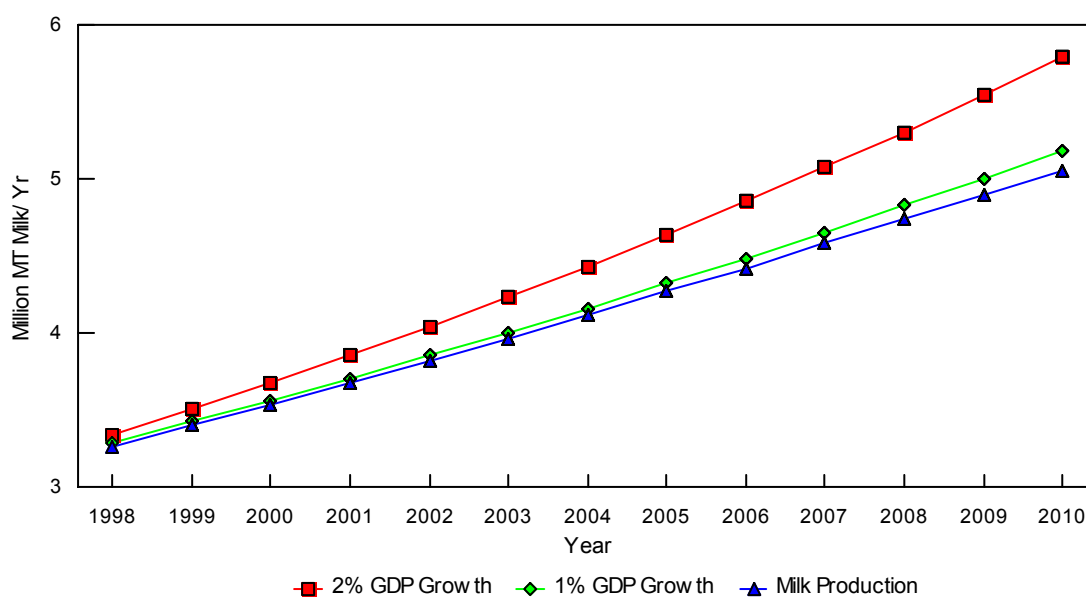
Table 3. Projected dairy demand^a

Demand variable		1998	2005	2010
Rural population (million)		25.2	30.3	34.2
Urban population (million) ⁸		4.6	6.4	7.9
Overall population growth rate (%/yr)		3.3	2.9	2.7
Scenario 1: 1.0% real annual GDP growth rate	Rural per-capita consumption (litres)	102	108	113
	Urban per-capita consumption (litres)	153	162	169
	Average per-capita consumption (litres)	110	118	138
	Demand (million litres)	3,288	4,320	5,185
	Production gap without intervention (million litres)	29	53	126
	Production gap with intervention (million litres)	29	-1079	-2169
Scenario 2: 2.0% real annual GDP growth rate	Rural per-capita consumption (litres)	104	116	126
	Urban per-capita consumption (litres)	156	174	189
	Average per-capita consumption (litres)	112	126	138
	Demand (million litres)	3,341	4,639	5,792
	Production gap without intervention (million litres)	82	372	733
	Production gap with intervention (million litres)	82	-760	-1562

^aCalculations based on 1996 production estimates and current rural and urban population annual growth rates of 3% and 5%, respectively, with an overall annual decrease in population growth rate of 0.05%; urban/rural consumption ratio of 1.5; and income elasticity of demand for milk of 0.8.

The predictions confirm the projected shortfalls in marketed milk supply contained in the Dairy Master Plan (1991). Assuming real GDP per capita grows at over 2%, closing the production gaps will require that government, NGOs, bilateral and multilateral donors support on-going (and planned) dairy development programmes to reduce the expected increase in overall deficit. Table 3 shows Kenya could become a net exporter of dairy products in the next 5-10 years with a modest improvement (3% increase) in the productivity of the dairy herd. That modest increase in productivity and supply can be realised because there is presently good opportunities for improvement due to the increasing stimulus for

private sector involvement in dairy production, with good opportunities for smallholders to meet shortfalls in local supply. Low per-capita milk availability in neighbouring countries (e.g.



Tanzania; MOAC/SUA/ILRI, 1998) also provides opportunities for exports.

Figure 3. Projections in dairy demand and supply at 1% and 2% GDP growth rate

3.2 Present Milk Marketing Channels

It is estimated that of the annual production of 2.5 million MT from the dairy herd, 1.72 million MT (69%) are produced by the smallholder dairy herd (Peeler and Omere, 1997). Of this smallholder production, on-farm consumption or non-marketed milk accounts for 626 million litres (36%)⁹ and the remaining 1,092 million litres (64%) is marketed¹⁰. About 20% of marketed milk flows through KCC and private processors. The remainder of the marketed milk is sold as non-processed milk. The non-processed milk market channels include: (i) direct milk sales to consumers by farm households (35%)¹¹; and (ii) milk collected by dairy co-operative

⁸ An urban population proportion of 15% (CBS, 1995) has been used for these calculations. This is lower than the approx. 32% given by World Bank (1989). The higher urban population proportion implies higher demand

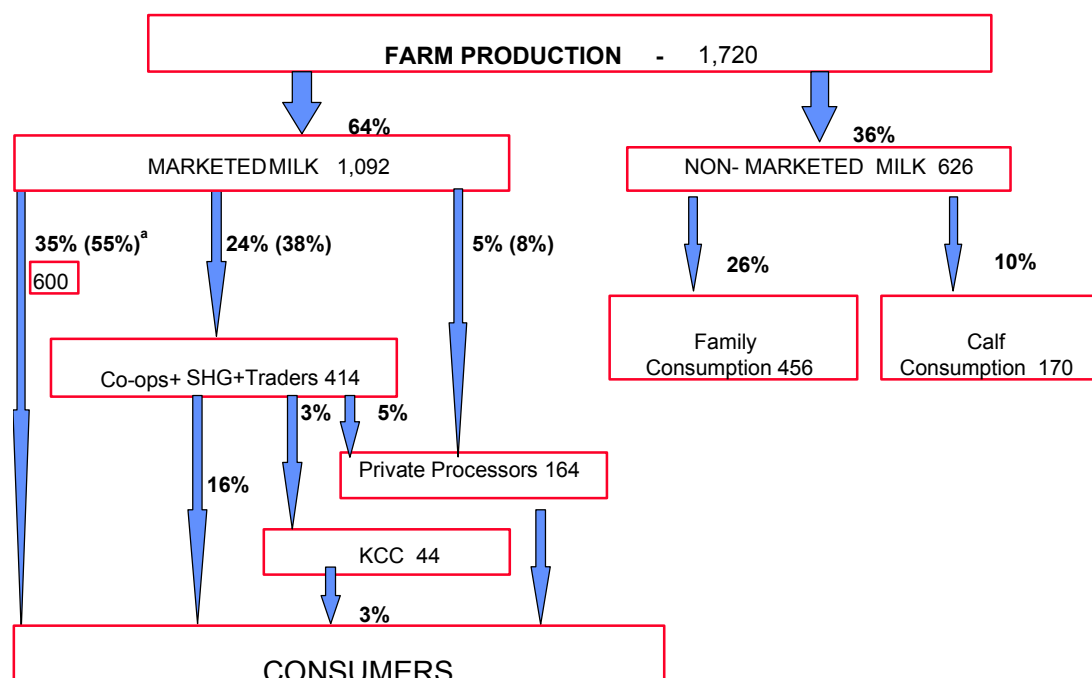
⁹ Farm consumption comprises calf and family consumption. Calf consumption is based on 3 litres per day per calf for 90 days for a calving rate of 70% and pre-weaning mortality of 20%. Family consumption is an estimated 2 litres per day for each of the estimated 625000 dairy farm households.

¹⁰ These figures have been adapted from Peeler and Omere (1997).

¹¹ Estimated from total marketed production less the estimates of flows through informal traders, co-operatives and processors. The flows through each of these channels were established through estimates of their numbers and average amounts handled by each market participant as follows: About 4,000 informal traders each handling about 100 litres/day; about 250 coops and SHGs each handling about 2,000 litres/day; and, about 45 processors each handling about 5000 litres/day

societies, SHGs and individual milk traders who sell either directly to consumers¹² (16%), private processors (5%) or KCC (3%).

There are however large regional differences in the milk marketing channels. In areas with high production, low consumer concentration or few alternative market outlets, such as Nyeri, Nyandarua, Koibatek, Trans-Nzoia and Nandi districts, marketing through KCC still dominates, with over 50% of marketed milk passing through their factories. The rest of the districts have most of their milk passing through other private processors; self-help groups (e.g., Kirinyaga, Nakuru); individual traders or co-operatives (e.g., Kiambu, Murang'a, Meru); or, local sales from producer to consumer (e.g., Coast). Nairobi, Coast Province, Machakos, Narok, Kisumu, Siaya and parts of Western Province are milk deficit areas that receive milk from high production areas delivered by KCC, small milk traders and private processors.



^aProportions of marketed milk in brackets

Figure 4. Milk marketing channels from smallholder dairy cattle production and estimates of amounts (million litres) and proportions of milk flows through each major channel

3.3 Non-Processed Milk Marketing Channels

The flow chart (Figure 4) reflects the predominance of raw milk sales, which account for approx. 884 million litres or about 80% of marketed milk, and the increasing role of private processors as an alternative market channel for milk from smallholders.

¹² Consumers include individuals, hotels, institutions, factories and restaurants etc.

Direct Producer to Consumer Milk Sales

About 600 million litres or over half (55%) of marketed milk is through direct sales from smallholder producers to consumers (Figure 4). This marketing channel is common in areas of low production relative to the number of consumers, particularly in the Coast, Nyanza and Western Provinces, and Narok District. Nearly all milk sales from small-scale zebu cattle milk producers in the rural areas are sold in this way.

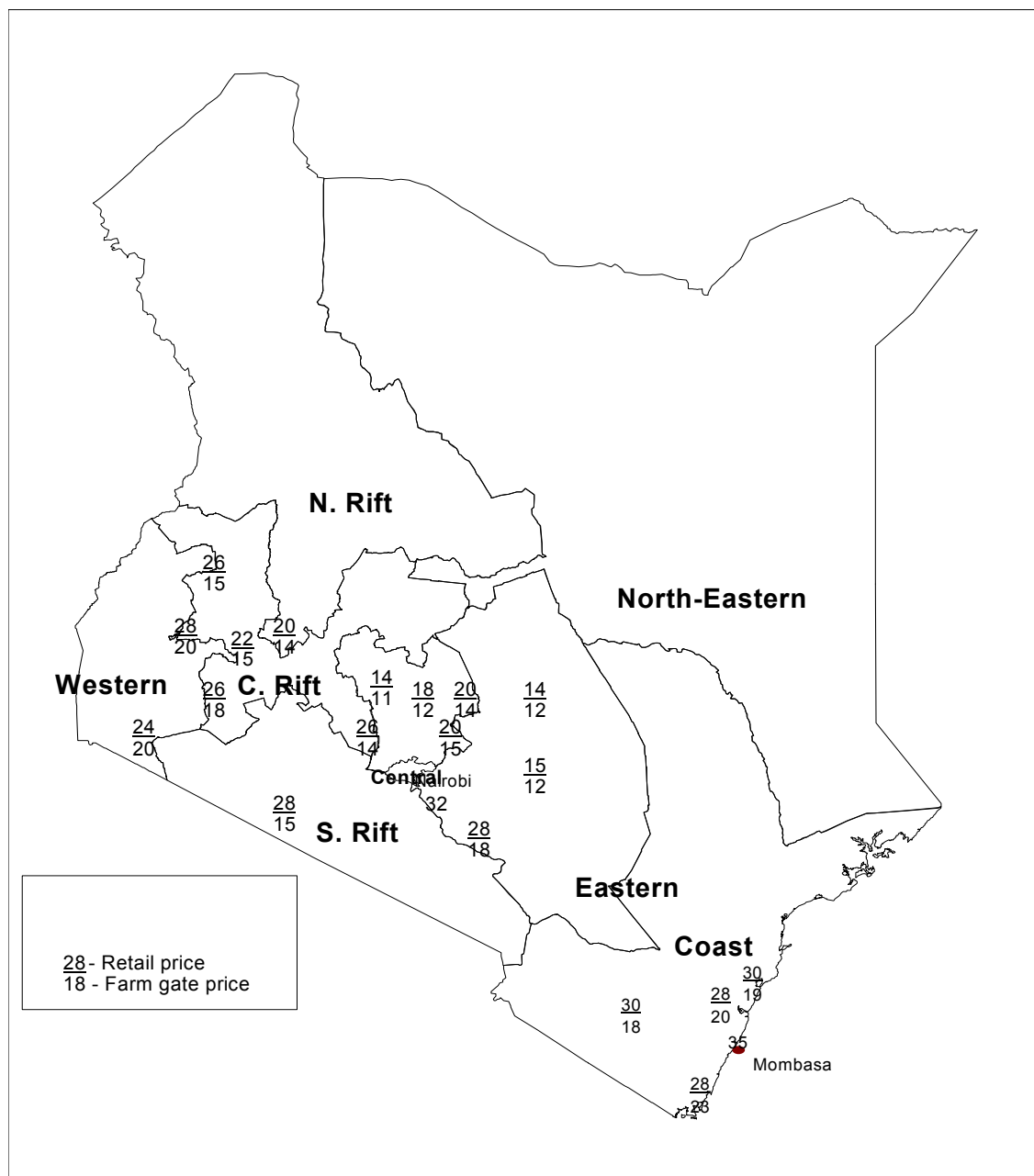


Figure 5. Producer and retail prices for fresh raw milk (KSh/L.)

Informal Milk Traders

The dramatic increase in the number of informal milk traders¹³ in milk marketing is a recent phenomenon prompted by the liberalisation of milk marketing. For example, in Murang'a District, 70% of milk sales were through KCC in 1995 (Owango *et al*, 1996) but reduced to only about 5% in 1997 (Survey, 1997). Kiambu and Murang'a Districts have the highest concentration of milk traders. In some cases, especially in Murang'a, traders are viewed as competitors to dairy co-operatives because they act as alternative channels and provide a better price for milk from producers. In Kiambu, traders play a major complementary role to co-operatives by providing outlets for milk collected by the co-operatives. This may be due to the value members attach to additional input services (veterinary clinical, AI, credit etc) provided by co-operatives in Kiambu, unlike those in Murang'a.

Large differences in producer and retail prices exist from region to region. Farm-gate and retail prices ranged from KSh. 11 (US\$ 0.18) and KSh. 14 (US\$ 0.22) per litre, respectively, in Nyandarua, to KSh. 20 (US\$ 0.33) and KSh 35 (US\$ 0.58) per litre, respectively, at the coast (Figure 5)¹⁴. The figures reflect a general rise in real farm-gate prices since milk market liberalisation (Owango *et al.*, 1996) and higher margins in areas of relative milk deficit.

While most informal traders take milk to the nearest urban centres, some were found to cover long distances to reach markets that offer higher retail prices. For example a few individual traders travelled over 100km on public transport to deliver milk all the way from Murang'a to Athi-River where retail prices, at KSh 32/litre, were almost double those in Murang'a. The traders mostly use bicycles or public transport to move around farms to collect milk and the same means to deliver the milk to markets, including restaurants and individual households. They handle daily between 60 – 250 litres each and sell to hotels, restaurants and individual customers, and earn gross margins and net market margins ranging from KSh. 1.50 - 5 per litre and 8 - 19%, respectively (Table 4). The net market margins mainly reflect returns to labour given the low operating costs and almost negligible capital costs. They are generally lower than those calculated for small milk traders in Tanzania where they range from 18-32% (MOAC/SUA/ILRI, 1998), reflecting, perhaps, the higher availability of milk in Kenya compared to Tanzania.

Some traders (observed mainly in the Rift Valley) boil then cool the milk before sale, mainly to lengthen shelf life because of the long distances and time that the milk takes to reach

¹³ These refer to traders who transport milk on bicycles, pick-ups or public transport and milk kiosks/bars

¹⁴ 1US\$ was approx. KShs 60

consumers. Many milk bars and kiosks were found in all urban centres, some of which are operated by dairy coops. They mostly sell raw milk that they buy directly from farmers, which they transport to their premises using public transport, bicycles or pick-up trucks. Some milk bars process the milk into yoghurt or ferment it to make *mala*. Records at KDB show only about 250 traders, including milk bar/kiosk operators are licensed, meaning that many more operate without a licence.

Table 4. Milk prices and margins for small milk traders

Region	Murang'a	Athi	Nairobi	Nakuru	Kitale	Kisumu	Mombasa
Costs							
Buying Price KSh. (P_1)	15	20	25	14	14	20	30
Operating/Transport costs	0.5	1	3	2.50	3	3	3
Total Variable Cost	15.5	21	28	16.5	17	23	33
Revenues							
Selling Price KSh. (P_2)	18	26	32	18	20	26	40
Gross Margin (GM)	2.5	5	4	1.5	3	3	7
Net Market Margin (GM/P_2), %	14	19	13	8	15	12	17

Source: Survey (1997)

Dairy Co-operatives and Self-Help Groups

It is estimated that over 200 dairy co-ops and self-help groups are currently engaged in active milk marketing in Kenya. Most farmer groups are concentrated in central Kenya. Most farmer groups collect mainly morning milk, and sell it fresh. Amounts that cannot be sold fresh are often sold to private milk traders and KCC or processed into *mala*. A few (e.g., Limuru and Meru Central Union) pasteurise the milk, besides making butter and yoghurt.

Dairy co-op membership ranges from 60 - 12,000 per coop and their milk intake/day ranges from 20 - 20,000 litres, with approx. 75% of them handling less than 1,800 litres per day. More than double these figures are handled during seasonal flush periods. They sell as much raw milk as they can locally and take the rest to KCC or to other big private processors such as Brookside Dairy. A couple of co-ops at Athi-River/Kitengela and Ngong received milk from traditional Maasai herds. Generally, only about 50% of co-op members are active, i.e., delivering milk at any given time. More coop members (e.g., about 50% of active members in Limuru Coop) in Kiambu use the feeds on credit facility as compared to coop members in other districts. This perhaps reflects that credit is not a very important constraint

to smallholder dairy producers. Some dairy co-ops have a strong capital base with assets in excess of KSh. 10 million (US\$ 167,000) (e.g., Limuru and Molo). SHGs, in contrast, are often much smaller with membership ranging from 12 - 1,200 and record milk intakes of less than 500 litres/day. They also have a much lower capital base. In many cases, members of SHGs seem to have a greater sense of ownership and “belonging” than coop members.

3.4 Processed Milk Marketing Channels

Private and Co-operative Dairy Processors

Until the early 1990's, milk processing in Kenya was almost entirely undertaken by KCC. Current records kept by the KDB indicate that last year (1997), there were some 45 registered private milk processors with a capacity to process about 400,000 litres/day. Most are small scale enterprises processing between 1,000 - 10,000 litres/day. Many small scale entrepreneurs operating private processing outfits visited during this survey were previously employees of KCC. A small number (e.g., Brookside Dairy) process over 50,000 litres per day. A cursory look at the records of most private processors show that their daily milk intakes are on an upward trend. Already, the upcoming processors provide stiff competition to KCC and dairy co-operatives for milk collection in many areas.

Table 5. Milk Prices and Margins for some Private Milk Processors and Co-operatives (KSh./Litre)

Cost Parameter	Milk processors/Co-operatives				
	Jufred Processor (Kirinyaga)	Boyo Coop (Muranga)	Molo Coop (Molo)	Kilifi Plantations Processor (Kilifi)	Wakulima SHG (Nyeri)
Full capacity (litres/day)	2300	10,000	50,000	12,000	5,000
Capacity utilized, %	70-80	5-10	5-10	60-80	70-80
Cost of raw milk (P ₁)	15	15	12	19	13
Operating costs	2.0	1.00	1.67	3.87	0.53
Transport to market	0.60	0.50	0.86	0	0.67
Total variable costs	17.6	16.5	14.5	22.9	14.2
Selling prices (P ₂)	20	16	15	36	16
Gross margin (GM)	2.40	-0.50	0.47	13.10	1.80
Net marketing Margin (GM/P ₂), %	12	-3	3	36	11

Source: Survey (1997)