

experimentally vaccinated in the early 1990's and about 1,000 in the highlands also experimentally vaccinated in 1995/96. Apparent success in reducing morbidity and mortality rates by ECFiM was reported at the coast and similar benefits may be expected in other areas of high ECF risk.

Intensification has been known world-wide to be associated with production limiting diseases such as mastitis and lameness. However, investigations under local intensifying dairy production systems indicate that they are currently not a priority. Clinical mastitis incidence is low at only 13.3 per 100 cow-years at risk and there is only modest association between sub-clinical mastitis and milk yield (Omore *et al.*, 1996a). Similarly, though cattle are predisposed to lameness and foot lesions due to confinement in the zero-grazing housing conditions, the incidence of lameness is less than 2% per month (Gitau, 1995). The occurrence of these diseases of intensification show that they are not a big constraint currently, although they can be expected to become a big problem once milk yields increase.

4.6 Main Issues in Production Systems

1. The lack of a livestock census to allow accurate production estimates. Random household surveys in Kiambu and Kilifi have shown that present estimates may be higher or lower than MoA estimates by as much as 50% or more.
2. The severe constraint of the scarcity of quality feed resources especially in the dry season. This constraint is expected to become even more severe with continuing land sub-division, unless efficient fodder markets emerge to fill the gap. Though many technologies on feedings strategies to improve production have not been tested on-farm, there is poor delivery of technical information on the efficient use of available feed resources.
3. The important disease challenge in many extensive areas especially TBDs and trypanosomiasis in Coast and central Rift Valley Provinces. The real and perceived risk of these diseases also inhibits adoption of dairying in some areas, especially in western and Nyanza Provinces.
4. Smallholder farmers do not have access to suitable replacements due to limited availability of good breeding stock and declining breeding services.
5. The low adoption of smallholder dairying in some apparently suitable areas that would also benefit from improved soil fertility with cattle manure application e.g., parts of western Kenya.

5. Policy and Institutional Issues

This section summarises the major issues on how policy and institutional aspects have affected present dairy outcomes, especially since the beginning of liberalisation of the economy, and how policy reforms at the national and local level can make better use of the technical and economic potential for smallholder dairy development. This includes analysis of the effects of liberalisation on the dairy sector -- and the competitiveness of smallholders therein -- of public policy and institutional arrangements, and of government and donor activities and investment.

5.1. Regulatory Environment

Relevant Acts of Parliament

Official regulations for the dairy industry in Kenya are contained in the Dairy Industry Act (CAP 336 of the Laws of Kenya) which was first enacted in 1958 and established the Kenya Dairy Board (KDB) to regulate the dairy industry. The act has been revised several times in the past (1962, 1972 and 1984) to improve the dairy. The KDB has mostly concentrated on its policing role at the expense of its other functions including: promotion of market research in dairy produce; improvement of quality of dairy produce; and, promotion of private enterprise in the production, processing and sale of dairy produce. Another major weakness of the Dairy Industry Act has been the concentration of authority in the hands of the government minister in charge of agriculture. For example, the appointment of officials to run KDB, and the nomination of KCC in the past as the sole agent for KDB never worked well for the industry. The latest revision, which is intended to bring the act into line with the liberalised dairy industry, is about to be enacted into law at the time of this write-up. The revision includes the establishment of a restructured KDB with enhanced functions and capacity to improve its role.

The other important regulation is the Co-operative Development Act, under which all dairy marketing co-operatives fall. Again, this act has in the past not allowed sufficient farmer-control of dairy co-operatives, thereby contributing to a high incidence of mismanagement. The act has been revised recently (1997) but its impacts on the ground are yet to be realised.

Taxes

Producers pay cess levy at 2 cents per litre to KDB. The cess is only paid from milk sales through processors and coops other than KCC, who are exempted from paying it. This denies KDB an important source of income. Large scale farmers would normally pay income tax but most small scale producers do not. Sales of processed milk products from established enterprises are subject to value added tax (VAT) at (16%). Imported milk and milk products are subject to import duties and other levies.

Land tenure

The land tenure policy in Kenya (Agriculture Act, CAP 318 of the Laws of Kenya) that allows private land ownership is considered to be one of the key factors that has spurred growth of dairy production. The policy has over the years had the positive effect of allowing producers to access credit by taking advantage of the collateral value of land, though this advantage has lately been greatly curtailed by expensive credit from the formal banking sector. The policy sought to prevent uneconomical sub-divisions of agricultural land by stipulating minimum land sizes in various areas but this is rarely implemented.

Major impacts of dairy market liberalisation

The immediate impact of the dairy market liberalisation has been increased participation in milk marketing by formal and informal market agents. This has had the effect of re-distributing the benefits of dairying including increased employment opportunities, increased milk availability and an increase in real farm-gate milk prices thereby increasing producer earnings. There is also a positive shift in the concerns of farmers from difficulties with milk marketing to investigating options for increasing production. The other major impact has been the changes in relative prices in various regions that now reflect market access (Owango *et al.*, 1996). However, as already noted, the legal framework to increase the benefits of market liberalisation has lagged behind the policy change. For example, though KDB now issues licences to traders of raw milk, the regulations that were there before liberalisation (that disallowed trading in non-processed or non-pasteurised milk products) are still in place. The KDB is also in a dilemma on how to institute new regulations in the absence of information on actual risks faced by consumers of raw milk.

With more accurate information²² on the risks to humans from informally marketed milk, the present regulations will need to be revised. The trade-offs from implementation of some

²² A study, on "Public health hazards of informal milk marketing in Kenya" is underway by SDP and the Dept of Veterinary Public Health, University of Nairobi in collaboration with various stakeholders including KDB and Kenya Medical Research Institute (KEMRI).

hygiene and quality regulations are substantial. They are favourable in that, aside from helping to ensure the standard of formally marketed milk, they assist in boosting the image of milk generally as a healthy product and thus may have a promotional effect on milk consumption. Importantly, however, the strict implementation of regulations creates strong incentives for markets to avoid them due to the costs of compliance, and the consequent higher sale prices of dairy products. In a market where purchasing power of the customers is low, this clearly weakens the competitiveness of the formal sector. The policy question that needs to be answered is thus: is it preferable to maintain strict milk standards which result in higher costs and thereby free most marketed milk into informal channels, or is the public better off by standards that are relaxed but capture more of the informal market? If standards were relaxed to officially allow raw milk marketing, yet regulations regarding handling, permissible time to retailing, and adulteration are maintained with some incentives to milk traders to comply²³, then a much larger proportion of the milk market may fall under regulatory control, improving the average standards of milk in the market.

5.2 Farmer Organisations

Dairy marketing farmer organisations mainly comprise dairy co-operative societies and SHGs. Dairy co-ops are organisations registered with the Ministry of Co-operative Development, while SHGs are registered with the Ministry of Culture and Social Services. Functionally, there are no differences between dairy co-ops and SHGs engaged in milk marketing. In comparison to other East African countries, farmer organisations and co-operatives in Kenya have played a critical role in assisting the participation of smallholder dairy producers in the market. Combining the roles of milk collection and service provision permits farmer groups to maintain an advantage over other actors in the milk market, principally because they offer producers the advantage of accessing distant markets at lower marketing costs per litre of milk due to bulk purchases and sales.

Dairy co-operative membership has generally been on an upward trend since 1963 when there were only 2,300 members to over 100,000 members currently (MOCD Annual Reports). Karlen (1995) established that dairy co-ops account for 34% of all co-operative societies in Kenya, and that they are mostly concentrated in the central highlands. It was observed during this study that SHGs were more popular in some areas (e.g., Kirinyaga) than co-ops because of the history of mismanagement in coops. As a result, some co-ops have become dormant. Both co-ops and SHGs offer producers in high milk production areas

²³ Some examples of incentives could include basic training in milk handling and hygiene, or an official stamp of approval, which they could use to promote their milk to customers.

the advantage of accessing distant markets at lower marketing costs per litre of milk due to bulk purchases and sales.

Kiambu District has the most well established milk marketing infrastructure through some 14 dairy co-ops with memberships ranging from a few hundreds to several thousands, some of which were established in the early 1960's (e.g., Limuru Dairy Co-op Society, established in 1962 and with a current membership of 7,000). Beyond milk marketing (which is mostly of raw milk), most of the dairy co-ops in Kiambu provide some or all of the following additional services: credit; the bulk supply of feed, drugs and other dairy inputs; and AI and veterinary services. In terms of provision of services, larger co-operatives (with many members) are best placed (Ombui *et al.*, 1995, Owango *et al.*, 1996). To enjoy the same services at a cheaper cost, smaller co-operatives have begun to pool resources, to be able to provide more services, including AI, at a cheaper cost. Dairy co-ops are also reasonably well established in Murang'a and Nyandarua Districts, but they offer few services beyond milk marketing.

Other areas of the country do not have a high concentration of co-ops either because they are relatively low milk production areas (hence most sales are direct from producer to neighbour), KCC still plays a dominant role, or other private milk processing dairies provide adequate service. For example, in Kirinyaga District there is only one active co-op, the Kirinyaga Dairy Co-operative Society, which is currently handling about 4,000 litres of milk per day. The co-operative sells raw, pasteurised and fermented milk. Private processors in the district handle in total an equivalent amount of milk to dairy co-ops and are beginning to provide some of the input services that co-ops provide. The central Rift Valley, though being a high dairy production zone, has relatively fewer co-ops than Central Province. Only a few co-ops were found in Machakos and Kitui Districts.

There are breed societies with origins in the colonial era when they were formed to serve the interests of large scale European settler farmers. The societies still mainly serve the interests of large-scale dairy producers. These societies exist for the following breeds: Friesian, Ayrshire, Guernsey, Jersey, Sahiwal and Boran. All breed societies maintain records of pedigree animals through the Kenya Stud Book (KSB). There are moves to integrate all the breeders' societies into one strong group.

5.3 Livestock Support Services

Research

The reorganisation of agricultural research activities in Kenya resulted in the creation of the parastatal Kenya Agricultural Research Institute (KARI) in 1989 with a national mandate to carry out both crops and livestock research. KARI has several research centres spread throughout the country with either national and/or regional research mandates. National mandates include strategic and basic research activities whereas regional mandates emphasise adaptive farming systems research. Research centres with both national and regional mandates for dairy research are situated at Naivasha and Muguga. Centres with regional mandates are situated at Kitale, Kakamega, Muguga, Kisii, Embu, Katumani and Mtwapa. This deliberate focus on adaptive farming systems research approach is commendable. The institute has recently completed its second priority setting exercise to enable it better focus its research activities; it considers dairy as one of the most important commodities for research. Current priorities under dairy research (KARI, 1996) fall under the following thrusts: i) socio-economics; ii) feed resources and utilisation; iii) animal health; and iv) animal breeding/genetic improvement. Under the socio-economics thrust, the institute identified research on policy environment as a priority. The main priorities identified under feed resources and utilization were: improving cow and heifer diets; forage/food crop inter-cropping; and, on-farm testing of forage technologies. Improvements in cow fertility and on-farm ECF control were identified as needing urgent attention under the animal health thrust. KARI has started to actively encourage the private sector to get involved in addressing priority research issues, including financing of research activities that benefit them. Besides KARI, useful research directly or indirectly related to dairy has been and continue to be carried out at agricultural faculties at the University of Nairobi and at Egerton University, Kenya Trypanosomiasis Research Institute (KETRI) and the Kenya Forestry Research Institute (KEFRI).

National dairy research to date has contributed to the identification of useful production technologies (especially feeding strategies), besides identifying and attempting to resolve social and economic constraints to the development, adoption and productivity of smallholder dairy systems. However, the translation of a number of these technologies into adoptable interventions by farmers still remains a major challenge.

The International Livestock Research Institute (ILRI) has been an active collaborator in a number of national dairy research activities. Notable examples include: the KARI/ILRI collaborative research activities on smallholder dairy in the coastal lowlands which was

concluded in 1994; KARI/ILRI/MoA collaborative smallholder research and development activities currently being carried out in the highlands; and, field testing of animal health technologies. The International Centre for Research in Agroforestry (ICRAF) is also involved in research aimed at improving natural resource management through the introduction of trees, including cattle fodder trees.

Input supply

Successful delivery of AI services country-wide since 1966 through the Kenya National Artificial Insemination Services (KNAIS) has been a major contributor to the growth of dairying in Kenya. These services continued to improve until 1979 when the peak of about 542,000 inseminations were performed, out of which 9% were carried out on zebu animals. This figure dropped dramatically by 1992 to 195,000 inseminations with only 1% being conducted in zebu cows (KNAIS, 1994). The number of inseminations by KNAIS has continued to drop with only about 85,000 and 60,000 inseminations in 1996 and 1997, respectively. In contrast, the number of inseminations by private AI providers (including coops and private veterinarians) has been rising steadily, surpassing those provided by KNAIS in 1995 when about 97,000 inseminations were conducted. This figure rose to about 113,000 inseminations in 1996, excluding those inseminations by informal service providers and individuals on their own farms. The dramatic decline in the number of inseminations provided by KNAIS since 1981 has greatly affected the growth and genetic quality of the dairy cattle population, but the private sector is evidently rising to the challenge of filling the gap left by the declining services by KNAIS. The Livestock Recording Centre, started in 1974, has been a useful programme for progeny testing and making available quality bulls for CAIS and private large scale farms.

Though increasing participation through the private sector (e.g., dairy co-ops, private veterinarians and companies such as American Breeders Service Ltd and World Wide Sires Ltd) may have improved the situation somewhat, many smallholder farmers were still found to solely rely on private, communal or NGO provided bulls for breeding. The government currently provides bulls through the FINNIDA supported Livestock Development Project (LDP) to individual farmers for use by local communities at a fee. The LDP, which is basically an extension project started in 1991, operates in the Lake Basin (Nyanza and Western Provinces) and Rift Valley. By 1995 the LDP had established 335 bull schemes providing services at KSh. 100 per bull service. In the absence of efficient AI services and with the high price of more than KSh. 25,000 (US\$ 400) for average quality heifers, upgrading through bull services provide a useful alternative for those wishing to increase

dairy genes of their animals. The obvious disadvantage of spread of reproductive diseases however remains.

Access to credit, for the purchase of services and inputs, is considered essential in solving the financial constraints at the farm level. As already stated, many dairy co-operatives are increasingly linking their marketing activities to the provision of input services. But access to credit inputs through coops mainly occurs in Central Province, especially Kiambu. In other areas, dairy co-operatives have not taken off or are still in their infancy. Formal credit institutions such as banks, charge relatively high interest rates beyond that which most smallholders can afford.

Extension and veterinary services

The effectiveness of government extension, including the provision of clinical and preventive health services, has been declining for some time as a result of government budgetary constraints and the transition to privatised services. Present evidence shows low extension staff to farmer ratios, which continue to decline, as a result of stoppage of further staff recruitment by the government. The extension staff to farmer ratios range from 1:500 in Central Province to about 1:1,230 in Western Kenya. These ratios will continue to decline unless the private sector (e.g., private processors) begins to provide similar services. A recent study in Kiambu shows that fewer than 50% of farmers receive livestock extension advice (Staal *et al.*, 1998).

The MoA has defined those goods whose delivery it considers public, private or shared; but the privatisation of the provision of those services that are considered private goods is happening quite slowly, despite the continued reduction in public budgetary allocations to these services. As a result, privatisation is happening by default but this is not adequate to fill the gap created by the continuing divestiture of government services.

As already stated, farmer groups are increasingly playing an important role in providing some veterinary services (e.g., clinical and AI) to smallholders that are linked to their milk marketing services especially in Kiambu District. This institutional linkage provides an opportunity to reduce costs of service provision and ease payment recovery, thereby improving the long-term viability of both the collection and service functions. A major gap however remains in the provision of technical information to improve productivity.

Presently about 200 veterinarians are in formal private practice, and many more practice informally, especially since the stoppage of automatic government employment of veterinary graduates in 1990. Most clients of private veterinarians are the better resource-endowed farmers who can afford their services (Wamukoya *et al.*, 1995). Where farmer groups are present, most smallholder farmers prefer the cheaper farmer-group provided veterinary services that they can also obtain on credit. The EU supported Kenya Veterinary Association Privatisation Scheme has boosted the number of formally registered private vets, which has attracted 41 successful loanees since its inception in 1995. Many more have not been successful due to lack of collateral. A "subsidised" private service is provided by government veterinarians and para-veterinarians who use public facilities at no cost and so can afford to charge low rates for their services. As the possibilities for such activity decline with continued reforms, and as private services respond to demand, it is anticipated that the privatisation of veterinary clinical services and liberalisation of input supply and AI will improve efficiency in the dairy farming community. There remains considerable uncertainty, however, as to the level of service that the private sector will be willing to provide in areas where dairying is less market-oriented.

Agricultural training

Private and publicly provided formal training for the agricultural sector is available at several levels from farmer training centres, to certificate, diploma and degree colleges. Certificate-level training in animal husbandry takes place at several Animal Health and Industry Training Institutes situated at Kabete, Ndomba, Bukura and Nyahururu; certificate and diploma-level training in dairy technology is provided at the Dairy Training Institute-Naivasha; and, degree-level training is provided at Egerton University, University of Nairobi, Moi University and Baraton University, which is privately funded.

5.4 Access Roads and Water Supply

Most dairy production areas have good seasonally passable road networks but which are rarely maintained. The lack of maintenance is major limiting factor for milk collection and transportation to markets, particularly in Nyandarua and Kericho Districts. Instances of milk wastage, especially during the rains are common in these areas. An estimated 30% of milk production from these districts is lost annually due to the poor state of roads (MoA, 1996). Poor access to water is also of great concern in many areas including those with relatively good market and roads infrastructure such as Kiambu District.

5.5 Donor Participation in the Dairy sub-Sector

Many bilateral and multi-lateral donors and NGOs have assisted dairy development in Kenya over the years. The major bilateral donors that are presently involved are: the Netherlands Government presently supports the Dairy Programme at KARI; Finnish Government supports the Livestock Development Project; Danish International Development Agency (DANIDA) recently supported the development of the Dairy Master Plan and the revision of both the dairy policy and the Dairy Industry Act (Cap 336); GTZ supports smallholder dairy goat development in Central Province; Swedish International Development Agency (SIDA) supports dairying related community water development projects; IDRC supports an agroecosystem health project based at the University of Nairobi; and, the Department for International Development (DFID) of Britain supports KARI's second National Agricultural Research Programme (NARP II)²⁴ and the MoA/KARI/ILRI Smallholder Dairy Project. Multilateral agencies that are involved are the World Bank which supports the National Extension Project (NEP) and KARI's Regional Research Programmes (RRP), Food and Agricultural Organisation (FAO) supports training in dairy processing and European Union (EU) supports the animal health services privatisation programme. NGOs that are involved are Heifer Project International (HPI), Farm Africa, and the Dutch Volunteer Services (SNV).

5.6 Institutional Linkages

Good linkages to improve the efficient delivery of livestock services, coordination and sharing of information for dairy development among national institutions exist between MoA and KARI. However further improvement in linkages with other related institutions is required to foster this effort. Other national stakeholders with whom linkages need to be strengthened include the national universities, farmer groups (e.g., cooperatives), NGOs, the private sector and donors. Strengthening of linkages between these institutions can enhance the capacity to undertake more integrated, inter-disciplinary dairy system research and development, by better utilizing available knowledge, institutional and human resource capacities. Improving linkages between KARI, MoA and the national universities should be a priority, particularly Egerton and Nairobi Universities which have well established agricultural faculties. Both universities possess a large pool of trained manpower whose skills can be tapped to contribute more to the national agricultural research agenda, besides present mechanisms such as KARI's Agricultural Research Fund which mostly serves independent research activities. Collaborative research activities currently being initiated between the University of Nairobi and the MoA/KARI/ILRI Smallholder Dairy Project to assess the public

²⁴ DFID's support to KARI's NARP II is scheduled to end in April, 1999

health hazards of informal milk marketing should serve as a model for similar collaborative arrangements in the future.

5.7 Main Issues in Policy and Institutions.

1. Underdeveloped infrastructure, especially access roads which are impassable during rains, and poor water supply in many dairy producing areas.
2. Uncertainty of appropriate policy guidelines for informal milk market agents whose role has increased tremendously in recent years. There is a lack of information on which to base those guidelines.
3. The difficulty farmers face in accessing input services including feed, veterinary and AI and the failure of the privately delivered input service provision to fill the gap left by the withdrawal of government services.
4. Unfair competition to private service providers from those still on government payroll.
5. Role of KDB needs to be redefined to reflect the wishes of all stakeholders
6. There is the need for decentralised feed quality testing centres. Currently, these services are only available centrally at KARI-NARL and KBS in Nairobi. Many farmers suspect that the lack of response by cows to feeding is partly caused by poor quality feeds.
7. The need for marketing institutions that link milk collection/marketing and livestock service provision in some areas, including provision of suitable credit. There is a near absence of farmer groups in some areas to facilitate input and output service linkage. Where present, many farmer groups do not provide input services (Farmer groups in Kiambu are a notable exception). The formal banking sector offers unaffordable credit due to high interest rates and the performance of the specialised agricultural banking institution - the Agricultural Finance Corporation - has greatly diminished in recent years.
8. Low impact of government extension services with less than 50% of smallholder dairy farmers accessing the services.
9. Uncertainty of the impacts of liberalisation on input supply and extension services.
10. Inefficient management and lack of effective farmer control in farmer groups particularly coops.
11. Uncontrolled livestock movement leading to resurgence of diseases in some areas where they had previously been effectively controlled.

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Appendix 1: Research Teams and Terms of Reference

Research teams

The collection and analysis of data were conducted jointly by three teams drawn from the three institutions represented in SDP. The three teams were:

Analysis of the Dairy Production Systems:

Dr. M. Owango - Animal Nutritionist, Head of Animal Production Programme NARC, Muguga, KARI ; Assistant Manager - SDP

Mr. B. Lukuyu - Senior Technical Officer – NARC, Muguga, KARI

Mr. F. Musembi - Agricultural Economist - NARC, Muguga, KARI

Analysis of Economic and Structural Aspects:

Dr. M. Kenyanjui - Veterinarian, Senior Field Research Technologist, Market-oriented Smallholder Dairy, ILRI

Dr. A. Omore - Veterinary Epidemiologist, Research Officer – KARI/ILRI.

Analysis of Policy and Institutional Issues:

Mr. H. Muriuki - Assistant Director, Animal Production , Ministry of Agriculture, Headquarters; Manager - SDP

Mr. G. Gichungu - Animal Production Scientist, Ministry of Agriculture, Headquarters.

Report-Editing:

Dr. A. Omore - Veterinary Epidemiologist, Research Officer – KARI/ILRI.

Dr. S. Staal - Agricultural Economist, Market-oriented Smallholder Dairy - ILRI

Terms of Reference for the Rapid Appraisal

The terms of reference (TOR) for each thematic research team were:

TOR for Economic and Structural Analysis Team

1. Identify the physical and geographical distribution of dairy production, processing, markets and consumption. This includes quantification of flows through alternative market channels and illustrated by diagrams of quantities and percentages for national market and smaller market components.
2. Assess the historical trends in output supply and demand, and project the changes in demand over the next 20 years.
3. Assess issues related to input supply and demand patterns, including for heifers and feeds.
4. Measure the economic viability of all market components of the sub-sector.
5. Quantify the effects of macro-economic and regional/world market factors on competitiveness of domestic dairy production and processing.

TOR for Production Systems Analysis Team

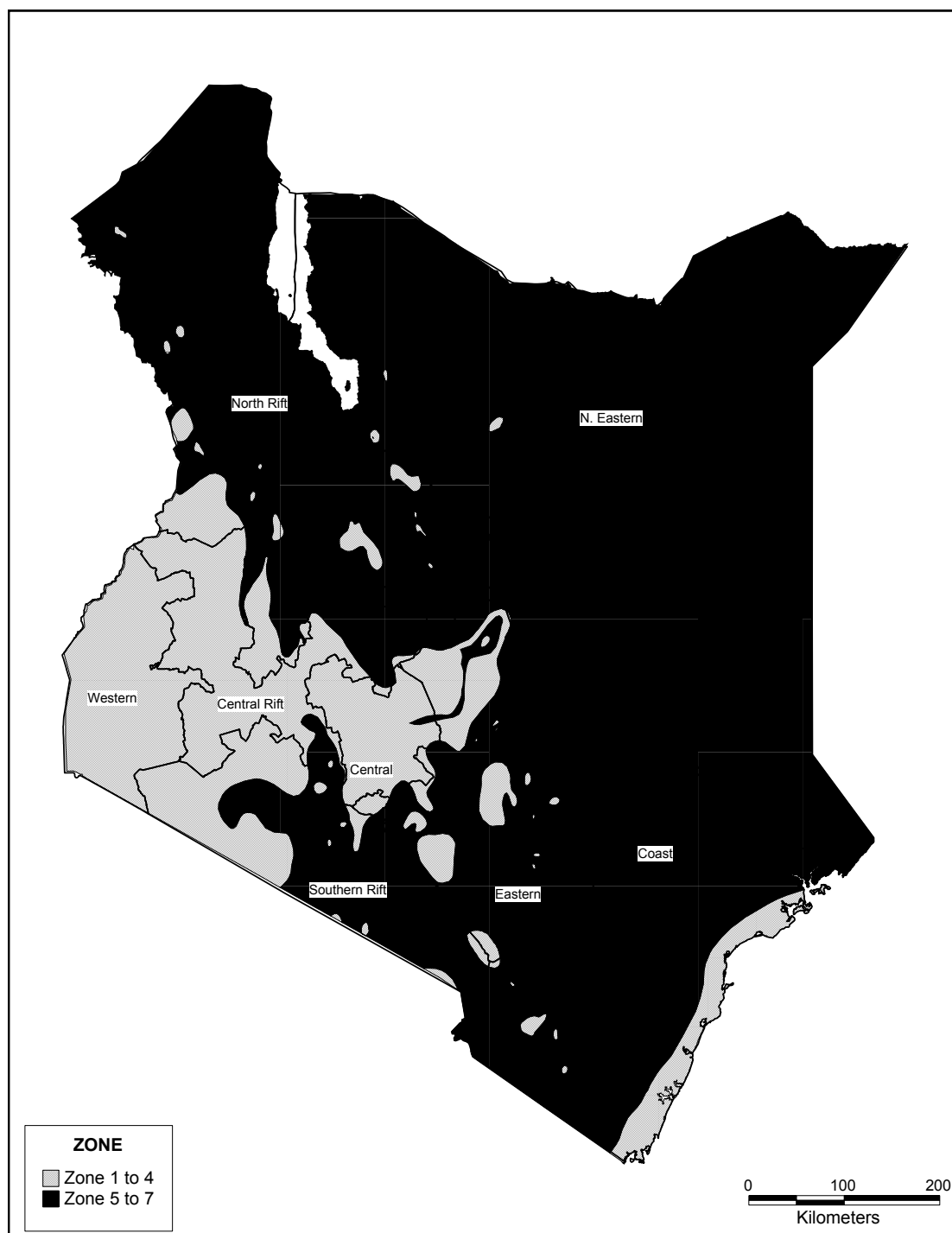
1. Identify the current principal milk sheds and their major consumption centres, and the areas with potential as milk sheds to serve milk deficit areas now and in the next 20 years.
2. Describe briefly the history of dairy development in each milk shed.
3. For each milk shed, document in as quantitative terms as possible, the current production systems (livestock species and breeds; herd/flock sizes and structures; milking and calf management; breeding practises; feeding resources and systems; disease risks and health management practises); and, their output and input market linkages (including quantities of milk consumed by progeny and by the producer household, and how much is marketed in what form). Put these descriptions into the context of the farm and land use systems of the milk shed.
4. For each major production system in each milk shed, identify the current major constraints and opportunities (bio-physical, technical, social, institutional and policy issues), and those expected in five, 10 and 20 years.
5. Highlight the factors driving changes in the production systems, their likely consequences and the resultant research and development challenges.

TOR for Policy and Institutional Analysis Team

1. Describe the evolution of dairy development nationally, including: changes in stated and effective public policy towards dairy production and marketing, and consumption, central and local government, donor and NGO activities in the dairy sector, and the evolution of institutions in the dairy sub-sector dealing with policy-making and investment, extension, training/education, disease control and animal health, reproductive services, input supply and feed, processing and marketing, and credit.
2. Describe the current and planned policy interventions, institutional re-organisation and donor activities.
3. Assess what is known about how policy at the central and local government levels has impacted on smallholder dairy development since 1960, and priority knowledge gaps for effective action to promote greater smallholder involvement, especially from the poorer groups.

Appendix 2 : Agro-climatic Zones

Agro-climatic zones classification²⁵



²⁵ ACZ 1-4 represent areas with humid to semi-humid zones with Rainfall/evaporative potential greater than 40% and are suitable for arable agriculture. ACZ 5-7 represent semi-arid to very arid zones with Rainfall/evaporative potential less than 40% and are suitable for rangeland cattle keeping only