AGRICULTURE INVESTMENT NOTE

SMALLHOLDER DAIRY PRODUCTION

Smallholder dairy production is common in many parts of the developing world, providing an important source of nutrition and income to millions of households. Income from such production often accrues to women who use this to provide better nutrition and education for their children. Projections for future growth in demand for livestock products show good growth prospects for the dairy industry. Public support is often needed to put in place appropriate policies, establish marketing chains, and provide services for growth of smallholder dairying.

Globally, there are about 300 million rural and periurban poor whose livelihoods depend on the daily income and nutrition they receive from milk production. In India, about 40 million landless poor families get a major part of their income from milk. Since there are fewer economies of scale involved in dairy production than in some other livestock production systems, the strong concentration of production evident in the pig and poultry sector is not yet seen in the dairy sector. Markets in developing countries are secure, as demand for milk and milk products is expected to increase by more than 3 percent annually over the next 10 to 20 years (Delgado et al. 1999). Per capita milk consumption will then still be only one-fourth of the per capita consumption in the industrial countries.

SMALLHOLDER DAIRY DEVELOPMENT

Smallholder dairy production takes many forms and is often combined with cottage industry (small household) processing activities. Smallholder dairy production is mostly carried out by the family, with some very limited hired labor. Examples of smallholder dairy production are the mixed farms in Central America with 25 cattle; small mixed farms in the highlands of Ethiopia with one or two cows; rice farmers in the Punjab of India with 10 buffaloes; and Sahelian pastoralists with herds of up to 100 animals.

Although future regional market developments are difficult to predict, it seems that developing countries have a good chance of benefiting from new market opportunities. Milk production growth in developed countries is constrained by land and water availability, and increasingly by strict environmental legislation and reforms in subsidies provided to the dairy industry. Because of the comparative advantage of temperate climates, production expansion is most likely to come from North America, the Southern Cone of South America, and areas such as the Ukraine, though there remain opportunities for growth in other areas, such as China, India and Eastern Africa (see box 4.12).

Box 4.12 India: Operation Flood—how a commodity project can reduce poverty

Operation Flood was supported by the Bank and other donors from the mid 1970s to the mid 1990s. It originally started as a marketing project but gradually developed into production and input services. It is based on a three-tier cooperative system that includes:

- Village-level dairy cooperative societies, which are farmer controlled, with an elected management committee, including at least one woman.
- Regional milk producers’ unions that own the dairy plants and transport equipment for milk collection and processing.
- State federations for interstate sales and coordination.

The National Dairy Development Board, a government apex organization, provided the technical support. Operation Flood now has 9 million members (60 percent are landless), with a daily milk throughput of about 30 million liters. It has made important contributions to poverty reduction, human health, and nutrition and is the most successful Bank operation in the livestock sector. Operational issues included interference by government, in particular in the federations, and its search for monopoly positions when support from outside sources was phased out.

Source: de Haan et al. 2001.
BENEFITS
Certain characteristics of smallholder dairy production systems—intensive, year-round labor needs, the provision of regular income, and easy substitution of the product between home and market—make dairy production a good example of pro-poor approach to agriculture and rural development. The production characteristics of smallholder dairying, such as use of crop residues, fodder-crop rotation, and production of organic fertilizer, provide a strong synergy with other parts of the farming system. Milk's perishable nature and the limited marketing leverage of an individual small producer make it highly suitable for cooperative marketing, and hence an important tool for farmer empowerment. However, smallholder dairying carries risks. In many cases, a small herd constitutes a large part of the farmer's assets, and disease and death can wipe out these assets entirely, potentially leading to increased indebtedness and poverty.

POLICY AND IMPLEMENTATION ISSUES
SUBSIDIES AND DUMPING. With milk production mainly being a smallholder activity, and milk seen by many as a being a staple product, the dairy sector is the subject of political attention and inappropriate policies. Thus the sector has suffered from excessive price controls, and greatly distorting subsidies both in OECD countries and in developing countries. In developing countries, the dairy sector has been negatively affected by the dumping of surplus subsidized dairy products by the European Union (EU) and the United States. With global trade negotiations in the World Trade Organization (WTO) on the issue of agricultural subsidies, producer groups, local industry, donors and finance ministries need to discuss issues of domestic liberalization and appropriate adjustment that may be needed as a transition mechanism. Other policy issues encountered in Bank projects include cooperative monopolies (India), excessive interference of government in the sector, the introduction of unsustainable subsidies, for example for artificial insemination (AI) (India, Kenya, Morocco) and health services, and excessive food safety regulations.

MARKETS. Milk, being highly perishable, requires daily collection and market delivery. Many past investments have focused on developing western-style collection, processing, and distribution systems, with pasteurized products. However, there is growing evidence, for example from Nairobi (Staal 2002), that this approach might be counterproductive. Pasteurization and packing costs nearly double the price of milk to consumers, thus reducing farm gate prices and limiting access by the urban poor. Giving the formal sector the exclusive right to distribute milk and milk products also affects employment opportunities for many small intermediaries involved in the distribution system. In addition, marketing through a formal collection system introduces one of the few economies of scale in dairy production, as it is often accompanied by a requirement for on-farm cooling equipment, which is normally profitable only with a production level of 100 liters or more per day. Such requirements, in situations where milk is boiled before consumption, are unnecessary, as boiling obviates the need for pasteurization.

LESSONS LEARNED
Success in smallholder dairy production can be evaluated at three levels: farm, market, and institutional (see box 4.13). Dairy production normally requires a high quality of support services as dairy breeds are generally more costly and more vulnerable than other cattle to disease and health problems.

VETERINARY. Because smallholder dairy development is a rather risky endeavor, good, easily accessible veterinary services are essential. Experience in many countries, such as India and Kenya, shows that private veterinary services (also supplemented by public services for the “public goods” such as vaccination) are highly desirable, and can provide the flexible, dynamic services the smallholder dairy producer requires.

BREEDING. The choice of dairy breed has been subject to much debate. Past introductions of pure exotic breeds have almost universally
failed (with the exception of restocking programs in areas such as the Balkans). Generally, a combination of selection in local breeds and cross-breeding with exotic genetics is more appropriate, leaving it to the skill of the individual smallholders to decide on the level of exotic germplasm they can manage. This approach has been quite successful in India, Northern Brazil, and Kenya.

Breeding systems are also subject to considerable debate. AI systems, often demanded by Bank clients, have high costs and logistic and maintenance requirements, because of the need for liquid nitrogen to store semen. Such facilities can be organized in areas with good communications and infrastructure, but many AI systems have proven unsustainable without continued subsidies. Terminating subsidies, as in Kenya, can then cause collapse of the system, which in the absence of alternatives, results in a considerable deterioration in the genetic base of the dairy herd. AI requires adequate producer skills, infrastructure, and communication facilities. Where AI is to be introduced, it should be privatized, and where appropriate conditions do not exist, bull camps or the use of fresh semen have given good results, as in Indian Watershed projects.

**Extension.** Most general extension staff members have little experience with livestock and dairy farming. Key areas requiring additional extension training include fodder production and livestock feeding schemes, husbandry (in particular calf raising), and dairy hygiene. Health and breeding services can best be handled by specialized professional services. Extension staff must also help producers cope with social change, such as changing gender roles and issues of access and control over resources.

**Credit.** Capital requirements for smallholder dairy producers are high and may be especially constraining for women farmers. Credit schemes need to be long-term. If, for example, a pregnant three-year-old cow is the starting stock for the family dairy, credit terms should be for at least three years. Loans are ideally accompanied by an insurance system to mitigate animal loss risks. However, experience with livestock insurance has not been very good, because of the moral hazard problems involved.

The credit-in-kind system, whereby animals are provided on condition that some of the offspring are passed on to other members of the community, has been effective in many programs. If the program is adequately integrated in the local community, peer pressure ensures sustainability of the passing-on mechanism. A number of nongovernmental organizations (NGOs), such as Heifer Project International, Oxfam, and Farm Africa, are specialized in this area (see box 4.14).

**Farmer Organizations.** The perishable nature of dairy products gives individual farmers little

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**Box 4.13 Indicators of success**

A successful smallholder dairy sector is characterized by the following:

- At the farm level: calving rate of 80 percent or more, a production level (depending on conditions) of 600 to 3000 liters per lactation (that is, about 300 days), mostly fodder based, and economically attractive.
- At the marketing level: a viable formal collection system (private or cooperative), supplemented by small traders.
- At the institutional level: an influential national organization.

**Source:** Authors.

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**Box 4.14 Indonesia: in-kind credit in Java**

The Provincial Development Program of Central Java Province introduced a new in-kind loan project in the 1980s to replace the existing small ruminant credit system. Target farmers were divided into groups of 10 with each farmer receiving two female goats or sheep. Each group leader received small ruminant management training and a good quality buck or ram. Each recipient had to repay four lambs or kids over a three-year period. Post-program evaluation in 1988 found the program to be successful in introducing new technology, increasing farmer income, improving production performance, and improving dynamics within farmer groups. The system can work equally well for dairy cattle.

**Source:** de Hann et al. 2001.
leverage in marketing. However, the involvement of many smallholders in milk marketing makes dairy products suitable to cooperative processing and marketing systems. Most cooperatives also provide services such as health and breeding, although cross subsidies of these services through the price of the milk become an issue. Government interference can however be a constraint to building organizational capacity.

FEED SUPPLY. Feed supply is a major issue for smallholder dairy systems, as most systems operate under conditions of extreme land pressure (Kenya, India) or labor availability (West Africa with high labor needs at the end of a marked dry season). Feed conservation for dry season supplementation has been a major issue, as most technologies, such as silage, haymaking, and urea treatment are not suitable for smallholder or humid tropical environments. Fodder trees and mixed tree-legume protein banks can be a solution.

RECOMMENDATIONS FOR PRACTITIONERS
Key conditions for successful dairy development involve market access and availability of services to smallholders and require public policy and institutional development and targeted investment. Sound investments generally must (see box 4.15):

Potential investments:

- **Conduct a detailed assessment on the extent and nature of market demand.** Key questions to consider include: Do local consumers want pasteurized milk and can they afford it? Are there opportunities to export? What safety and quality standards must be met? All initiatives to promote smallholder dairying must be led by market demand.

- **Promote private sector development of supply chain infrastructure required for efficient production and marketing.** This includes transportation and communication systems, food testing and certification facilities, and cold chain infrastructure.

- **Establish an appropriate balance between public and private involvement in the supply of services.** In many instances public sector involvement is best restricted to limited-term cofinancing arrangements that encourage private sector investment. A direct government role is appropriate in areas such as auditing of certification systems and management of quarantine procedures and epidemic risks.

- **Promote establishment of effective financial markets and risk management mechanisms.** This is largely the role of the private sector, and private investment may be best initiated through limited-term cofinancing schemes.

- **Provide technical assistance to both male and female farmers.** Assistance is needed in areas such as breeding policy (what breeds are most suitable to the production and market environment; where to source breeding stock; is AI appropriate?), animal health (control of internal parasites, mastitis management), milk hygiene, and feeding policy (managing feed supply, conservation of surpluses, supplementary feeding).

SELECTED READINGS
Asterisk (*) at the end of a reference indicates that it is available on the Web. See Appendix 1 for a full list of Websites.


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**REFERENCES CITED**


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**Box 4.15 Potential investments**

- Animal health and breeding services, with a focus on developing private systems. Costs would be about US$2,000–5,000 for breeding services, and US$10,000 – 20,000 for veterinary practices.
- Extension services to provide specialized skills for dairy production.
- Market development and infrastructure. Cooling systems vary between US$1000 and US$20,000. Wood-fueled pasteurization plants at nominal costs can be effective up to about 500 liters per day; small pasteurization plants (2,000 liters per day) cost about US$10,000; and larger processing plant costs vary according to individual design.
- Financial services (savings and credit) need to be included in the overall microfinance systems, eventually supported by special credit in-kind schemes.
- Producer organization support, mostly in the form of technical assistance.

Source: Authors.

This Note was prepared by Cees de Haan with inputs from the Sustainable Agriculture (SASKI) Thematic Team of the World Bank.