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# Improving smallholder livelihoods: Dairy production in Tanzania

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**Abstract**

Tanzania is primarily an agro-based economy, characterized by subsistence agricultural production that employs more than 80% of the population and contributes up to 45% of the GDP (2005). This country is endowed with a cattle population of 21.3 M, composed mainly of indigenous Zebu breeds and about 680 000 improved dairy animals. About 70% of the milk produced comes from the traditional sector (indigenous cattle) kept in rural areas, while the remaining 30% comes from improved cattle, mainly kept by smallholder producers. In Northern Tanzania and particularly in Hai district of Kilimanjaro Region, some dairy farmers organize themselves into small producer groups for the purpose of milk collecting, marketing and general promotion of the dairy sector in their community. Nronga Women Dairy Cooperative Society (NWDCS) Limited is one of such organizations dedicated to improve the well-being of the Nronga village community through promoting small-scale dairy farming and its flow-on benefits. Milk flows out of the village, and services for investment and dairy production flow into the village, ensuring a sustainable financial circulation necessary for poverty reduction, rural development and better life for the rural community. In 2001 NWDCS introduced a school milk feeding program that has attracted Australian donors since 2005. Guided by Global Development Group, a multi-faceted project, integrating micro-enterprises, business, education and child health/nutrition, was proposed and initiated by building a dairy plant in Hai District headquarters, the Boma plant. In March 2013, the Australian High Commission to East Africa approved Direct Aid Program funding of AUD 30 000 towards the NWDCS - Biogas Pilot Project in Tanzania, which included the renovation of zero-grazing cow shade units, the construction of 6-$m^3$ biodigester plants on each farm, and encouragement of the use of bioslurry for pasture production and home gardens.

**Resumen**

La economía de Tanzania se basa principalmente en la agricultura, caracterizada por sistemas de producción de subsistencia que emplean más del 80% de la población. En 2005 estos sistemas contribuyeron con más del 45% del PIB. El país tiene una población de 21.3 M vacunos, compuesta principalmente por razas cebuínas autóctonas, y aproximadamente 680 000 vacunos lecheros mejorados. El 70% de la leche se produce en el sector tradicional rural con animales autóctonos, mientras que el restante 30% proviene de animales de razas mejoradas mantenidos por pequeños productores. En el norte de Tanzania y particularmente en el distrito Hai de la región Kilimanjaro, algunos productores de leche se han organizado en grupos pequeños con el propósito de recolectar la leche producida, comercializarla y, en general, promocionar el sector lechero dentro de su comunidad. Una de estas organizaciones es la Cooperativa Lechera de Mujeres de Nronga (NWDCS Ltd., por su sigla en inglés), dedicada a mejorar el bienestar de la comunidad a través de la promoción de explotaciones lecheras a pequeña escala y su flujo de beneficios. La leche producida es enviada fuera de la comunidad y en cambio regresan servicios para la inversión y la producción lechera; de esta forma se asegura un flujo monetario sostenible que es necesario para la reducción de la pobreza, el desarrollo rural y un mejor nivel de vida de la comunidad rural. En 2001 la NWDCS estableció un programa de suministro de leche a las escuelas, que desde 2005 ha atraído a donantes australianos. Con la

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orientación del Global Development Group, una ONG australiana, se propuso un proyecto multifacético que integra micro-empresarios, negocios, educación, nutrición y salud infantil; este proyecto se inició con la construcción de una planta procesadora de leche en Boma, la cabecera del distrito Hai. En Marzo 2013, la Australian High Commission to East Africa aprobó una partida de su Direct Aid Program por AU$30 000 para la NWDCS, destinada al proyecto de una planta piloto de biogás, que incluye la renovación de unidades cubiertas para vacas lecheras en confinamiento, la construcción de biodigestores de 6 $m^3$ en cada finca y la promoción del uso de biolodo para fertilización de plantas forrajeras y huertos familiares.

## Introduction

Tanzania is primarily an agro-based economy, characterized by subsistence agricultural production. Despite its subsistence nature, the agricultural sector employs more than 80% of the population and contributes up to 45% of GDP (2005). The livestock sector contributes 30% of agricultural GDP, which includes contributions of 40% by beef production, 30% by milk production and 30% by poultry and small stock production (ASR 2008).

Tanzania has a cattle population of 21.3 M (ASR 2008), ranking third in Africa after Ethiopia and Sudan. The Tanzanian cattle population is composed mainly of indigenous Zebu breeds and about 680 000 improved dairy animals. Livestock-keeping offers a livelihood to 1.3 M men and women, who raise their animals on the semi-arid plains and highlands of Tanzania. The cattle herd has been increasing at 2.1% per annum, which is still short of the targeted growth from 2.7% in 2000 to 9% by 2010, set by the National Strategy for Economic Growth and Poverty Reduction, known by its Swahili acronym as MKUKUTA.

Tanzania's dairy industry is meager; estimated milk production is 1650 ML (2011). About 70% of the milk produced comes from the traditional sector (indigenous cattle) kept in rural areas, while the remaining 30% comes from improved cattle, mainly kept by smallholder producers. Per capita consumption of milk is estimated to be 42 L/annum (2011). Around 10% of the small-scale dairy farmers are found in Northern Zone and Southern Highlands, where rainfall is high, climate is temperate and disease vectors are minimal. Hai District, in the Northern zone with 49 225 households and 38 280 dairy cattle on the southern slopes of Mount Kilimanjaro, practices intensive dairy production with improved dairy cattle breeds. Most households own from 1 to 3 animals and milk production exceeds family requirements; the surplus milk is sold to meet financial obligations of the family. Average daily milk yields per milking cow range from 7 to 12 L. There are 12 small-scale dairy farmer groups in the district, collecting on average 4550 L of milk daily.

This case study focuses on one of the groups, the Nronga Women Dairy Cooperative Society Limited. The paper describes the structure and operation of the cooperative, discusses some of the main challenges and constraints, outlines Australian assistance programs and points towards some lessons for the future.

## Case study

The Nronga Women Dairy Cooperative Society Limited (NWDCS, registered as KLR 476) is an organization of dairy farmers, whose main purpose is to improve the well-being of the Nronga village community through promoting small-scale dairy farming and its flow-on benefits. For the Wachagga tribe on the southern slopes of Mount Kilimanjaro, milk production is considered a traditional chore/role for women, so women in Nronga were the originators of the organization that now serves the whole community. The cooperative's services to the Nronga community include:

- Buying milk from all dairy farmers in the village;
- Promoting milk consumption through school milk nutrition programs;
- Offering saving and credit facilities to the community (by way of a village community bank);
- Providing artificial insemination of dairy cows, also for neighboring villages; and
- Promoting slow-combustion wood stoves in an effort to reduce environmental impact.

The Nronga village is situated in Machame Division, Hai District, located on the mountainous area of the slopes of Mount Kilimanjaro. It has 659 households with a population of 2181 inhabitants, and a population density of 860 people per $km^2$ (2011). An international heritage area, the Kilimanjaro Forest to the north of the village, is the source of 2 major rivers, the Semira and Kikavu, located to the east and west of the village, respectively. These rivers converge to the south of the village, with deep valleys isolating Nronga from the neighboring villages. Animal fodder, firewood and building materials were collected from riverside and heritage forests until recently, when the government restricted the exploitation of these natural resources. Hence, the community is left with very narrow options on the alternative sources of basic materials, particularly firewood.

NWDCS was formed in March 1988 as a model pro-

ducer-based organization to promote dairy production through effective milk marketing. Its formation was assisted by FAO, DANIDA and the Tanzania Ministry of Livestock Development. NWDCS started with 75 members by collecting daily about 200 L of milk from its members and selling the milk untreated to food shops in Moshi town, as they had no milk coolers, processing machine or office. The members milked their cows just after midnight and sent the milk to collection points, where a vehicle would collect it in cans, drive to Moshi and sell it in bulk to food stores before dawn. While this procedure was cumbersome, tedious and actually painful to women, who traditionally own the milk, it was necessary to minimize losses from milk going sour. Elected leaders recorded the details and were responsible for fortnightly payments in an open area in Nronga primary school playing grounds. Today, NWDCS has 402 members and collects daily between 800 and 900 L of milk from Nronga village and the neighboring villages of Foo, Shari and Kyeeri. Evening and morning milk is collected and cooled in electric-powered cooling tanks before processing or selling unpasteurized to wholesalers or consumers in urban areas of Kilimanjaro and Arusha Regions. Milk is disposed of in the following products: 36% fresh whole milk, 36% skimmed cultured milk, 24% whole cultured milk in packets (500 ml for ordinary market and 200 ml for school distribution), 4% pasteurized butter and 1% yogurt. These products are produced manually using local facilities and limited skills to produce market-competitive products.

Hence, NWDCS benefits the Nronga village community, dairy farmers in Hai District and Tanzania at large. The main benefits are:

- Dairy productivity has been enhanced in the Nronga village as well as in the neighboring villages. Nronga village and neighboring village dairy farmers have a clearly defined milk market and consumers and traders have a reliable milk supply.
- The cooperative has made a business out of dairying, which was once considered a subsistence activity. As milk flows out of the village, services for investment and dairy production flow into the village, ensuring a sustainable cash flow necessary for poverty reduction, rural development and a better life for the rural community. The NWDCS initiative's business has fostered a Saving and Credit Cooperative Society (SACCOS) and a Village Community Bank (VICOBA) in Nronga village.
- In their endeavor to increase future per capita milk consumption in Northern Tanzania, in 2001 NWDCS introduced a school milk feeding program. Currently 6 schools (3 in Kilimanjaro Region and 3 in Arusha Region) with a total of 4717 pupils are fed milk, usually twice a week, on a cost-sharing basis: the parents contribute Tsh 150 (150 Tanzanian shillings) and the Tanzania Dairy Board (TDB, which receives Australian donor funds) also contributes Tsh 150 per 200 ml packet fed to the pupils. NWDCS donates milk to a total of 540 orphan pupils in the same schools. This school milk feeding program has improved health and academic performance of pupils, improved enrolments and attendance, and enhanced the morale of teachers.
- About 650 farmers are self-employed through dairy farming and supply of milk to NWDCS. The lowest supplier earns Tsh 70 000 per month from milk sales, more than the Tanzanian minimal wage for rural workers, while the highest supplier earns about Tsh 450 000 per month, a middle-class employee salary. Moreover the NWDCS has indirectly created employment opportunities for traders, vendors and suppliers of dairy farming inputs in and around Kilimanjaro and Arusha Regions.
- Other benefits of NWDCS include public awareness creation, women empowerment, promotion of the dairy subsector nationwide, and the model for dairy development in Tanzania.
- Through NWDCS it has been possible to introduce other appropriate technologies to the community, such as energy-saving firewood stoves and the use of biogas from zero-grazed cattle waste, to conserve forest resources.
- Nronga village is one of the most developed villages in Tanzania. It has a good source of income to pay for social needs, such as good housing and school fees. Enrolment in primary school is 100%, while 85% of primary school graduates join secondary schools and 10% join vocational colleges. About 45% of high school graduates join universities. The village has 12 university professors and other high-level personnel working on various projects and their involvement has been attributed to the impact of the NWDCS.

## Challenges and constraints

### *Market competition*

As the number of dairy groups and processors increases, competition in the market increases as well. Lowering the price is not a good option in order to remain viable; satisfying the customer may be a better choice. Improved product quality, better packaging, product diversification and promotion of the products etc. need to be priorities. Resources to take these steps are the main constraints. NWDCS needs better technology, skills, funds for machinery, buildings, organization and legal frame work, facilities to ensure quality is maintained, to mention but a few, in order to be competitive.

*Location and inadequate infrastructure*

The NWDCS factory is not centrally located to the market for its products. The land on which the facility is located has limited scope for expansion. The terrain for transportation is difficult. It is located in the rural area, where utilities like electric power, water and telephone are unreliable. In order to expand processing facilities, NWDCS will soon have no choice but to transfer to a location with enough land and relatively reliable utilities, where workers' housing can easily be provided.

NWDCS is a pioneer in the dairy business in the Hai district. Other milk collecting groups would like NWDCS to grow further in order to be able to receive milk from them. However, NWDCS's capacity for receiving milk is already over-stretched. These other groups are ready to supply Nronga with milk, provided they position their processing plant in the lowland area, where it will be easily accessed, rather than in the undulating terrain of the Hai District on the slopes of Mount Kilimanjaro.

*Technology and training*

Dairy farming productivity in the Hai District as a whole is below its potential. The effective training of farmers, extension agents and other key players in development of the subsector is paramount. If milk production is to increase in quality and quantity, the milk collection system must be made efficient and the dairy products compatible with customer needs. A training center specifically for these purposes must be in place.

*Packaging materials*

The school milk program is a tool to boost future per capita milk consumption and ultimately expand the market for milk and milk products. The immediate benefit of the program is remarkable (as mentioned earlier) and the cooperative would like to expand to more schools and reach more pupils and orphans for development of the Tanzanian economy and well-being of its people. However, the production of more school milk pouches is the main constraint. An automatic packing machine is required to make the many extra pouches that will be needed by the schools.

*Investment plan and profitability*

In the past profitability of NWDCS has been suboptimal. For sustainability and development of the cooperative and dairy sector in the Hai District at large, the NWDCS has to make a profit or at least break even. A good investment plan is therefore essential.

*Undeveloped distribution network*

In rural areas, disposal of excess milk is difficult to organize. In Tanzania there are few milk collecting centers, mostly organized through donor-funded projects. In Hai district, there are 12 centers owned and managed by producer groups. However, most of these centers have no skilled manpower, facilities and proper equipment to manage collection of this perishable food resource.

**Australian support**

*School milk project*

In 2007, 3 Australian private donors learnt about the NWDCS initiative to feed school children with milk and kindly decided to partner with the cooperative by providing funds to increase the number of children and schools receiving milk on subsidy. A refrigerated van was also donated to distribute milk to distant schools.

Of late the donors are contributing towards building a second dairy factory in the District capital town (Boma - Hai) to enable NWDCS to make more milk packets and reach more schools in a sustainable way. The dairy factory and the donors have agreed that 10% of the milk collected for processing will go towards the school milk program.

The 3 Australian donors requested Global Development Group (GDG), an Australian charity organization carrying out humanitarian projects with approved partners and providing aid to relieve poverty in a tangible way, to provide a governance role and assist in the areas of planning, monitoring and evaluation, as well as compliance, risk management and auditing to ensure that this project is carried out to Australian aid requirements.

*The Biogas and Zero-Grazing Dairy Projects*

Through a local contact in Tanzania using participatory methodologies, GDG identified the need for and suitability of a local biogas program to complement plans for adopting zero-grazing dairy methods that would provide wider community benefit. Biogas is the use of livestock waste to produce renewable energy in a climate-friendly and resource-efficient way. The Australian High Commission to East Africa approved in Mach 2013 Direct Aid Program funding of AUD30 000 towards the NWDCS - Biogas Pilot Project in Nronga.

The features of this project include: renovation of 17 zero-grazing cow shade units; construction of 6-$m^3$ biodigester plants on each participating farm; and encouragement of the use of bioslurry for pasture production and home gardens.

The expected direct benefits from the production and use of biogas to the Nronga community include:

- Environmental sanitation through biodigestion.
- Biogas as an alternative fuel has the potential to reduce illegal logging in the international heritage-listed Kilimanjaro Forest.
- Appropriate zero-grazing cow sheds have positive impacts on animal well-being and productivity.
- Bioslurry enhances pasture production and home gardening.

Other expected benefits are: Cash saving; increased milk production; reduced women work load; cleaner food preparation environment; family happiness and peace; home sanitation; less pneumonia and ocular illnesses; NWDCS's image enhanced; and the youths are attracted to stay with the rural community.

## Conclusions

The formation and development of the NWDCS has been pivotal to the well-being of the dairy industry, farmers, villages and school children in Tanzania. Development organizations as well as policy makers commend this model of rural formation for stimulating and spearheading improvement of living standards in rural communities. NWDCS is a living example of a successful primary cooperative society that addresses its community needs.

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