



THE MACHOBANE FARMING SYSTEM IN LESOTHO



Location: Lesotho

Declining soil fertility, climatic variability, and outmigration threaten Lesotho's agricultural productivity. The Machobane Farming System is a simple, low-input technique based on intercropping and localized application of organic manures. Since its re-introduction in the early 1990s, nearly five thousand farmers have integrated this system into their land management, increasing land productivity three-fold compared to traditional monocropping.

CHALLENGE

As elsewhere in sub-Saharan Africa, food security in Lesotho has been hampered by the confluence of both environmental and social dynamics. A third of the country's population lives in extreme poverty. This percentage is higher for elderly and female-headed households and for those with less than half a hectare of land. Thirty-seven percent of the children under five are chronically malnourished. High rates of HIV/AIDS exacerbate households' food insecurity.¹ Arable land is limited to ten percent of the nation's total area of 30,355 km² and labor is in short supply due to widespread migration to neighboring South Africa. Most farmers cultivate less than 1.5 hectare, growing maize, sorghum, wheat, and beans. Many also graze livestock on increasingly degraded land.

Declining soil fertility and erratic rainfall have led to a gradual decline in per capita food production and overall land productivity. Over the last decade, yields averaged between 422 and 701 kilograms per hectare, less than half of what was produced during the 1970s. Today almost 70 percent of the country's annual cereal requirements are imported.² In response to these declines, cultivation has been expanded onto marginal grazing lands; the overall area under cultivation in Lesotho increased from 317,900 to 406,500 hectares during the 1990s. However, expanding cereal monocropping is not sustainable: without adequate household labor or organic supplements to ensure long-term soil fertility, rural food security is subject to climatic and food prices variations.³ Green Revolution packages—hybrid maize and chemical fertilizer—will not succeed in the marginal, high acid soils of Lesotho's mountainous area, which experiences high rainfall variability.

RESPONSE

To address productivity declines, thousands of Basotho farmers are turning to an integrated system that incorporates several agroecological principles. The Machobane Farming System (MFS)—*Mantsa Tlala*, or “expeller of hunger” in Sesotho—was developed in the 1950s by Dr. Joseph J. Machobane. His sustainable agricultural system was inspired by more than a decade of research on traditional Basotho farming techniques. Early research revealed that MFS out-yielded conventional cropping methods nearly three-fold.⁴ An intensive, low-input, intercropped farming system; MFS eschews dependency on expensive external inputs. By shifting away from grain monocultures and encouraging ecological intensification of cultivation on small plots, it provides a year-round supply of food.⁵

Farming in Lesotho usually consists of a three-month monoculture of maize, wheat, or potatoes. In contrast, MFS is based on intercropping and relay cropping a small parcel throughout the year, except in the highlands where land is not cultivated during the most severe winter months of June, July, and August. In the lowlands, farmers plant crops as follows: winter resisting crops such as wheat, peas and potatoes (the MFS cash-crops) are planted in April-May for harvest in January-March. In summer (August-October), they intercrop maize, beans, pumpkin, sorghum, watermelons, or groundnuts for harvest in November-December.⁶

Because the cropping system is intensive and productive throughout the year, farmers fertilize with farmyard manure (collected in livestock corrals, or *kraals*) and ash. The benefits of organic amendments such as ash and manure are well recognized by farmers and researchers. Ash provides nutrients—potassium, in particular—and has a liming effect on acid soils. Manure provides vital nutrients for plant uptake and enhances long-term soil fertility by improving its physical properties.⁷ Appropriate application rates vary, depending on soil quality, crop, and availability of amendments. To provide manure, as well as milk, eggs, and meat, MFS encourages farmers to maintain at least one animal per household. Local breeds selected for drought and disease tolerance are preferred, as they require fewer costly nutritional supplements. Weeding is also a necessary component of the system.

MFS techniques are presented to farmers within a crucial philosophical context that stresses self-reliance to avoid external aid, utilization of locally available resources, on-farm experiential learning and teaching, and farmer-to-farmer extension services. Farmers are selected for a five-year training curriculum based on their understanding and acceptance of these principles. Farmers find three main advantages to the system. First, ecological intensification leads to higher productivity. Second, the intercropping of potatoes leads to higher cash revenues. Finally, fields using MFS are more drought-resistant.⁸

In 1991, MFS was incorporated in the International Fund for Agricultural Development (IFAD)'s Soil and Water Conservation and Agroforestry Program (SWaCAP). Five years later, the Government of Lesotho and Machobane Agricultural Development Foundation launched another IFAD-funded program called Sustainable Agricultural Development Programme for the Mountain Areas (SADPMA) in the three mountainous regions of the country: Mokhotlong, Thaba T'seka and Qachas'nek. The program ran from 2001 to 2006 with 786 households.⁹ In addition, a modified form of MFS was applied to nearly 1,500 backyard garden households. Since 2005, local NGOs such as the Serumula Development Association and the Rural Self-Help Development Association also promote MFS in their projects.



Promoting the use of available organic matter to increase soil fertility. © M. Stapleton, FAO

Intercropping consists of alternating rows of a cereal or tuber with a legume such as pigeon pea, cowpea, or *Mucuna* as well as a vegetable row of pumpkin or leafy greens. It brings overall greater yield per unit area (even if a particular crop yield might be lower due to fewer plants per unit area). Yield increases come from the legumes' ability to fix nitrogen in the soil; from decreased competition for light, water, and nutrients due to different plant architecture; or from intercrops acting as a living mulch that maintains soil moisture and reduces erosion and suppresses weeds. From an economic perspective, increasing crop diversity through intercropping protects farm income by buffering against yield fluctuations for a single crop, essentially spreading price and yield fluctuation risk across several crops.¹³

RESULTS

- Between 1991 and 1997, the number of farmers practicing MFS rose from 22 to 1,998.¹⁰ More than half of the adopters were women. By the late 1990s, an estimated 3,000 farmers were practicing MFS on roughly 2,500 hectares. Most adopters were poor; many were former migrants recently returned from working the South African mines. Between 2001 and 2006, IFAD's SADPMA program helped train nearly 800 farmers who practiced MFS techniques on an additional 1,800 hectares of land. Wider countrywide adoption led to over 5,500 farmers practicing MFS throughout Lesotho by 2006.
- While national yields declined dramatically between 2001 and 2005 due to severe drought, yields in regions with medium to high levels of intervention by the SADPMA program were higher overall; maize yields were higher by 14 percent, sorghum yields by 63 percent, bean yields by 61 percent and potatoes by 294 percent.
- In its most orthodox form, MFS advocates using only hand tools so that even the poorest farmers can practice the technique. A survey conducted on Machobane farms during the SWaCAP program however revealed that all farmers used an ox-drawn plow or tractor to till their fields. About half of the farmers weeded manually, while the other half used an ox-drawn cultivator. Although labor requirements were higher in the Machobane system because of cultivation of potatoes (a labor intensive crop) and because of the need to transport manure and ash to fields, long-term application of MFS practices provided by far higher yields than traditional monocultures.¹¹
- Average land productivity under MFS increased three-fold over traditional monocropping in Lesotho. Under traditional systems, the average family needs 1.2 hectares to guarantee food security; under MFS, the area needed is less than half a hectare. Improved nutrition from MFS and other intercropped systems results from integrating cereals, which are high in calories, with legumes—high in protein—and vegetables, which are high in vitamins and nutrients. A South African study found that the productivity of maize-bean intercrop was 15 to 26 percent higher than monocropped maize and bean. The total protein content in the intercrop was as much as 60 percent higher than the monocrop, and total energy was 11 to 18 percent higher. Calcium, vitamin C, and iron were also higher in intercrops.¹²

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Average land productivity under Machobane Farming System increased three-fold over traditional monocropping in Lesotho.



Conducting a post planting assessment of crops.
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Farmer walking through her crops. © Gianluigi Guercia, FAO

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www.oaklandinstitute.org
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ENDNOTES

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FRONT PAGE PHOTO:

A farmer checking the growth of her crops. © Gianluigi Guercia, FAO