Mr Makgati's tomato production using a mixture of manure from different livestock.

Credit: LDARD Team

was not giving results that compared with synthetic fertilisers. He then came up with the idea of mixing manure from different types of livestock to improve vegetable yields.

Mr Makgati hoped and believed that by mixing three different types of animal manure (in his case goat, sheep and cattle manure), the homemade natural fertiliser would be more effective. He collects manure with his light delivery vehicle (known locally as a bakkie) and prepares the natural fertiliser. To date, he has not been measuring the quantity of each manure in the mixture, but even without standard application rates, this innovation has already shown promising results in terms of improving his crop yields. While he has not yet shared the innovation widely within his community, he pointed out that adopting the practice is relatively simple because it requires only the collection of different types of manure, which can be sourced locally from livestock owners. Even for his own farming activities he has had to rely on sourcing cattle and sheep manure from neighbouring livestock owners at a small fee as he only keeps goats.

There is ongoing joint experimentation involving members of the LPTT and Mr Makgati, which is exploring the effect of different combinations of manure sources on plant growth and productivity. In time, the team plans to assess the mineral nutrient content of his homemade fertiliser. This case demonstrates that farmers effectively innovate to solve challenges, and can be supported by other stakeholders such as researchers, extension staff and academics to design trials that assist them to make sound decisions.

Richard Chuene, Ernest Letsoalo, Thabo Mahlobogoane, Koketso Mphahlele, Davies Phaladi, Kabelo Madia, Charlotte Mohlabi, Jackson Kadiaka, Refiloe Thobejane
All representing the Limpopo Prolinnova Task Team

Use of *Ficus* fruit powder to increase sorghum productivity

The arid rural regions of Mali are characterised by the challenges of climate change and low productivity of staple cereals such as sorghum and millet. Researchers recommend the application of the fertiliser diammonium phosphate (DAP) in a microdose of 30 kg/ha to help farmers improve their cereal yields. In a context of limited financial resources to access chemical fertilisers, innovative farmers are developing their own solutions. This is the case with Mr Nanou Coulibaly from the village of Tongouma/Monimpé, Niono district, Ségou region, who developed a local innovation that uses powder of the fruit of the Ficus *gnaphalocarpa*, locally known as Tôrôgongon, to increase the productivity of millet and/or sorghum. Ficus *gnaphalocarpa* is known by many communities for its medicinal and nutritional properties, which is why the innovator used this plant. He used a little water to mix the required amount of powder with the sorghum seed just before planting and reported satisfactory increased yield.

This local innovation was identified and documented through a project titled "Improving food and nutritional security and the resilience of rural populations to climate change through farmer innovation in the Ségou, Mopti, and Dioïla regions", known as PROFEIS-Mali Project, under the umbrella of Prolinnova Mali.

The local multi-stakeholder platform (MSP) in Ségou, constituted of local

NGO staff, researchers and farmer innovators, selected the local innovation for participatory innovation development (PID), a farmer-led joint-experimentation process to evaluate and validate the local innovation. Involving key agricultural and research development stakeholders in the joint experimentation was also a way to move towards mainstreaming the PID approach. This will also help to share the best options using the powder of the fruit of Ficus *gnaphalocarpa* to increase sorghum productivity with a larger farming community and to improve subsequent living conditions of these low-income farmers.

As the farmer had not been systematic with testing application rates, he was unable to indicate the optimal quantity of powder to be used for a given quantity of millet/sorghum seed. Since the innovator's rate was approximately 40 g powder per kg seed, the MSP members together with the farmer innovator agreed on testing four application rates, which were 20 g, 40 g, 60 g and 80 g of powder applied to a kilogram of sorghum seed, mixed in a small amount of water. These application rates were compared against the researcher recommendation (30 kg/ha of PDA as a microdose) and against "the control", which had no powder or fertiliser applied. Each plot consisted of four rows of sorghum, each 5 metres long, the rows spaced 0.75 metres apart and with the sorghum seed planted 0.50 m apart along the ridges.

All the plots where the sorghum was treated with the Ficus powder proved to have higher yields than "the control" showing that the powder was beneficial. For example, the highest grain yield for sorghum was 829 kg/ha, which was for the plot where the application rate was 80 g/kg. The grain yield for the control plot was only 496 kg/ha. The two higher application rates of the Ficus powder gave grain yields higher than those obtained using the researcher recommendation.

The results validated the local innovation in terms of its effectiveness in increasing the sorghum yields of small-scale farmers and were also useful in determining the optimal application rate. These results were shared with community members at the local innovation fair. Through the joint research process that involved members of the MSP together with the farmer innovators, it was found that the application rate of 60 g of powder mixed with 1 kg of sorghum was the most efficient option. Furthermore, this highlighted the importance of collaboration between actors through the MSP for the promotion of the PID approach.

Farmer experimenter Souleymane COULIBALY from Cinzana village in Mali showing the sorghum from the experiment conducted in the rural commune of Cinzana-Gare, Ségou Region.

Credit: Seni Coulibaly

Bourama Diakité, Assétou Kanouté and Henri Bosco Coulibaly
Coordinator, Gender Officer and Facilitator for Ségou Region, respectively, for the project "Improving food and nutritional security and the resilience of rural populations to climate change through farmer innovation in the Ségou, Mopti, and Dioïla regions" PROFEIS-Mali.

Souleymane Diarra and Ousmane Barké Diallo
Representatives of the Association of Professional Farmers' Organizations within the PROFEIS-Mali technical team

Samba Traoré and Dommo Timbely
Resource Persons, Researchers within the PROFEIS-Mali technical team

Mahamadou Diarra
Representative of the National Directorate of Agriculture within the PROFEIS-Mali technical team

Neguessama Traoré
Head of the Cinzana-Gare Agricultural Sub-sector

Paul Jimmy
Prolinnova Sub-Regional Coordinator for West and Central Africa