

RUFORUM Case Studies

From Soil Microbes to Markets:
Strengthening Farmers' Organisations
and Value Chains in Kenya through
Community Action Research

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A group of farmers and university researchers gathers round a large pile of leaves, soil and ash, watching farmer Salome Wamalwa demonstrate how she prepares a rich, natural compost to spread over her fields.

The technique, as she explains, consists of forming a pile of the matter, mostly leaves, and adding specific quantities of ash, cow dung, or soil and water to aid fermentation and nutrient fixation. The mixture includes *Calliandra*, a bush grown for animal feed, which contributes nitrogen. Over the next month, as the rich brew decomposes, Wamalwa will keep a stick handy – what she calls her 'thermometer' – and use it to probe the mixture until it is ready.

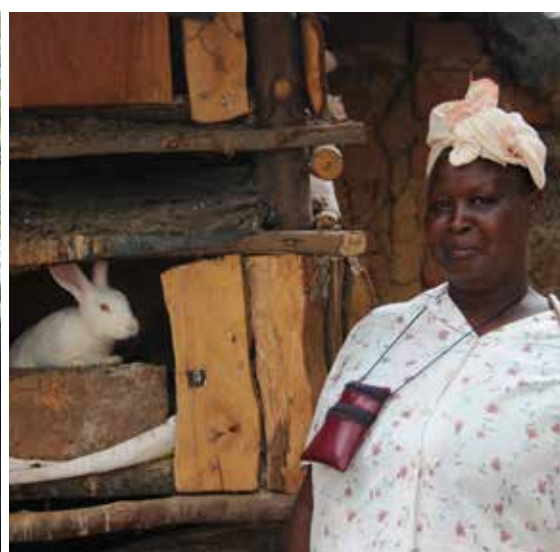
This method is cheaper than buying inorganic fertiliser, she says, but the results are just as good. This four-layered pile will produce enough manure to cover a quarter-acre field of finger millet. This is just one of many techniques that Wamalwa, as a member of the Upendo Women's Group, a local farmers' association, has learned to improve her crop yields and her soil. The sharing of knowledge and collaboration with friends and neighbours is one of the fruits of membership of the organisation.

Indeed, farmers' organisations are widespread across Western Kenya and, as such, in theory they have the potential to serve as a powerful mechanism for their members to collectively organise themselves, learn from one another, promote their shared interests, pool their resources and benefit from economies of scale, gain access to markets, and ultimately lift themselves out of poverty. Seldom, however, is this the reality – and that is why the university researchers are here.

The group of researchers from the University of Eldoret, in Western Kenya, has been working with three umbrella organisations in Western Kenya, as part of the Community Action Research Programme (CARP). The programme is funded by the Regional Universities Forum for Capacity Building in Agriculture, or RUFORUM, an advanced research and training network and consortium of 45 African universities in 22 different countries. CARP in Kenya has supported five students – four masters and a PhD – in conducting collaborative, inter-disciplinary, participatory research aimed at helping to strengthen farmer-led institutions.

Farmers across Western Kenya had been organising themselves into farmers' associations, but this seldom had the desired effect, as their yields and incomes remained low and their markets remained poorly developed. CARP provided the opportunity to build a relationship with farmers' organisations in which a trans-disciplinary team of researchers could engage with farmers to help address their challenges in a holistic manner. Researchers and students with different specialisations could help farmers to address a multitude of challenges, ranging from soil fertility to post-harvest value-addition.

The collaborative research project builds on RUFORUM's ten years of experience of supporting students and university researchers in conducting the kind of hands-on, in-the-field participatory research that has proved so crucial to applying scientific knowledge to farmers' problems of poverty and underproduction. Interdisciplinary collaboration and participatory research are both popular buzzwords in academe, but it is difficult to employ these approaches in meaningful ways. Poor, rural, small-scale farming communities are a world apart from the halls of academe.



ABOVE: Farmers in Teso are raising rabbits and poultry to supplement their incomes.

LEFT: Researchers from the University of Eldoret have been working to help farmers in Teso strengthen their organisation.



Farmers in Bungoma are developing value-added products to earn more from their soya crops.

"The starting point for CARP was the farmers' organisations. We knew they were not performing, so we developed an intervention to employ students to address issues of production, management and marketing, dealing with entire value chains."

Dr Anderson Kipkoech

"Universities are known to be ivory towers," says Prof. Robert Okalebo. "When we went to do our survey in Bungoma, we asked the community about the problems they face in farming. One farmer mentioned a pest, an insect that disturbs their maize. We asked if they had taken that insect to the university for researchers to study, and the response was, 'no, we fear going to that place!'"

Okalebo and his colleagues recognised a need to try to bridge this gap. The university had produced a number of simple, affordable technologies over the years that could help farmers improve their soils and their yields – but very few of these technologies were actually being used in farmers' fields, partly because the university had no connections to farmers' groups. One method of soil preparation developed by university researchers, for example, was the use of fortified compost. Instead of buying synthetic fertilisers, which are costly and can toxify the soil, a method was developed to prepare organic compost, analyse its nutritional content, and fortify it with precise amounts of missing nutrients such as nitrogen and potassium – so that fertiliser could be applied in small amounts, with greater precision.

The university had also developed two fertiliser products from local materials, one called Sympal for legume crops and another called Compal for maize. The university then partnered with a local company, MEA, to produce the fertiliser commercially. The advantage of these products is that they are cheaper than imports and better tailored to local conditions. The products are distributed and promoted through local credit schemes.

Prof. Okalebo and his colleagues realised that strengthened farmers' institutions were needed in order to put the structures and capabilities in place that would allow farmers to discover and access these promising new technologies. At the same time, the academics saw these institutions as crucial to helping farmers to access markets, develop new value-added products, and ultimately engage on an equal footing with businesses, academics, NGOs, local authorities and other actors in the agricultural value chain.

Grain-, coffee- and cotton-growers' cooperatives had once been widespread across Kenya, but these institutions all crumbled during the 1980s, as global commodity prices collapsed and internal management structures fell apart. The past decade or so has seen a resurgence of farmers' organisations, yet these institutions too often fall victim to a lack of transparency and leaders who abuse their power.

"The starting point for CARP was the farmers' organisations," explains Dr Anderson Kipkoech, an agricultural economist and CARP team member. "We knew they were not performing, so we developed an intervention to employ students to address issues of production, management and marketing, dealing with entire value chains."

The key strategy for improving production was to focus on the soil. Western Kenya is the breadbasket of the nation, but this status has grown tenuous as soils have become severely depleted, due to natural acidity, improper use of fertilisers, and exhaustion. A major issue is the fact of population growth and land pressure, meaning that land is no longer left to lie fallow for regular intervals but is constantly under production.

The Mbili intercropping system, invented at the university through a previous RUFORUM grant, was another important technology. Mbili (the Swahili word for 'two') is a maize-legume intercropping system that disrupts pest and disease cycles, while introducing

symbiotic nitrogen fixation in the soils. The method was developed as the result of a previous FORUM collaboration, which had produced new soybean varieties that did not require inoculation with specific rhizobia bacteria before planting. These 'promiscuous' soybean varieties held great potential for cultivation by resource-poor farmers because they were able to nodulate with naturally occurring rhizobia and to fix nitrogen effectively.

The Mbili system improves on the mixed cropping systems typically used in Western Kenya, by intercropping nitrogen-fixing soya with maize, in a method that optimises nutrient and water efficiency. In common cropping systems, the plants all compete for water, nutrients and light. Mbili is a system of *"managing beneficial interactions in legume intercrops,"* explains CARP team member Dr Abigael Otieno, a soil scientist who worked on the original Mbili trials. Maize is planted in rows, with two rows of soya planted between each row of maize. The spacing of the rows allows all the plants to receive optimal sunlight, while also allowing for optimal root system development below ground.

For her PhD research, CARP team member Peris Mong'are worked with farmers' associations in assessing the nitrogen dynamics to develop soil fertility packages that they could use in maize-legume systems – nitrogen being the key limiting nutrient in these systems. She ran a number of field trials that compared the effects of the common cropping systems with the Mbili system, both on its own and paired with other techniques such as checking the nutrient levels of compost and calculating the correct amounts of inorganic nutrients to add; or adding locally sourced lime to the soil to reduce acidity. She worked on fine-tuning these approaches and figuring out how to make them work together optimally, in order to offer farmers a 'package' of technologies for use in maize-legume intercropping systems.

As a soil scientist, Mong'are collaborated with masters student Dreda Olal, a horticulturalist supported by CARP. Olal explains: *"Most of the farmers have smallholdings and are working on them continuously, so the soils become depleted. They are resource-poor, and can't afford the inputs, so we worked on using the available materials on the farm."*

Most important is getting the mix right for the specific soil conditions of each individual farm. Yet farmers have also lacked access to laboratories where their soil can be tested, or even cheap, portable methods of testing, and are consequently unable to manage their soil properly, which contributes further to its deterioration.

Another CARP-funded student, Wycliffe Sunda, who is doing his masters in agronomy, worked on developing an integrated package for reducing maize crop losses due to the invasive weed *Striga*, a parasitic plant that grows rampantly in poor soils and can take over entire maize fields. He also worked with available technologies to integrate them and measure which combination worked best to improve yields. He looked at the use of *Striga*-tolerant maize varieties, as well as the efficacy of the Mbili intercropping system in managing *Striga*.

"We know so much research has been carried out on Striga management," says Dr Julius Ochuodho, dean of the Faculty of Agriculture at the University of Eldoret. *"So many technologies have been developed, but they are not effective alone. The problem is they are being used singly. Our challenge was to look for a way to integrate some of these methodologies for maximum effect."*

Sunda also compared the use of different fertilisers, as well as different coatings for maize seeds, as measures to control *Striga*. One successful approach was to coat maize seeds with a fungus, *Fusarium oxysporum*, which would attack the *Striga* without harming any of the other plants. The project even generated a side business for farmers' associations to multiply these *Striga*-resistant seeds. *"You find that farmers have a problem getting hold of Striga-resistant seeds, so we worked on a system to multiply the seeds from the sources we could find,"* he says. *"This can help farmers' associations improve their self-sustainability."*

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For Sunda, the farmer collaborations gave meaning to his work as an agronomist. *"You're looking at the problems farmers have in the field, and you're looking for solutions. You're not doing research for the sake of research, but looking for solutions that the farmer can integrate within his or her normal practice of farming. It's a unique opportunity."*

Seventy-one-year-old farmer Stephen Ngoya has reaped the benefits of these combined approaches to soil fertility management. Using the Mbili system has not only enriched his soil and improved his maize yields, but has also given him a bonus soya crop. When Ngoya was first introduced to the Mbili method in 2003, he had been on the verge of abandoning maize production in favour of the local cash crop, sugar cane, because he could only produce six bags of maize per harvest on his two-acre plot. The disadvantage of sugar cane, however, is that it takes 18 months to mature and harvest, so he was willing to give the Mbili method a try.



Bungoma farmers visit a UNIDO-sponsored facility to observe the processing of soya.



The University of Eldoret farm is a showcase for innovative dairy, animal and crop production practices.

"I find when you practise Mbili, your soil becomes rich, it becomes robust," he says. "Those soya roots with those nodules carry a lot of nutrients for maize. Here the soil is more fertile, and whenever I mix Mbili with other approaches I find it very profitable because both crops are harvested."

The introduction of Mbili is steadily changing farming practices across Western Kenya, as many farmers have changed their planting techniques from broadcasting their seeds to planting in rows spaced to allow optimal root development, he says. Researchers estimate that as many as 70% of local farmers have now switched to the Mbili method and are reaping similar benefits.

Through a combination of practising Mbili, using certified seed, and fertilising his crops with a mixture of Sympal and biofix (an organic fertiliser researched and developed by the University of Nairobi since 1981), Ngoya has seen his yields rise to 15 bags per harvest – enough to support his family on his two acres of land. He harvests twice a year, and always has enough money to buy milk and bread. He has also become a trainer, introducing other farmers to the Mbili method. And he has benefited from CARP's focus on helping farmers' organisations enter the potentially lucrative arena of value-addition.

Soya was first introduced to help boost soil fertility, but as the crop was not grown traditionally, there was no local market for it initially. Soya is a tremendously nutritious, protein-rich and versatile crop: it can be used to produce soup, bread, cake, milk – and the now-widespread adoption of the Mbili system across Western Kenya has brought the crop into widespread production. The abundance of soya has presented farmers with an opportunity to organise themselves to create local markets for soya and pool their strengths to get a better deal from buyers. Farmers are now able to come together and market their products, buy inputs in bulk and borrow from their farmers' associations.

This is where the next level of CARP kicks in, with addressing the structural and governance challenges within farmers' organisations and at the same time equipping them to get in on the lucrative value-addition game. The remaining two CARP students, Christine Navalayo and Carol Soi, both completed their masters in agricultural economics and resource management. The two young women worked with the three farmers' organisations to help them to develop strategic plans and business plans, and to put good organisational management structures in place – for example, with regular elections for leadership positions.

In addition, Soi helped to introduce loan schemes within the organisations, enabling member farmers to access seeds and other inputs on credit. The two young women helped the organisations with practical business challenges, such as gaining certification from the Kenya Bureau of Standards for their soya flour and other value-added products. (The certification processes are still ongoing).

"Sometimes the farmers have the will to adopt new technologies, but they lack the capacity," explains Navalayo. "We saw the issue of finance in agriculture was very important to incorporate into the plans. We started a savings and credit scheme where farmers can borrow money and pay interest to the group, which adds income to the farmers' association and assists farmers in accessing technologies."

In the offices of the Bungoma Small-Scale Farmers' Association (BUSSFO) – the umbrella organisation to which farmers Salome Wamalwa and Stephen Ngoya both belong – BUSSFO chair Boniface Wamalwa describes the impact that these interventions have had on the organisation.

Since CARP began in 2011, he says, the group has set up stocks of inputs, banking seed and improving farmers' access to varieties of disease-resistant maize. The group has been working on value-addition of soya products, and the commercial production of fortified manures, and has also introduced a savings and credit scheme for its members. To achieve all of this, the structures and governance of the association had to change, becoming clearer, more inclusive and more transparent, and the organisation had to become more strategic in its objectives and more focused on the business side of farming.

"Because of CARP and the trainings, we now have a constitution with relevant objectives, management structures and a clear vision and mission," he says. "We now have a network of strategic partners."

Boniface Wamalwa explains that the group has learned very important lessons from its collaboration with CARP, including that farmers' willingness to join the association depends on the management structures in place, and how they perceive the benefits of membership; that farmer-to-farmer exchanges are needed to enhance the uptake of certain technologies; and that serious engagement with people and institutions that matter is highly beneficial.



ARDAP, an NGO working with rural Kenyan farmers, was a key facilitator of the CARP.

A local NGO, the Appropriate Rural Development Agriculture Programme (ARDAP), has also served as a crucial link and facilitator/ liaison between the university researchers and the farmers. Being close to farmers and knowledgeable about farmers' organisations, ARDAP has been able to offer advice, technical support and knowledge of both the farmers' and the researchers' respective worlds.

Ultimately, the researchers want to establish whether the model they are building can serve as an effective extension system. While formal extension services work in a top-down manner, explains student Navalayo, the CARP approach emphasises adopting bottom-up collaborations to address the technical challenges faced by farmers.

ARDAP has helped with the organisational development aspect of the process, assisting with strategic planning, developing business plans, and restructuring the organisations. A curriculum was also developed for farmers to come and learn these things at ARDAP. *"We needed to help the organisations build credibility with their members and gain skills in areas like financial management and entrepreneurship,"* explains Benjamin Obiero, the information officer at ARDAP.

Everyone has learned from the collaboration: *"The farmers assume that graduates are people with a lot of knowledge; only to find that the graduates don't have the practical skills, so there is a lot of cross-learning,"* Obiero says. Soi concurs: *"We knew theory from class, but I had never written a business plan before."* ARDAP has been able to provide that real-world guidance.

Such guidance has also benefited the farmers. Through the ARDAP curriculum, farmers' association officers have developed the

confidence and know-how, for example, to purchase soya from their member farmers, collect it in bulk and then sell six tonnes of the soya to a local UNIDO-sponsored facility for the processing of soya into flour and other products. Stephen Ngoya was one of the farmers to benefit from that transaction, as he was able to sell his soya to the farmers' association, and then received 10% of the profit that was derived from the value-addition to his share.

Farmers have also begun to identify their own markets for soya, such as schools and homes for children with HIV who benefit from the immune-boosting nutrients of the product. And the group has engaged with the Kenya Industrial Research and Development Institute – KIRDI – to win approval to use the KIRDI seal, the mark of quality, on the soya flour they sell. This also allows the group to use the KIRDI machines, helping them to get their product into supermarkets. The farmers have succeeded in getting a loan from Kenya Industrial Estates for purchasing a mixer and roaster, and have negotiated with county officials, who will provide the facilities for the enterprise as long as the farmers can obtain all the necessary machinery.

Furthermore, in negotiations with the regional office of the Red Cross, they have been assured of a market serving internally displaced persons (IDPs) and vulnerable, nutrition-insecure populations. That agreement came about because the farmers' association was able to secure the KIRDI seal of quality on its product.

The BUSSFO initiative has had its share of difficulties along the way, however. For example, the association bought a grinder, but has struggled with local authorities to deliver an electricity supply. Obtaining certification from the Kenya Bureau of Standards is also a long and arduous process, and until that is completed the association cannot get its products into supermarkets.

And not all of the CARP collaborations with farmers' associations have been as successful as the one with Bungoma. In Vihiga, the researchers' relationship with the Mwangaza Farmers' Group broke down, as the organisation's leaders resisted introducing new transparency measures.

Farmers from the third participating farmers' organisation, in Teso, were initially frustrated after they produced their first soya crop and could only obtain a rock-bottom price for it. As student Christine Navalayo explains, this group is less literate than the Bungoma farmers. When the project started, the organisation was riven by mismanagement and most members were kept in the dark about finances and other matters. But over time the leadership was persuaded that the mutual benefit that could be derived from collaboration and transparency within a solid organisation far outweighed the benefits of personal gain.

Another challenge in establishing credit schemes has been farmers' very understandable fears of taking loans, as rural lenders are notoriously exploitative of small farmers. *"We encouraged them to start from a point where this is their scheme, not an external thing, and the guarantors are people they know,"* explains Carol Soi. *"They could take the loans directly as input, in kind rather than as cash loans."*

Gathered at the organisation's small office, members of the Teso group explain how they have begun to overcome these hurdles, and particularly how they have learned to cooperate rather than compete with one another. When they bulk their produce together for sale, for example, they get better prices, which is a powerful incentive to cooperate.

"We are grateful to the university, especially us women," says Phelois Arono Epugot, a widow with five daughters. *"They have empowered us not to remain dependent on men; when we are two together, we work as a team. The university should make us continue moving and not remain stagnant, make us employ knowledge and pass it on to our children so that when we die the knowledge remains."*

"Now we are working together, we're able to do more," she continues, *"working in one person's fields one day and the other's the next. After working as a team, the owner of the land can give us a boost with something, like a chicken to eat after we have been doing the work together."*

Not far from the office, the chair of the farmers' organisation has set aside some of her own land for use by the organisation's members as a sort of innovation and value-addition testing ground. Everywhere are ideas that group members are trying out to generate new income streams: there are rabbit hutches, chicken huts, and a nursery of tree seedlings.

The strategic plan has been instrumental in galvanising the farmers' resources. Members' farms are spread far and wide across the district, and some are remote and can only be reached on foot; the strategic plan has helped to map out which farmers are located where, and the particular strengths and resources that they can offer the group.

Small farmers have long faced severe exploitation, as they have lacked both organisation and marketing know-how. As a well-organised collective, however, they can now position themselves in the marketplace and negotiate better deals for their produce. Yet they remain vulnerable to exploitation, says CARP team member Dr Anderson Kipkoech. He envisages a new phase of the CARP initiative, in which a student can be posted full-time in Teso to help the organisation develop strength in marketing.

"Without marketing, the farmer can't take the chickens beyond the farm gate, and can't realise a profit," he says. *"The danger is that the farmers get frustrated and that there's a disincentive for them to produce more. Now Teso farmers can organise themselves and produce more, but without marketing know-how they are still likely to be abused."*

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