



Introducing Innovative Processing Technology in the Burkina DryMore Project

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The Burkina DryMore project aimed to support food-processing companies in Burkina Faso with product diversification in their established dried mango businesses. Early in the project, dried ginger, hibiscus, and fonio were selected as focus product for diversification. All three of these products are food ingredients, with hibiscus and fonio competing in the health and wellness space. This raises the bar for supplying companies as consumers, retailers and importers strive for excellent food safety.

In this series, we sit with the staff of the Burkina DryMore project to learn more about the triumphs and pitfalls of introducing new technology to companies, who participated in the program in Burkina Faso.

Why is introducing new food-processing technology so relevant for development projects and companies in Africa?

There has been a lot of change in recent years. COVID disrupted supply chains and showed us that shorter supply chains and more diversified sources of products make good business sense. There is also greater interest in African products, in natural food ingredients as well as lightly processed foods. This creates opportunities for African businesses to export to the EU.

At the same time, we need to remember that products are flowing to the EU member states from across the globe. If you want to compete in these markets, you might just have to compete with larger, more established businesses that can offer good product quality, meet the stringent EU food safety standards, and still deliver lower pricing.

The implications for companies from new supplying markets, such as these companies in Burkina Faso, are significant. It makes sense to develop a production system that sets you up for success. It needs to be efficient, cost-effective, and improve food safety. Adopting new technology is often the best solution.

What was the focus of the technological innovations in this project?

Ginger needs thorough cleaning. Ginger is a root and therefore is fairly encrusted in soil when it is harvested. This soil needs to be cleaned off before processing. Thereafter, it is sliced and



Figure 1: Ginger washing machine

dried before ending up as a finished product. The challenge, however, was in the cleaning process. Thankfully, technology already existed in India that provided a good example of how to solve this problem using equipment.

Out of the three, fonio proved to be the most challenging to solve. Prior to harvesting, the stalks cannot support the weight of the grains and tend to lean over, causing the valuable grains to come into contact with soil. This problem is exacerbated during threshing, which involves beating the stalks on the ground. Finding a solution to minimize soil contamination and effectively clean the grains became a priority.

In the case of fonio, dry and wet washing techniques are used for cleaning. Workers scoop up bowl by bowl of fonio to be rinsed, raising concerns about water cleanliness and worker hygiene. Additionally, this process is slow, labor-intensive, and inefficient, leading to higher production costs and uncertainty about meeting anticipated demand. The EU imports 160,000 tons of quinoa annually, and if fonio were to gain even a fraction of this popularity, companies would struggle to meet the demand.

The project identified the intruding new processing technology could speed up processing and improve food safety levels for both fonio and ginger. This was an ambitious undertaking.

For hibiscus, the innovation wasn't in processing technology, but rather in more efficient farming techniques. Food safety is vital when farming hibiscus, a flower used as an ingredient in herbal teas. The challenge was to invest in technology that would simplify the farming process of hibiscus, reducing labor-intensive methods to farm or clean the products and raising the food safety levels.





Figure 2: The ginger processing line

What challenges did you face in finding the right equipment to achieve the project goals?

Introducing new technologies is challenging in any context, but the project revealed specific challenges in Burkina Faso.

It quickly became clear that developing new processing equipment is expensive, and it requires highly skilled staff typically found in more developed countries. These staff spend hours researching the production process, reviewing applicable technologies, and

adjusting to accommodate the specificities of the new products. This generally makes designing custom equipment expensive and time consuming.

In the case of fonio, this was made particularly difficult by small size of the grain- it's smaller than a sesame seed. Not only does the grain need to be cleaned, but it also has an outer husk that must be removed. Applying too much pressure during processing causes the grain to release a natural oil that holds on to dirt. Thus, the required equipment not only needs to handle small grains but also be sensitive enough to avoid crushing them and releasing the oil. Admittedly, there is a production line in West Africa that uses partial mechanisation. But it's expensive and the delicate parts of the process are not yet mechanised.

We realised that this is an issue that the project could address. Our solution was to find a company that could design robust and user-friendly equipment. The engineer drew inspiration from technology being used in India to clean ginger, from rice processing equipment, which is found in a thriving local rice milling sector and from a research project previously delivered by CIRAD. They were also interested in partnering with the project to explore this new opportunity. This allowed the design costs to be more affordable despite this being custom built equipment.

How did the companies fare in getting the equipment imported and to their destination? What did you learn?

The challenge began with importing and transporting the equipment to the factory. We agreed to share the transport costs with the local company by funding delivery to Abidjan, where the company would take over. In Burkina Faso, it is a common practice to offload equipment in Abidjan and remove it from the container. The unprotected equipment is then transported by truck to its destination. This helps lower transport costs and avoids issues with unreliable trucking companies.

While this is a practical choice, it results in additional costs that most companies do not consider when making decisions. Since the equipment is unprotected, it can be damaged during transport, as was the case in this project. Supporting struts were damaged and the surface had dents. Although this may seem

minor, mishandling the equipment made the warranty null and void.

Furthermore, the damage raised concerns about the equipment's lifespan and wear and tear, leading to additional costs in the long run.

These experiences led to some significant realizations. We learned that it is better to ship the equipment in smaller pieces in protective crates, which allows the equipment to be safely offloaded and transported.

What lessons can you share about commissioning, i.e., getting the equipment up and running?

Commissioning challenges are a regular part of introducing technology, whether it is new or common-place. However, as these were custom-built the specific commissioning challenges faced in the Burkina DryMore Project are especially worth mentioning.

The very first challenge was faced in the preparation of the infrastructure. Due to language barriers and a lack of required skills, the discussed floorplan was not prepared as planned.

When the technicians arrived to commission the equipment, they encountered several additional issues. Firstly, the equipment was larger than what the Burkinabé were accustomed to, which meant that walls needed to be broken down and doorways widened.

Secondly, the engineers had to operate the forklift themselves to move the equipment into position. Thirdly, the electrical fuses in the equipment had blown because the electrician had mistakenly installed two-phase electricity instead of the specified three-phase electricity. This troubleshooting significantly delayed the commissioning process.

It is important to emphasize the significance of the commissioning process in introducing new technology. It is not just about getting the equipment to function properly; the maintenance and operator training required in this phase are equally important. However, this can only be achieved if the equipment is operational.

As this was custom built equipment, were adaptations required? And if so, what can we learn from that process?

Making adaptations is a normal part of commissioning newly designed equipment. In the case of fonio production, it was already clear during the design and initial testing phase that the variability of the grain size would require adjustments to the equipment. Additionally, repairs were needed due to damages incurred during transport.

Making these adaptations in Burkina Faso was not a straightforward task. Skilled machine fitters were not readily available, which complicated the necessary alterations. Welding stainless steel also requires specialized equipment, which is often lacking in the region. Lastly, spare parts are not always easily accessible. We searched for drive chains in four different West African countries before realizing that we would have to import them from South Africa, which is not a sustainable solution in the long run. Fortunately, local suppliers were able to develop an alternative solution using motorbike parts that were readily available.

What role did testing play in the project?

Production trials are a crucial step in the commissioning and adaptation steps. The trials give insight in to design issues, the machine performance and the adaptations that are needed. It takes months to optimize new equipment and then more time to understand its true capacity. The percentage of raw material that can be turned into a sellable product - whether it's 60% or 55% - has significant implications for sourcing, production, and the overall business case.



Figure 3: Ginger moving through the ginger washing line

Reaching this stage requires the organized and systematic operation of the equipment and that the maintenance team and machine engineers are working hand in hand. It's such an important step that the project team lent the company to plan for these trials, to keep records, to adjust the production process.

We've also been working with the company to adjust the financials to reflect the real production times, the staff numbers needed on the line and how much product gets converted from raw material to finished product. These are all a part of learning how to organize production and get the most out of the equipment.

Honestly, this is still incomplete. While there is significant interest from the market, the companies are still struggling to estimate the sales price and make sales. It is a work in progress, and it is holding the companies back from moving into full-scale production. This is the ultimate "production trial" and the moment when everyone will know whether we have found the right model of production.

What was done with the product processed during the testing phase?

This is an aspect of testing that many companies overlook. Part of the goal is to play around with the machine settings to understand the equipment. The initial product is thus unlikely to meet the client standards.

The company in Burkina Faso faced some potential losses as large volume of raw materials needed to be processed over multiple trials. In some cases, it's possible to rework the raw materials, or blend it into existing products. But, as this is an innovation it wasn't possible.

Fortunately, most of the fonio and ginger could be sold in the local market. It's really important that teams introducing processing technology plan to source the raw materials, budget for these costs and then develop a strategy so that waste is limited.

You mentioned a challenge with integrating into ongoing operations. Please expand on this.

Getting the equipment commissioned was only half of the challenge. The other challenge has been transitioning from this being a "one-off project" to being a normal part of ongoing operations.

A key step in this process was drafting standard operating principles (S&OPs). We brought a machine fitter in from South Africa to make repairs and a food technologist and former milling factory manager to assist with the S&OPs related to the equipment. The production team were able to work alongside these experts to learn how to organise themselves, to run the equipment, to identify when little issues are developing and what they need to do about it. This was invaluable hands-on training for this team.

How did the program support the equipment remaining in good working order after commissioning?

This was a real concern for the project team and the company. All processing equipment needs daily inspection, regular tweaks and then rigorous, scheduled maintenance. This is especially crucial for the ginger equipment, which has a water filtration system. Without keeping the system clean, you cannot ensure that the ginger is being washed with clean water. The system must be flushed, and the water replaced at least every two days. It is an excellent piece of equipment, but only when it is properly maintained.

We recognized that some maintenance challenges shouldn't be dealt with inhouse. So, we have been working to create a relationship between a local engineering company and the companies in the program. The engineering company was involved in commissioning and adaptations, and they have many of the skills need for ongoing scheduled maintenance and for tougher repair jobs.

One of the major system changes that needs attention is developing the company's service and maintenance capabilities. This is a change management project within the larger program.

Owners need to understand that the "breakdown and fix it" approach is outdated and ineffective when dealing with more advanced processing equipment or competing in advanced markets. These companies need to embrace the total productivity philosophy that is the manufacturing benchmark worldwide. The equipment is an asset, and keeping it in good working order is essential to maximize the investment. The focus should be on proactive and routine repair and maintenance, which is a shared responsibility of the production team rather than solely the maintenance team or person.

Staff members also need to be attentive to changes in the equipment. Wear and tear is normal, but the sooner it is reported, the better. However, until now, they have not been seen as an integral part of maintenance, and therefore lack the training that is common in manufacturing facilities worldwide. This is known as total productivity management.

The BDM program invested in specific training for the entrepreneurs and their maintenance staff so that they could begin to embrace this change. The entrepreneurs' training emphasized the importance of delegating authority and getting everyone involved in total productivity management.

The staff training staff really focused on them becoming more proactive around maintenance. There were some real breakthroughs with staff with many of them realizing that they are an important part of running and caring for the equipment. They might not be able to develop a deep cleaning schedule, or hire technicians. But, they can note down every repair, who did it and when it happened. And they have an essential role to play in protecting the equipment from poor workmen and making sure that the S&OPs are being implemented.



Figure 4: Commissioning the fonio processing line



How can companies take further steps towards this new way of total productivity management?

Transitioning to this system may sound simple on paper, but in reality, it requires new processes, organized management, efficient administration, and skilled staff. Operators need to be trained to identify problems early and even make minor repairs. This is especially important as untrained staff tend to take matters into their own hands, which can cause mishandling of equipment and real damage. We hope that the training we've provided can help with this important transition.

In the long run, the company needs to make a far bigger evolution from a hierarchical structure, where the investor is central to every decision, to one that relies on professional, skilled staff who are given real authority to make decisions. It's a different way of running a factory.

This is the next frontier for these companies. They've started the work, but it's a transition that requires change on many levels- the entrepreneurs need to be certain this is what they want for their company; they need to reflect on the type of management style they want and then learn the necessary management skills to achieve this. Many companies will need to work on staffing whether that's recruiting staff, training existing staff or considering how they will retain skilled staff when they find them. This evolution will take time.



Figure 5: Fonio moving through the newly commissioned line

The innovation does not solely lie in the equipment itself. Give a competent engineer the task, provide funding, and the equipment can be built. However, without associated process and system innovation, the equipment will ultimately lead to frustration, if not failure.



These are considerable challenges. How did the project manage to balance the demands of the innovation process with multiple companies involved in the project?

Firstly, it quickly became apparent to us that it wasn't practical for all the companies to partner with us on equipment testing. Our intention was not to supply equipment to every company, in fact, quite the opposite. We aimed to develop a working template that would demonstrate the commercial potential of this activity for both the diversifying companies and the equipment suppliers. Ultimately, these companies would need to purchase their own equipment for this market to be sustainable.

Working with one company and one prototype also made good practical sense. It helped to mitigate risks and allowed our team to provide more substantial support compared to if we were dealing with five prototypes that required commissioning and modifications.

The burden on the company chosen as the frontrunner was significant.

How did you assist this partner company and make it more manageable?

We must recognize that innovation comes with costs. The design work is expensive, the learning process takes time (which equates to money), and the resources required for commissioning, adapting, and establishing systems and standard operating procedures add to the costs.

Furthermore, there was the possibility that the equipment would need substantial modification or that the design itself could be fatally flawed. Nonetheless, we believed it was important for the company to invest. By doing so, they had a vested interest in getting the machines up and running and maintaining their operation. Our model was to co-finance the equipment design and adaptations, as well as invest in the commissioning, adaptations and production trials. The company would contribute the remaining funds, staff, towards the shipping costs and the product for production trials.

In reality, financing the equipment was not the biggest obstacle or cost we faced. The far greater challenge was how to successfully commission and integrate the equipment into normal business operations.

These are significant barriers to achieving a sustainable solution. How did the project overcome these challenges?

During the project, we provided translation support and helped mediate between the two parties. However, as you rightly pointed out, this is not a sustainable solution. So, we encouraged the South African company to hire staff who could speak French. This made a big difference. But, this is something that will require further work in future programs.

The biggest breakthrough was recognizing that local companies, specifically those in Burkina Faso, should be involved in the design phase and supported during the commissioning phase. This allows them to tackle the problem-solving required for adaptation and sets them up to provide ongoing maintenance, repairs, and spare parts.

Importantly, systems development must be done simultaneously with technology development. However, privately-owned businesses often find it unaffordable or impractical to make these investments when the technology and market are new and uncertain. This is where development programs like Burkina DryMore can offer support.

How did the companies adapt to being a part of an innovation project?

In this project, the entrepreneurs were being asked to invest in unfamiliar technology, presenting a risk dilemma. They had the option to stick with the seemingly safe mango drying, which they were familiar with. It doesn't require change at all.

Innovation, on the other hand, is uncomfortable and disruptive for companies. To succeed you need to develop capabilities in all areas of their business. It is not just about making the product, but also about establishing a reliable supply of raw materials, building food safety and certification systems, and learning how to market and sell it to new customers. This is a

challenge for companies everywhere. To innovate they'd have to take a chance and invest in a potentially expensive or difficult business opportunity. The benefits can be great, but there's risk.



We've come to think of this as the companies being stuck in a "safe zone". It feels nice and safe, but it also stops you from changing. The risk is that you miss opportunities in the marketplace, or that you fail to adapt and develop resilience to the changes that are ahead.

What have you learned as development professionals that can improve future program design?

Innovation requires change management, and success cannot be achieved without an understanding of this reality. It takes time for everyone to grasp the solution, and businesses need even more time to adapt to the changes. Without a focus on change management and systems development, programs will not succeed.

Since people are at the core of change and systems, programs must address the capacity of employees and entrepreneurs to successfully navigate these changes.

Another revelation is that local teams tasked with creating change often remain on these teams for extended periods and take charge of complex project components. While they bring relevant skills, it is essential to consider what additional skills they need to lead these system changes. Do they require an understanding of total productivity management? Do they possess the ability to coach companies through the process? More needs to be done to prepare them for this important change management work.

Finally, this program spanned three years. Admittedly, in such a short period we couldn't always dedicate sufficient time and resources for everyone to fully absorb the change. Additionally, there remain loose ends in areas like systems development and spare parts supply that require further attention.



Figure 6: The fonio processing machines

As we wrap up the project, what do you believe are the important next steps that companies and future funders can take?

On a positive note, the marketing efforts have paid off, as there is a clear growth in demand for these products. More than 4,000 farmers have also been trained to grow and supply the raw materials. However, there is still much work to be done in terms of change management and capacity development within these companies. We have reached a critical point where scaling up is necessary. Now, it is crucial for the companies to have the courage to take the next steps. But, as they do, we can see how daunting innovation is. Providing additional support would be incredibly helpful.



Figure 7: Operator, works on the new ginger washing line

Skills development is clearly an important need. It's a key ingredient in being able to adopt this technology. It's not enough for senior leaders to be trained on project management and finance skills. The next one or two levels of management need to be developed so that it makes sense for entrepreneurs to delegate. Innovation is just too difficult for one person to manage.

Finally, progress for companies wanting to adopt this technology in the future will be held back if the more practical skills are not more readily available. Modern food manufacturing relies on staff knowing how to maintain equipment, manage a spares store, operate a forklift, run a production trial etc. This program was able to train a few people, but this needs to be scaled up. The positive impact it can make on the food manufacturing in Burkina Faso would be incalculable.

