



Testing the production of hydroponic fodder for cattle, supporting climate resilience

Pilot Learnings

2024

Our fifteen month pilot looked to explore if the application of technology, while minimal, can be viable in a rural context to combat the effects of climate change and reduce conflict. Herders predominantly located in the north of the country are moving south due to desertification, creating conflict as there is frequent encroachment onto farm land.

The pilot team looked to develop a simplified hydroponic fodder system that could be utilised in rural Nigeria and cattle fodder to ease the pressure on grazing lands.

While the first phase of the pilot was purely technical, the purpose of the second phase was to test how such a system can work in the rural setting, how it impacted cattle, their health and productivity as well as how the communities reacted to the new system.

Stakeholder Learnings

Impact of conflict and climate change is bad enough that herders are willing to break tradition and culture

There was a level of uncertainty with the herdsmen on the reception of this solution. Traditionally nomadic in nature they may not have responded to a solution well that is counterintuitive to their culture. However, the impact of climate change and the prevalent conflict has made them more flexible and open minded to the point that they were willing to try this, while still sceptical. The group who participated in the pilot now welcome the solution as something they wish to continue utilising.

Agricultural Learnings

Cattle received hydroponically grown fodder very well

There was significant scepticism and doubt by the herders that the cows will be willing to feed on the fodder or even "enjoy" this. A field test showed curiosity and once some cows fed on it, the whole herd proceeded to do so and there was no rejection by any cows during the course of the entire pilot.

Significant increase in Milk production

There was no scientific projection on the increased milk production prior to the commencement of the trial, however there was hope for an increase of at least 30%. This was overshoot to 600%, from 0.7L to 4.7L at the highest level while the lowest was 2.2L, giving us an average of 3.5L.

This still remains an estimation as the true potential of the cow's milk production has not yet been met as the trial was run during the dry season when their feed from Pasture grazing was limited. This means during the raining season and the combination of Pasture and hydroponic fodder feeding may result in even higher milk production.

Reduced Methane production

While the reduced methane production was a realistic assumption, considering the assumed higher digestibility resulting in less gases, there was no indication that similar data already captured in the US through an experiment would be doubled in the African context. The experiment in the US involved comparing the gases produced by cows only grazing on pasture vs cows being fed hydroponic fodder, with

a registered reduced methane production of 25%. However, an in vitro experiment during the pilot in Nigeria showed a reduced methane production of 50%. This may be attributed to the fact that the baseline data of pasture being grazed on in Nigeria and the US already differ in quality, the one in Nigeria being significantly lower for a variety of reasons. Considering the fact that Livestock, primarily cows, produce 14.5% of global greenhouse gas emission, the 50% reduced methane production may have a significant impact in meeting the objectives of the Nigerian Climate Change Act.

In addition to this there may also be the possibility of herders being able to earn carbon credit on the significantly reduced Methane emission. The concept of herders being able to earn carbon credits while increasing overall yield and productivity of the cow could create an entirely new and even more independent business model while improving livelihoods at the same time.

Learnings of the pilot have resulted in “spin-offs” that may indicate an ecosystem of different business models and revenue streams that may require further research and data.

Systemic Learnings

Dairy companies must be part of the equation

Due to the unfavourable price of raw milk and the continuous rate of inflation, increasing the main input cost, seeds, it became clear that a basic business model of comparing finances of input (cost of seeds) vs output (revenue from sale of milk) was not viable in some regions based on the price of seeds and low value of milk. Dairy companies, however, due to the variety of value-added products such as yoghurt, cheese, pasteurised milk, butter etc. generate significantly more income with higher profit margins.

However, the dairy companies disclosed that due to the low volumes of milk produced by local cows, they have realised it costs them more to acquire more herders to supply them through advocacy etc and have therefore decided to invest into improving the output of the individual cows already supplying them to increase productivity and scale, therefore reducing or completely eliminating the dependency on the importation of milk.

This way the business model is independent from donor funding and would require a dairy company as the anchor, providing a level of financial security that the informal and nomadic nature of herders cannot provide to financial institutions that would back these.

Understanding the KPI's or data points stakeholders need to see for a solution to be viable for them will be useful throughout the course of a pilot to ensure data captured is relevant to their decision making. In this case this ranges from the herders themselves and what would be “life changing” revenue due to the increased milk production, to the banks who need to see x return on investment period for it to be viable to them.

Banks are interested in the solution

Over the past 7 years there has been more focus on the agriculture sector by the government. One of these initiatives includes the incentivization of banks to provide financing to small holder farmers and other producers at the bottom of the value chain such as herders. However, the risk of providing loans to this informal sector has been quite high and banks constantly seek for opportunities that allows them to meet certain targets set by the government, while also managing their risk and exposure. A business model that puts the dairy company in the middle as a guarantor and the receiving party of the loan, while the final

beneficiary is still the rural producers, creates a very attractive opportunity for financial institutions to cater and develop a product for this specifically.

Lack of policy and regulation on the herder behalf prevents simple business model

Many segments of the agriculture sector have significant representation at policy and government level. This ensures the interest of farmers for example are protected when it comes to pricing of agricultural products, this has enabled farmers to base their pricing on the market, inflation and the exchange rate.

However, there may be an underrepresentation of milk producers at that level, ensuring that multinational dairy companies that are the largest processors of dairy products, are bound by certain pricing regulations. With an inflation rate of 20% the past 2 years, there has been no significant change in the price of raw milk, making a simple business model that does not involve any third parties impossible.

This is a significant lesson in understanding how policy and proper representation of various actors of a value can create an enabling environment. Lack of this has left an industry underdeveloped with no incentivization to do otherwise and how solutions, however impactful may be “dead on arrival” if a business model cannot be adjusted or pivoted to achieve the same objective.

Attaching the private sector/dairy company has created a sustainable and independent model from grant funding.

During the initial pilot phase, there was a lot of excitement on the solution but there was also significant concern of the dependency on donor funding for this to be scalable. When data became available on the increased milk production, a model became clearer and eliminated the need for donor funding to scale this solution. While the model will be tested, there is more certainty that scalability will come from the private sector.

Data not sufficient for all stakeholders working with cows

At the beginning of the pilot the focus was on feeding cows, with time and engagement with stakeholders there was a realization that the dairy industry is impacted the most by the low output of cows locally and the focus went to the milk production of dairy cows through the feeding on hydroponic fodder. However, there is still the beef industry that is currently feeding and fattening cows on processed concentrate feed, but may see additional benefits to the feeding of hydroponic fodder. This data however was not captured during the pilot phase and currently eliminates or excludes the beef industry as a beneficiary of the solution.

Pilot Learnings

Limitations on project site

During the pilot site selection process, the criteria on what requirements will be had for a successful pilot, did not extend to continuation beyond the pilot. If this criteria was considered during the selection phase, a different location may have been selected that already had a dairy company attached to it that would allow for seamless continuation.

Continuous stakeholder engagement

There was an impression that it would be more beneficial to engage with stakeholders such as the dairy companies and banks when data was fully available, however the pilot “exit strategy” may have had less of a negative impact if dairy companies and banks had been involved throughout the process too.

