

Industry 4.0 for Agricultural Development in Zambia

Toni Hassenmeier
September 2015

Abstract

Access to market and seasonality are the biggest challenges for remote farmers in developing countries. This environment does not support entrepreneurs and the development of business minded small-holder farmers. These challenges cannot be addressed through large scale infrastructure projects alone. This paper describes an alternative approach to the challenges by developing a small scale food/agro processing technology that can be run efficiently in remote areas and incentivizes productivity increases of small holder farmers. This will in return increase resilience to external shocks, such as climate change, international price shocks or resource dependency.

Acronyms	3
Industry 4.0 for Development - A Vision	4
Farmers Access to markets - what is the problem?	4
Industry 4.0 - a brief introduction	4
Agro/Food Processing via Industry 4.0	5
Piloting the Approach - The Zambian Case	7
Government Funds	7
Electricity Generation and Distribution	8
Challenges in Rural and Remote Areas	9
Productivity	10
Nutrition	10
Government Initiatives on Agro Business	10
Opportunities for Zambia and Beyond	11
Developing the Solution	12

Acronyms

CEEC	Citizens Economic Empowerment Commission
CSO	Central Statistical Office
DFID	Department for International Development (UK-Government)
EAZ	Economics Association of Zambia
FRA	Food Reserve Agency
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IAPRI	Indaba Agricultural Policy Research Institute
ILO	International Labour Organization
JCTR	Jesuit Centre for Theological Reflection
LCMS	Living Conditions Monitoring Survey
MTEF	Medium-Term Expenditure Framework
NGO	Non-governmental Organization
PSDA	Private Sector Development Agency
QR Code	Quick Response Code
R&D	Research and Development
UNZA	University of Zambia
WFP	World Food Programme
ZAM	Zambia Association of Manufacturers
ZDA	Zambia Development Agency
ZDHS	Zambia Demographic Health Survey
ZIPAR	Zambia Institute for Policy Analysis and Research
ZLA	Zambia Land Alliance

Industry 4.0 for Development - A Vision

Farmers Access to markets - what is the problem?

One of the key challenges for farmers in developing countries - and it is even more severe for farmers in remote areas of these countries - is access to market for their produce. For crops that can easily be stored and have a long shelf life positive strides have been made, e.g. for cashew nuts, honey, cotton or some dried products. The challenge particularly for perishables is the time it takes for goods from the farm to the markets. The most common approach to further develop opportunities for farmers is to reduce the time to market through improved transport infrastructure. Countries, such as Zambia, embark on large scale road construction projects. While the alternative is to reduce the time constraint through improving the ability to store a product through food/agro processing at the farm gate and therefore increase its shelf life. This second option has been utilized to a much lesser extend. The main reason for this might be technological challenges in form of the availability of technologies for food/agro processing on small scale level. In developing countries missing utilities in particular electricity in remote areas is an additional challenge.

This paper outlines a possible application of technology focusing on value addition and food preservation using latest technological advancements. It is to be seen as an addition to large scale infrastructure development projects, which has its place, but cannot be the sole solution for developing countries with limited resources. The paper is strongly based on the country context of Zambia. Zambia is a suitable example and candidate as pilot country considering Zambia's agricultural potential, with underutilized arable land, low productivity levels in agriculture, low population density in remote areas, limited all year accessibility of remote areas, a burden of young citizens seeking employment opportunities and limited financial resources of the government. Zambia is a country that relies on agriculture with an urgent need for diversification of crops and providing economic development for the rural communities. The track record of 50 years of peace and stability provide a fertile ground for developing and implementing a multi-year programme.

Industry 4.0 - a brief introduction

Considering current developments of cyber physical systems, a window of opportunity seems to open up for looking into technological options under the umbrella of Industry 4.0. The term Industry 4.0 refers to a generation of industrial processing and manufacturing technology that increasingly uses intelligent systems, of modules and products able to communicate with each other. It is an industry driven approach on cyber physical systems. The idea is the increased use of information technology along the complete value chain. It will allow for an optimization in all steps of production, including a closer integration of the customer. In theory this will have the effect that economies of scale in production processes will diminish dramatically, making the smallest lot size of 1 item possible, for an affordable price. One aspect of intelligent systems is the capacity of learning. The factory will be able to observe the production process and identify areas for optimizing the production process, such

as power saving opportunities or improved maintenance plans. The factory and its parts are able to communicate via interfaces to the person responsible for the production process, indicating the status of production, the parts to be serviced or production materials to be provided.

Agro/Food Processing via Industry 4.0

Some use cases of Industry 4.0 in the chemical industries have shown that it is feasible to develop small systems of the size of cargo containers. One example would be the provision of fertilizer to farmers. A container can be placed on a farm or in a farm area. The farmer brings a soil sample, which is analyzed in a mini-lab being part of the container. Based on the crop grown and the size of the crop to date the optimal fertilizer is mixed and provided to the farmer. This increases yields, avoids over utilization of fertilizer and reduces cost. Via mobile internet the container factory can be remotely controlled and managed. If the supplies stock runs low, a delivery can be arranged. Maintenance works necessary could be coupled with the restocking exercise.

This concept should be further elaborated towards a container size food/agro processing unit, which is a completely autonomous system, especially in the context of developing countries. Small scale farmers would be registered as suppliers of agricultural produce. The container will have an input section, which allows the farmer to drop of his or her produce. The agricultural produce of the farmer will be checked for quality and then processed. The crops will be processed according to international standards of hygiene and packaged ready for sale in supermarkets. For this to be possible a supply of packaging material and eventually needed supplementary production materials have to be stored in the container, or supplied by local farmers. This can include locally produced herbs and spices, such as salt, chili, sugar, pepper or lemongrass, to name a few. Examples of such ready for market products can be tomato paste, fruit juice (or concentrate), peanut butter, canned fish, vegetable oil, canned peeled tomatoes, potato chips or any other items that do not require cooling. Cooling facilities will require additional constant energy supply and for transporting the products cooled transport facilities will be mandatory. Based on the final amount of products packaged from the farmers produce for supply to consumers, the farmer will be paid electronically into her or his account of choice, such as a bank account, mobile money account or an e-voucher system like the one the Zambian government wants to introduce for the Farmers Input Support Programme and the Food Reserve Agency. A full traceability of the farm produce from farm to market could be introduced, e.g. using QR Codes for each farmer on the final product. This will create a stronger link between consumer and producer, along the line of the „Proudly Zambian“ campaign.

The container is supported by a small power plant, either solar powered, a solid waste power plant or other feasible solutions. A borehole provides access to water. The water quality is consistently monitored by an integrated small scale laboratory. If it stays within the boundaries of given quality parameters in accordance with international health standards the

production continues normally. If the water is not suitable for consumption, the production can be stopped immediately. Excess electricity and the safe for human consumption water can provide additional benefits to the people living near the container site.

The ready for market products will be collected, transported and marketed by an agent overseeing the operations of the container. The container will be connected to via mobile internet to a centrally located service station. This station will monitor the level of stored products, supply of production materials, including packaging material and any needed supplementary production materials. The container being an intelligent manufacturing unit will be able to monitor the status of the machinery. It will provide information on parts that need service or replacement. Given the status information provided by the container the service station will be able to plan trips to the container efficiently and schedule any service trip, only when needed. This reduces oversight cost, especially on the part of transport cost.

A network of containers should be monitored by one service station. This will allow for realizing economies of scale. Additionally, it will create the necessary amount of marketable products to supply supermarkets or other institutions (e.g. government schools, school feeding programmes) on a regular basis. Without a regular supply the market players will not buy or stock the products in their outlets.

The network of containers does automatically include a network of small scale off grid power plants. These can be used to build an electricity grid on regional level at a later stage and thereafter be integrated into the national grid, as soon as funds for this are available. This provides an opportunity for organic growth of a national electricity grid and is therefore a sustainable approach for building a national grid.

Such a system has multiple benefits to the local farm communities and country at large, such as

- the provision of income generating activities,
- the increase of food security, since more perishable foods can be processed and stored for later consumption,
- the provision of clean and safe drinking water, controlled by the lab of the container,
- the provision of electricity for productive and non-productive use, e.g.
 - ▶ lighting allowing to do homework in the evening by school children,
 - ▶ cooking and therefore reducing deforestation and health hazards,
 - ▶ listening to radio and therefore engaging in more informed discussions of all aspects of social life,
- the improvement of Zambia's Balance of Payments, substituting international imports,
- the support to combating of stunting through a higher level of diversification in food production and consumption,
- the support of the electrification attempts of the Zambian government through the Rural Electrification Programme,

- incentives for further diversification of agricultural activities and therefore the economy at large.

Considering the various benefits of this approach, it makes sense to develop a public private partnership model for implementing Industry 4.0 for Development. It includes public service provision, such as health benefits (reduced use of charcoal, safe drinking water), protecting the environment (deforestation) and food security, as well as services to be provided by the market, such as providing a market for farm produce, food/agro processing and product marketing. The main challenge lies in Research and Development efforts to develop a technically feasible system. The funding for this could be provided by governments and corporations.

Piloting the Approach - The Zambian Case

In Zambian supermarkets a variety of imported food products can be found, mainly from South Africa or Kenya. Agricultural produce is only to a small degree processed in Zambia, in some cases exported and the processed food re-imported. For perishable goods this is not an option, leaving farmers to sell locally before the goods are not fit for consumption any longer. Small scale farmers are therefore often at the mercy of the buyer. This reduces the income generating opportunities for farmers in remote areas, who cannot transport their goods to the markets or a food processor in time. Food/agro processing capacities in Zambia are few so far, although the potential for food production and processing is immense. Zambia's current challenge of generating sufficient electricity to support not only but also industries, negatively affects the potential for new investments in manufacturing, including food/agro processing. Although the current government has put the manufacturing and food/agro processing sector as one of the priority areas on its agenda, the opportunities for intervention are limited, at least in the short term. This is even more so, as the revenues generated by the Zambian government are likely to reduce, given an expected reduced GDP growth rate (5% for 2016 or less, from 5.6% in 2014, 6.7% in 2013, and higher the previous years) as well as the falling prices for the main export commodity and one key revenue generating resource copper. Hence, other players need to find opportunities of growing the food processing sector, without further restraining the limited resources of the country, such as electricity, government funds and increasingly natural water sources.

Government Funds

Zambia's fiscal space for the years 2015 and following is dramatically constrained. The Zambian Government was able to tap into international markets for financing infrastructure projects, issuing three eurobonds, totaling 3 billion US\$ (750 Mio. in 2012, 1 billion in 2014 and 1.25 billion in 2015). The last bond was targeted at 1.5 - 2 billion US\$, but did only attract 1.25 billion US\$. This undersubscription indicates that further borrowing at the

international market will not be feasible. In the Medium Term Expenditure Framework (MTEF) 2016-2018 government proposes to spend 10.4 billion Kwacha non-financial assets, which include road construction, energy generation and distribution, as well as water and sanitation. The amount is almost equivalent to the budget deficit estimated to be 10.9 billion Kwacha. This means that the Zambian government is just able to finance its daily operations through domestic revenue. Any investment in infrastructure will have to be financed by borrowing, leaving no room for emergency measures or new infrastructure developments. Even existing infrastructure measures might be stalled, provided the inability to further borrow internationally. Given this situation urgently needed investments in infrastructure cannot be supported by the Zambian Government, putting additional pressure on alternatives to improve the lives of Zambian citizens.

Electricity Generation and Distribution

ZESCO, the state-owned Zambian electricity supply corporation, is relying to almost 100% on hydropower. In 2015 a demand of 12,900 GWh was estimated by ZESCO, facing a power generating capacity of 10,800 GWh. Low rainfall in 2014/15 rainy season is claimed as reason for the gap of 2,100 GWh for the year 2015. To mitigate the shortfall in electricity supply ZESCO introduced a wide ranging load shedding schedule affecting all areas of life, including all industries, also mining operations. For 2015/16 rainy season a strong El-Nino effect is expected, anticipating a low rainfall pattern and reduced power generation capacity in 2016 and the years following. The shortage in power supply already leads to laying off of personnel in business entities, e.g. CNMC Luanshya Copper Mines Plc. Other businesses try to compensate the daytime load shedding by working night shifts, as witnessed in Lusaka compounds along the roadside. On September 16th 2015 Zambia Development Agency (ZDA) Director General Patrick Chisanga claimed that within two years power plants with the capacity of 4,000 Megawatt will be built in Zambia. This overly ambitious and optimistic statement highlights the despair with the current situation and stands in contrast to the MTEF expecting additional 4,000 Megawatts power generation capacity by 2030 and contrasting the statement of a ZESCO representative presenting at a public discussion forum on August 20th 2015, which foresees an increase in power generation by the end of 2018 of 950 Megawatt. During the same presentation the ZESCO representative was not able to convincingly explain how the connection of the power plants to the grid will be ensured at the time the power plants are ready to commence operation. This is a critical aspect in the mix for providing electricity to consumers and industry, which are up to now mostly located in urban areas, as rural electrification stands at 3% in 2015 (according to MTEF 2016-2018; 2010 Living Conditions Monitoring Survey (LCMS) Data show 4.5% rural households being connected to electricity).

Challenges in Rural and Remote Areas

The low electrification rate of rural households with 4.5% compared to 53% of urban households, highlight one aspect of the rural - urban divide in Zambia. Likewise, education, income, access to clean water and access to health facilities are unequally distributed. The severity of the urban - rural divide increases with the distance of the area to the major urban areas, leaving the rural population in remote areas behind even more. A review of the poverty levels according to the LMCS 2010 clearly endorses these findings. The provinces (Lusaka, Copperbelt, Central, North Western and Southern) along the line of rail have higher levels of urbanization and lower levels of poverty compared to all other provinces, with Lusaka and Copperbelt Provinces having reached poverty levels of less than 25% and 35% respectively, compared to a national average of 60.5% (rural 77.9%, urban 27.5%).

In order to address the access to market challenges of farmers in rural areas, the Zambian Government has embarked on the Link Zambia 8000 project, trying to increase the accessibility of rural areas with all weather roads throughout the year. These roads should assist rural communities in accessing public services and markets for their produce. The project targeted 8000 km of road network. This target will most likely not be met in the near future given the fiscal situation Zambia faces and the current rate of completion (The Progress update from February 8th 2015 shows only a few roads that have been finished.). The effects for areas where roads were completed will have to be evaluated in due course. The road network is but one aspect to improve access to markets. The provision of transport capacity is another one. The roads clearly improve the accessibility of areas and reduce travel time. The question is whether this will be to the advantage of rural communities or individuals with transport facilities at hand. Business owners are able to travel into rural and remote areas buying agricultural produce for low prices and transport them to food processors, realizing a higher price. Because the amount of produce available might not be known before the trip, this business undertaking is characterized by inefficiencies per se. Which leads to relatively high transport cost compared to the cargo transported. The transport facility will most likely have some downtime in the rural areas, waiting for farmers delivering their produce or driving around from one farmer to another. Farmers do not only achieve low prices for their produce, they also can't rely on the regularity of business. This in turn leads to a situation with no incentives for increased production and productivity. Producing perishable goods for which is unclear if they can be sold or not, does not make economical sense. Hence, the majority of farmers engages in subsistence farming for quickly perishable crops. A different situation is found for Zambia's staple crop of maize and a limited number of cash crops, such as cassava, millet, sorghum, rice, beans, soya beans, sweet potatoes, potatoes and groundnuts. Especially the example of maize shows that incentives, like a secure market for the produce will attract increased yields. The Zambia Food Reserve Agency (FRA) has provided a market for all maize produced in Zambia. This resulted in several bumper harvests over the years 2010 to 2015, always exceeding the demand in Zambia. Although this action by the FRA heavily distorts the market forces and provided opportunities for corrupt and rentier behavior through briefcase buyers and government

officials, it is a clear example that farmers are able to increase production levels, if a market for their produce is provided. The existence of briefcase buyers highlights another issue. The farmers need immediate payment and/or they must be sure the payment will come. Therefore, they sell to the bidder who is paying immediately and for the best price. The same would be possible for any other agricultural produce.

Productivity

If farmers are able to increase their income and have level of guaranteed income, they can engage in small scale mechanization and possibly grow their production into a commercially viable business. At present most small scale farmers have rather low productivity rates, e.g. 2-2.5 tonnes per hectare maize compared to 6 tonnes per hectare of possible yield. Mechanization as one element for raising productivity is particularly difficult in remote areas, because service providers for machinery are not present and during the rainy season remote areas are difficult to reach. Private sector driven services, such as rent to own or sales of machinery focus on areas close to urban centers. These businesses need a critical mass of clients in order to build a viable business case. The densely populated remote areas do not provide a sufficient client basis, especially given their low levels of income and missing access to markets. The Zambian Government provides agricultural extension services that reach out to farmers, down to sub-district level. These extension services focus on training and support to farmers improving their businesses. Extension services can be a vital source for closing the information and training gap between urban and rural areas.

Nutrition

Productivity levels as well as learning and training results are also affected by nutritional aspects. Farm work requires a lot of energy, which can only be provided by a balanced diet. Concentration levels are also closely linked to the diet of a person. Zambia faces the challenge of malnutrition and high stunting levels (40% for children under 5 with 42% in rural areas and 36% in urban areas; ZDHS 2013/14), due to unbalanced diet. This is a result of low diversification in the Zambian agricultural market, with main incentives provided for farming maize. Though, the FRA intervention has helped Zambia to be food secure, the next step has to be taken, ensuring higher diversification and through this higher nutritional levels. By providing a market for non-traditional cash crops, the level of diversification in production of agricultural goods will increase. This will provide a basis for improved diets and nutrition. The increased income in remote areas will also allow for buying other food items not produced in the area, additionally increasing the nutritional values.

Government Initiatives on Agro Business

The Zambian Government under the Patriotic Front leadership has identified rural development as one of the key pillars for developing the country. The Strategy Paper on

Industrialization and Job Creation identified Agriculture and Manufacturing as two of four priority sectors. One sub sector particularly focuses on agro processing. The Strategy is supposed to „contribute to value addition and the diversification of Zambia’s economic base“. One of the main elements of the strategy is the creation of farmer clusters and increased value addition. For the latter the Citizens Economic Empowerment Commission (CEEC) has become a vehicle providing funding under the value chain cluster development approach. Loans are particularly provided to businesses in rural areas, following a value chain approach and pre-defined priority industries in each district, e.g. mango in Mongu, honey in Kabompo or beef in Namwala. This line of thinking will also be integrated into a Rural Development Strategy focusing on agriculture, based on a one village one crop concept accommodating comparative advantages.

Opportunities for Zambia and Beyond

Developing the container solution based on the Zambian context offers a number of opportunities for Zambia and its partners. Especially given the current fiscal constraints and the policy environment that favors manufacturing and agricultural development projects along value chains, an opportunity for a win-win situation exists. Zambia provides some solid base infrastructure in terms of mobile phone network and basic road network, though not all weather roads. The population density is relatively low, especially in the remote areas. The mostly young population does not have many opportunities for personal, professional and economic development, especially in remote areas. Although, the exact figures are contentious, Zambia still has unused land fit for farming and low productivity levels offer potential for agricultural growth. Currently, the urban rural divide is also used for profit gains by middlemen and women buying agricultural produce in remote areas and selling in towns. There is no regular market for remote farmers to sell their produce. Zambia faces possible conflicts between generations, considering a population with approximately 80% younger than 35 and 50% below the age of 18. Additionally, the traditional leadership is strong in remote areas, being the functioning governance system, as the government fails to provide statutory services in all areas of the country, due to fiscal constraints and the vastness of the country.

The development of the solution will require to train young people in servicing and maintaining the containers, but also to include local expertise in the development stages, offering opportunities for engineers. If this project is approached correctly, Zambia could build capacities and become a hub for manufacturing technologies. Once the technology is well established it could offer development opportunities in the agricultural sector especially for countries with non-functioning transport systems or poor road networks and low population density, such as Congo DR or some areas of Mozambique. Zambian Engineers could use this opportunity for generating employment within the region, being the technology lead.

Developing the Solution

The basic ideas for the solution were described in the introductory section. The technical feasibility needs to be established and possible use cases further elaborated. The first step to achieve this will include reaching out to

- researchers in the food/agro processing industries and at universities,
- practitioners in the development cooperation field (Institutions such as IFAD, WFP, FAO, bilaterals, etc.),
- bodies of industries, such as Plattform Industrie 4.0.

It will be critical to raise funding for a team, tasked to analyze the technical and commercial viability of the concept.

Once the technical solution has been developed and is ready for commercial use, the container solution should be operated by private sector investors. These can be companies producing the containers, e.g. operating them under a build operate transfer scheme. Other options are local or international investors, including existing food/agro processors enhancing their portfolio. Some of the initial investments for setting up the container sites can be financed by international development agencies, e.g. for providing clean and safe drinking water to local communities or for supporting Private Sector Development. Several additional services are thinkable besides providing electricity and safe drinking water, such as having a weather station providing data on weather patterns. These services improve the commercial viability of the solution. Alternatively, development agencies, NGOs or government agencies can run the container solution. Though, this is not advisable as it bears a higher risk of mismanagement or misuse of the system. Government run businesses can be a solution, if strong control systems are in place, ensuring transparency and efficiency in running the business.

In the long run this solution also offers business opportunities in industrialized countries. Rising energy cost and the increasing demand of consumers wanting to know where the food has been produced, will open opportunities for small scale food processing units. Given the constraints of electricity and water supply in a country like Zambia, the solution to be developed has to be highly energy and water consumption efficient. As there is no alternative energy source in remote areas, these would set the immediate boundaries for developers of such a solution. If a solution is found addressing these constraints, it needs to be commercially viable in industrialized countries.

To develop the solution, including a sustainable business approach, it is necessary to constitute an interdisciplinary team of international and Zambian experts from the areas of

- business development
- agricultural development
- agricultural research
- food/agro processing (R&D)

- market research
- ICT
- social sciences.

Research has to be conducted in the areas of technical feasibility, business viability and societal aspects. Technical feasibility should be examined by experts from the food processing industry and plant manufacturers. This area should be lead by experts from the leading industrial countries, ensuring the use of latest technology. The team should include Zambian experts, who understand the country's specifics in terms of main aspects of wear and tear and human behavior when using technology. This will ensure best possible adaptation of the technology to the local context. The business viability is linked to the societal aspects, such as skills, social norms, regulations, and believe systems. For this reason a team with strong knowledge of the Zambian context should conduct market research regarding the available agricultural produce, acceptance of products, acceptance of such a solution by farmers, existing market distortions and possible marketing channels, particularly the intended reinstating of marketing cooperatives and their effects. Additionally, research should be conducted in remote areas on how willing farmers will be to deliver their produce to the containers and what consequences such solution could have on the communities, e.g. if one farmer is doing commercially better than others. Maybe there is need to support setting up of local cooperatives or alternative community cooperation schemes. A close cooperation with government as well as traditional authorities (chieftainesses, chiefs, headmen and headwomen) is strongly advisable.

The research team can be established in stages. At the first stage it is necessary to establish the technical feasibility and estimate the cost for developing a marketable solution. This work can be done outside Zambia, preferably in industrialized countries with strong linkages between university and enterprise research teams. Once the technical feasibility has generally been established, the parameters have to be narrowed for a pilot project. This includes the identification of the type of agricultural produce to be processed and the area for piloting. For Zambia this would require a team of local experts, who already have data available on agricultural produce, poverty figures and existing and planned projects. It has to be decided whether it makes sense to conduct the pilot in areas with the most difficult conditions (e.g. furthest distance to market, accessibility, poverty level, lowest level of productivity, availability of extensions services) or rather in less challenging areas. Some first information can be gathered from survey data, such as the LCMS, the Crop Forecast Surveys, the 2010 Census or Demographic Health Surveys. Although these mainly provide information on cash crop production, the food consumption section of some surveys can provide information on agricultural produce available in the various areas of the country. A further analysis has to establish which areas are most suitable for increasing production.

The last stage is the development of a business model that fits into the social system at hand and is commercially viable. This business model needs be tested and especially social impacts

analyzed. The project could lead to changes in power structures, if it provides a market for actors that did not have potential to grow yet. In most areas in Zambia men are usually farming cash crops and women are responsible for reproductive tasks at home. Therefore, if now a market is opened for non traditional cash crops it could provide opportunities for women empowerment in communities. These effects might pose a threat to the solution, if the community does not approve such. Hence, the business model will pose challenges very particular to the remote areas this approach tries to address.

Developing and implementing such a solution is a multi-year project. Based on experience from working with the private and public sector institutions in Europe and Southern Africa, the time for developing and testing the technical solution as well as developing a business approach that is accepted by local communities (let us call it Community Business Model), it can be assumed that the overall development process will take about 5 years (see table) from the moment a project team is established and stakeholders contributions have been agreed.

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Establishing Technical Feasibility					
	Establish Pilot Area and Products				
	Develop Technical Solution				
		Develop Community Business Model for Pilot Area			
			Piloting of Technical Solution and Community Business Model		
					Start of Commercial Phase

This project can be implemented as a joint effort of public and private sector institutions, including universities, research institutes, enterprises, development agencies and NGOs. The engaged institutions could contribute from their own budgets or a budget is provided, either through a funding pool or funds provided by a sponsor. The preferred option would be a budget provided, as this will reduce conflicts with other budget lines in the institutions involved. At this point it is not feasible to establish the cost of the project, as they depend to a large degree on the development cost associated with the technical solution. The immediate funding requirement would be the salary and extensive travel cost for a project manager or

coordinator (Toni Hassenmeier¹) to establish the current status of technology and find suitable partners.

¹ For implementing the project Toni Hassenmeier would be the best option, because

- he conceptualized the idea,
- he is willing to work in the field in Zambia's remote areas,
- he knows and understands relevant institutions in academical research (UNZA, IAPRI, ZIPAR, CSO), public administration (Cabinet Office, Ministry of Finance, Ministry of Agriculture, Ministry of Labour), the international donor community (GIZ, DFID, European Commission, WFP, ILO), private sector (PSDA, ZAM), Civil Society (JCTR, EAZ, ZLA), Members of Parliament, to name but a few,
- he is able to adapt to his counterparts, on every level from high ranking government officials to children in rural areas.