International Development Design Summit Botswana

July 15th – August 13th 2018
D'kar, Rakops, Dutlwe and Kaputura

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Message from the Lead Instructors

Dumelang!!

IDDS 2018 was a special experience, and we are delighted to share this report with you. During our four weeks together, participants and organizers came together for a journey through design, business and community building. This summit had a goal of providing tangible solutions that improve the livelihoods of community members in villages in Botswana through the strengthening of local innovation ecosystems. Building off of previous IDDS design summits, we challenged ourselves to go further– not to be satisfied with creating technologies that had the potential to create businesses, but to actually create businesses. Each of our teams addressed a real community need, developed a technical solution, explored market opportunities, created a business model and then launched their ventures. All in less than a month!!

In the pages that follow you will learn more about the summit and the technologies and businesses that were created during IDDS Botswana 2018. We hope you are inspired and energized.

We would like to thank the entire organizing team for all their hard work to make the summit such a special experience! We are also grateful to Ta Corrales, for doing such a wonderful job to compile and edit this report.

Sincerely,

Amy Smith
Co-Lead Instructor IDDS Botswana
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Mustafa Naseem
Co-Lead Instructor IDDS Botswana
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About the summit

IDDS Botswana 2018 was a four-weeks hands-on summit which was hosted in the villages of D'kar, Dutlwe, Rakops and Kaputura in Botswana from 15th July – 13th August 2018. Under the theme "*improving rural community livelihoods in Botswana"* which had a particular focus on co-creating grassroots technologies/innovations and the supporting business models that will be taken-up by the rural community members through their innovation centers in order to enhance and sustain their livelihoods.

Our Vision

THE CHALLENGE

How can we support rural communities to use their indigenous knowledge to start and run businesses that foster their sustainable development?

There is a need in Botswana to foster new businesses that transition from an extraction-based economy to a more knowledge-based economy. This is especially vital in rural areas, which suffer from disproportionately high levels of unemployment and poverty while representing over two thirds of Botswana's population.

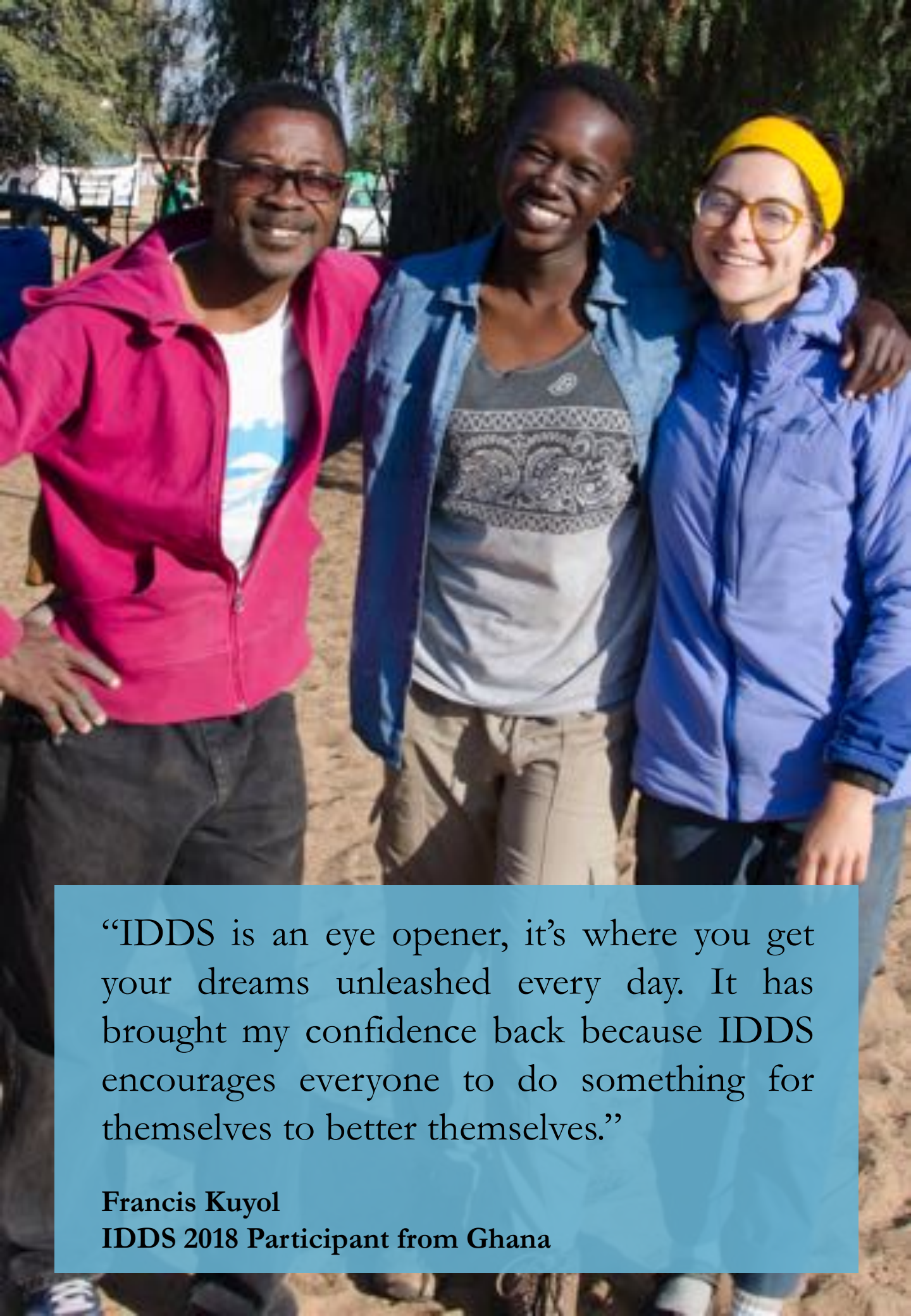
OUR APPROACH

We believe in community-led developmental interventions and work with local communities to facilitate the creation of technological solutions to their local development challenges.

These Hands is a social enterprise founded by Thabiso Mashaba, that fosters local innovation and supports entrepreneurship in rural communities. These Hands together with MIT D-Lab have pioneered an alternative approach to the top-down model of development in Botswana. They focus on community-led developmental interventions, and work with local communities to help them create technological solutions to their local development challenges and generate income by participating in the creative industries sector (industries based on art, design, and technological innovation).

ABOUT IDDS

The first International Development Design Summit was organized by MIT D-Lab in 2007, led by MacArthur Genius Prize winner, Amy Smith. IDDS are 2-4 week hands-on design experiences that emphasize the importance of co-creation, and are based on the idea that working with communities is more powerful than designing solutions for them. These Hands GSSE in partnership with MIT D-Lab and IDIN organized two successful design summits in D'kar, Botswana in 2015 and 2016. IDDS Botswana 2018 responds to a growing demand for design, co-creation, and solution development at the local level in the communities of Rakops, Dutlwe, Kaputura and D'kar, that can be turned into income generating businesses.



"IDDS is an eye opener, it's where you get your dreams unleashed every day. It has brought my confidence back because IDDS encourages everyone to do something for themselves to better themselves."

Francis Kuyol
IDDS 2018 Participant from Ghana

IDDS Botswana 2018

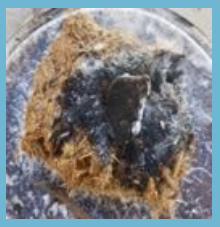
WHAT?

8 grassroots technologies with supporting business plans that address livelihood challenges

Bean Thresher

Dough Mixer

Hydroponic Fodder



Elephant Repellant

Elephant Dung Paper

Roasting Machine

Deep Sand Wheelbarrow

Paper Bags

WHERE?

The Villages of D'kar, Rakops, Dutlwe and Kaputura.

The summit focused on 4 communities: D'kar, Dutlwe, Rakops and Kaputura, where local innovation centres have been established and community members have trained in the design procerss. We anticipate that the projects from this summit will catalyze increased activity in the innovation centres and will provide these communities with sustainable development opportunities and jobs.

WHO?

32 participants and 13 organizers from Botswana and abroad came together to turn the vision for IDDS 2018 into reality. The participants wre engineers, artisans, designers, farmers and entrepreneurs and included 13 local participants from the innovation centres in Kaputura, Rakops, D'kar and Dutlwe, as well as 4 other participants from Botswana and 14 participants from eight other countries.

The organizing team was made up of experienced national and international professionals, local leaders and innovation centre managers with a wide range of expertise and full of the IDDS spirit.

Quick Beans

Bean threshing machine

First prototype of the bean thresher (left) and second prototype (right) incorporating community's feedback, which indicated a need for a machine with larger capacity, and hooks to hold the sack at the outlet.

Quick beans is a bean thresher that makes the threshing experience easier and faster! It also aids the winnowing process by separating the beans from the pods. This solution is valuable to bean farmers who can rent the machine and entrepreneurs interested in venturing into the bean threshing business.

THE OPPORTUNITY

Threshing of beans is an exhausting task that involves placing the harvested beans in a sack or on a paved cement floor and hitting them repeatedly with a stick until all the beans are threshed. It takes a long period of time and sometimes requires the hiring of extra manpower.

Once the beans are threshed, they undergo winnowing to separate the beans from pods and dust. This stage is dependent on the presence of wind, which is unreliable and thus can take a much longer time than expected.

TECHNOLOGY AND DESIGN PROCESS

Our bean threshing machine incorporates the use of internal rotating blocks that break the pods on impact, setting the beans free. It involves loading the beans in the funnel, turning the lever and collecting the beans at the outlet covered with mesh. The key features of the machine are:

- ✓ The use of a funnel for easy loading of the unthreshed beans.
- ✓ The use of a lever mechanism to rotate the internal blocks.
- ✓ A specialized outlet mechanism that separates the beans from the pods and allows for quick removal of the pods thereafter.

Since we began the project we've added vertical blocks on the horizontal internal blocks to further improve the quality of the output, used a smaller mesh size and made it bigger.

The materials required to make the machine are: sheet metal/drum, rivets, wood (Plywood and planks), mesh, bearings, 40 x 40 square tube, a shaft, screws and nails, bolts and nuts, and hinges. The tools used to make the tools are the drilling machine, riveting gun, angle grinder, jig-saw, welding tools, hacksaw, spanner and pliers.

BUSINESS

We will generate revenue from selling the machine and renting the machine within the community.
Dutlwe is a low-income community with bean farming as one of their main sources of income. They put the separated beans in a 50L sack that can be sold to BAMB for P. 450, the school for P. 1200 or individual sales of 1 cup for P. 5. For other crops such as sorghum and maize the miller goes to the respective farms to mill the crops and charges the transport costs on the community. They accept both cash and a trade of 1 sack of sorghum per every 5 sacks milled.

The assumptions made for costing and pricing are:

- There are roughly 150 bean farmers with about 20 of them as potential clients giving us a market size of 13%.
- The average farmer has roughly 18 sacks of unthreshed beans that amounts to 3 sacks of beans ready for market.
- The capacity of the machine required that directly influences the size of the machine. (We have no figure for this.)
- The willingness for the farmers and potential entrepreneurs to respectively hire and purchase the machine.

	Cost (BWP)
Materials	3000
Labour	1200
Transport	200
TOTAL	4400

For direct sales, we are targeting entrepreneurs and farmers at a price of **P5,500**.
The hiring charges of the thresher are:

- P20 per unthreshed sack.
- 1 unthreshed sack per 5 unthreshed sack.

With the estimated market size being 20 people with roughly 18 bags of unthreshed beans, our profits stand:

- 20% per machine sold.
- After the first harvest season (2% profit) the profit earned will drastically increase.

The sources of income include renting the thresher and the transportation costs to the community, while the expenses include payment to the operator (a future expense once the company grows) and fuel costs for the transport.

LESSONS LEARNED

If we had extra time, we would have:

- Tried different principles that requires less material to build and are more portable.
- Looked further into winnowing of the beans.

Advice to future teams:

- It's important to have a record of your material costs from the beginning. Assists in the business development process.
- Ensure to draw up the measurements before beginning the fabrication. It makes the process faster and easier. It also enables division of tasks. This is important since all members will be fully engaged in the development of the project whether they have technical knowledge or not.
- Check on the availability of materials.

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Mma Borotho

Dough mixing machine

THE OPPORTUNITY

Mixing dough with your hands is tiresome and time consuming! It can discourage individuals from making and selling mangwinya, which is an easy way for them to earn money. We identified an opportunity to develop a product that eases the process of mixing dough. Our goal is to make it available to a wide range of customers

Mma Borotho is a dough mixer for mangwinya that eases the mixing task while creating business opportunities.

TECHNOLOGY AND DESIGN PROCESS

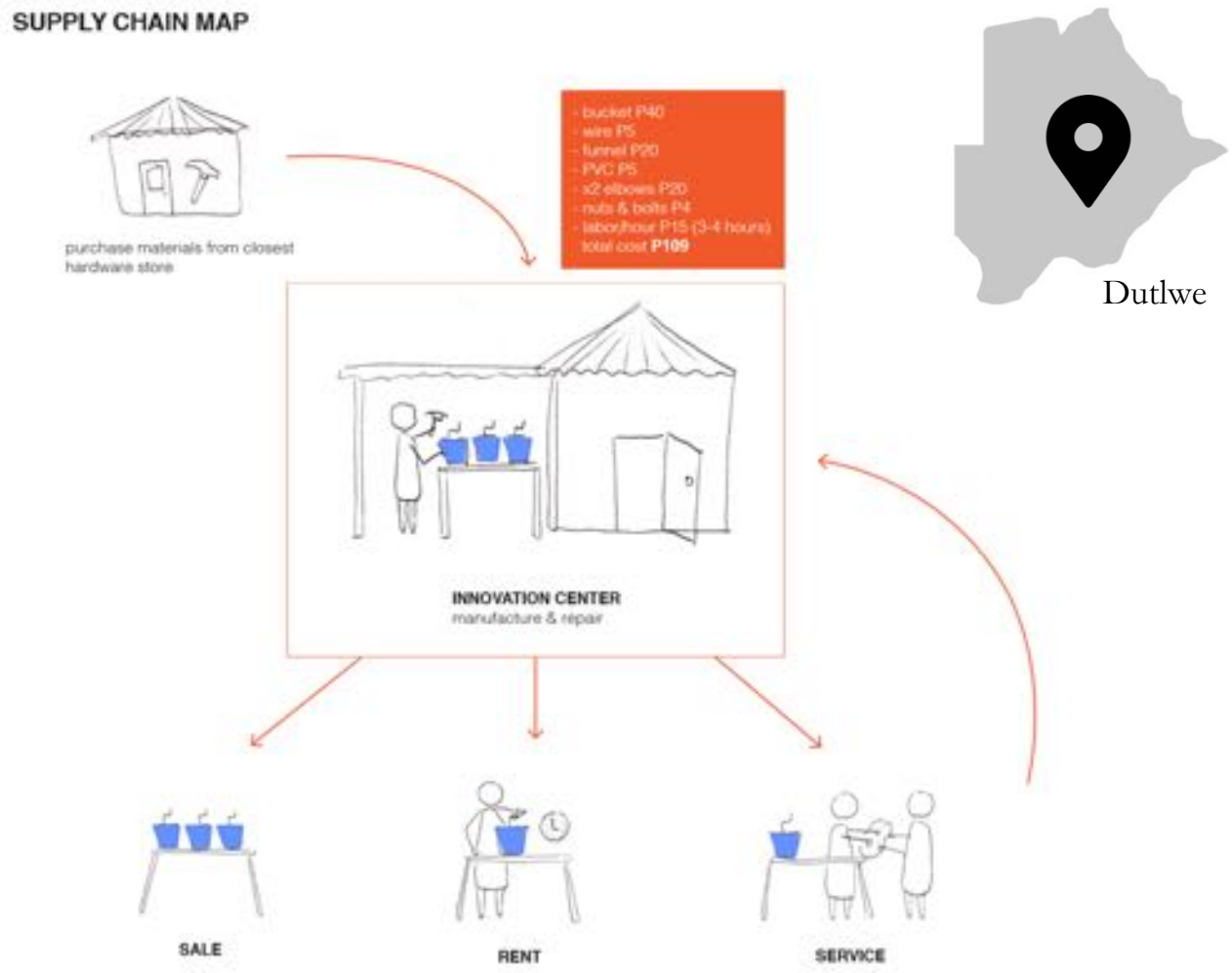
Mma Borotho is a simple to do technology! It's low cost and easy to manufacture using highly accessible materials. Anyone can build it and anyone can use it. It decreases dough contamination and it's easily transported.

OUR PRODUCT/SERVICE

Mma Borotho can be bought as a product, rented on a long-term basis, or used as part of a dough-making service. The innovation center acts as the main hub for the manufacturing and repair of Mma Borotho. We sell to tuck shops, bakeries, caterers, and individuals.

	Price (BWP)
Product Sales	**150**
Hourly Rental	**20**
Service w/ own ingredients	**15**
Purchasing dough	**70**
Product Profit	**41***

**Per sale, with additional revenue through rental and services. 10% goes to Innovation Center*



Dutlwe

LESSONS LEARNED

If we had time we could have made the blades/stirrer with stainless steel rods and used a metal handle to make our prototype stronger for different mixtures of dough. Some of our challenges were that the stainless steel rod is expensive and not easily accessible. It will make our prototype less affordable to the community. Working with stainless steel rods need upgraded skills to avoid wasting the metal when welding/attaching it. Therefore, we need training to do so. Due to stirring frequently the plastic container wears off easily/damaged. Therefore the blades should be positioned and be far a bit from the container to avoid friction. On considering to use a metal container, we take note that in case there be a friction between the blades and the container it could be much hazardous than plastic.

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Nosa Momela

Hydroponic-grown fodder

THE OPPORTUNITY

Nosa Momela system works to solve the challenge faced by local farmers in Botswana who lose almost **30%** of their cattle each during the dry season because the costs for the feed is unaffordable.

Nosa Momela is a hydroponic system that is an **affordable and an easy way of growing fodder** to feed cattle during the dry season that doesn't require soil or fertilizer.

TECHNOLOGY AND DESIGN PROCESS

A hydroponic fodder system allows the sprouting and growing of seeds and grains without the use of soil, using only water to support and give the growing plants with nutrients and energy. This is possible because seeds and grains have energy stored inside themselves, which allows seedlings to grow even if there is no sunlight. It similar to how an egg feeds the chicken before it is born. Its is possible to grow fodder using this technique because during the 14 days of growing the growing seed can rely only in the energy stored into the seed.

The first step is to soak the seeds in enough water to make they moisturized. We experimented 2 different timings, 12 hours of soaking followed by 1 hour of drying and another bigger period of 12 hours soaking, 1 hour of drying followed by 12 more hours of soaking and 1 hour drying, in a total of 24h soaking. We did this based on the assumption that the dry climate in Botswana would need for more time in soaking to moisturize properly.

After 2 or 3 days the maize starts to sprout. When the roots are visible and approximately ½ inch long, it's time to put then in the trays. The trays should be placed on top of each other with an angle. That angle will determine how fast the water will flow from one tray to the other. It happens because trays have holes drilled in their ends so that dripping can occur.

Fodder grown from Maize, 7 days after soaking and sprouting

BUSINESS


Rakops

Nosa Momela's hydroponic technology will be sold to the government of Botswana so they can support their agricultural extension officers in training the farmers who are facing challenges feeding their animals. Individual farmers will also benefit from paid trainings by Nosa Momela community trainers directly.

Future demonstration Nosa Momela farms will be established in several villages in Ghanzi and Rakops. Community trainers and extension officers will hold farmer trainings and work with local people to grow fodder. Nosa Momela farmers will sell their fodder to cattle farmers at an affordable price as compared to other feeds.

7-14 days from seeds to harvest fodder

Trays and vertical structure can grow a large amount of fodder in a small amount of space

1kg of seeds produces **10 kg** of fodder

1 L of water grows **1 kg** of fodder
Automatic irrigation system recycles water and saves time

To reach farmers across Botswana, we need to recruit talented graduates of agricultural programs and extension officers who are interested in drought-friendly farming and can spread Nosa Momela through trainings and technical support. Our community trainers will need support to set up demonstration farms in the villages where trainings take place. Initial costs to build a farm can be very little if an existing structure like a tuck shop is converted, or as much as P2,000 for building a stand-alone hydroponic system.

Seeds that are suitable for hydroponic farming and that animals like to eat, such as sorghum, lucene, and maize each cost around P. 200 per 50 kg sack. Expected yields are up to 10 times the weight of seeds, so therefore a farmer sprouting 5 kg of seeds and harvesting 50 kg of fodder each week can expect to earn P. 15 per kg or P. 750 back in revenue. The expected profit is P. 730 each week if the fodder is sold on the market.

LESSONS LEARNED

- In Botswana, farmers practice open grazing. Hydroponic farming is a new idea for many in Rakops, and so there will be challenges in educating people on its benefits. One farmer also mentioned the lack of free time as a barrier. There was limited knowledge in the communities about growing fodder, and few currently have the means to purchase it for their animals.
- Large-scale farmers in Botswana have herds of 2,000 or more cattle. The current scale of the Nosa Momela prototype is more suitable for small-holder farmers with fewer cattle.
- Main competitors: Commercial imported feeds in the market are readily available in Botswana at high prices. Open grazing is completely free. Most interviewed farmers are not willing to pay for supplementary feeds because of free range / open grazing.
- Recruiting people and designing trainings will take a lot of time initially. The target small-holder farmers may also be more accustomed to NGOs and government offering them new products and holding trainings for no charge.
- The development of a prototype that can grow fodder, the selling of the fodder, and the selling of the knowledge/training around hydroponics are three different design and business challenges to scale.
- Controlling the temperature, pH, liquid nutrients, water quality, humidity and light intensity without access to electricity or a highly-trained operator is a challenge for new farmers. We learned that it is absolutely important for the growth of seeds to control these variables in the environment.

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Boikago Co.

Chili briquettes for chasing away elephants

THE OPPORTUNITY

Our market research shows that there is great demand for chili bricks for repelling elephants because of the great loss of money people experience when they lose their harvest or water point. Our research also shows that there are two types of customers interested in buying chili bricks: farmers who have fields near elephant corridors and need chili bricks during the rainy season, and cattle ranchers who dig wells along the Boteti River and need chili bricks during the dry season. Both have frequent visits from elephants who destroy fences, water points, homes, and crops. In Rakops village, for example, there is an increasing number of reports to the wildlife office of elephants destroying property and harvests, and now many people are not compensated for these losses. Therefore, there is great year-round demand for a product that can repel elephants and save farms and water points.

TECHNOLOGY AND DESIGN PROCESS

The Warthog, the namesake for our product, is the traditional enemy of the African elephant. Our briquettes are made from powdered elephant dung, crushed chili, and a small amount of soft porridge. To use, simply burn it on the ground or in a perforated tin can for use during the rainy season.

The technology is a press for making chili bricks from elephant dung, chili powder, and sorghum meal. Our design process was to select a mechanism that could produce enough force to compress the bricks so that they could burn for a long time. We did this by experimenting with the proper ratios of ingredients and making different shapes and sizes of bricks such as cubes, balls, and bricks. Then after the bricks are compressed they are dried in the sun and lit on fire with either a hot coal or a match and the time that they take to burn is recorded.

The best-performing chili bricks use a ratio of ingredients of 2 to 1 elephant dung to chili and a ratio of 20 to 1 of elephant dung to soft porridge. The overall recipe is 20:10:1 dung to chili to porridge. This contains the right amount of chili to produce strong smelling irritating chili smoke, and the right amount of fuel and moisture in the chili bricks for them to dry quickly and to burn for a long time. The recipe and press are also still being perfected so that the chili bricks can be able to dry in one day and burn for 8 hours. The farmer can place the chili brick in a metal mbaula or stove to protect it from going out while burning and to last longer.

Rakops

Our first prototype press was a hinged wooden box with a removable mold inside with 16 square compartments. We tested the box press and learned that it could not exert enough force to produce compact enough bricks, and that our customers wanted larger bricks so that they could burn longer.

Then for our second prototype we built a larger metal handle-operated lifting device to raise and lower a heavy concrete block. There is a removable mold inside with 6 larger brick-sized compartments. We also tested this design and found that the prototype was too expensive and mechanically inefficient to produce affordable and well-compressed chili bricks. Therefore, Arthur and Pihelo will continue developing the technology further in their home villages of Kaputura and Rakops.

BUSINESS

The business model is a family or farmer-owned small business selling chili bricks to other farmers in their village. Once the press design is perfected, then the press designs can also be shared or reproduced and sold to other entrepreneurs in other villages interested in making and selling their own chili bricks.

Raw ingredients for the chili bricks are very inexpensive and locally available. The elephant dung can be collected for free, chili powder can be from chilies that the farmer grows or be sourced from the Wildlife Department, and only a very small amount of sorghum meal is needed. Powdering the elephant dung and chilies and making the mixture for the chili bricks is very labor-intensive and slow, but our business will be very profitable and worthwhile for the entrepreneur. This is because customers are willing to pay between P15.00 and P20.00 for each chili brick, and many will require multiple bricks for their farm to burn each night. Therefore, with daily production of chili bricks, the entrepreneur can expect a profit greater than P1,000 each week.

Suppliers & Supply Chains: The business can be profitable as all the materials to make the press and the brick can be sourced from Rakops suppliers. Elephant dung can be collected wherever there are elephants. The chili can be grown on the farmer's land or possibly sourced from government or NGOs.

LESSONS LEARNED

When we interviewed farmers and ranchers at Rakops we realized that our project has high profit potential and that the base technology, the chili brick, is already well-understood and found to actually work by most people who have tried it. There is also high demand but no current supplier of chili powder or chili bricks. Two members of our team, Pihelo and Arthur will continue develop the project and build a business out of it.

One note is that all recipe testing for the chili bricks was conducted with small-scale 5 by 5 cm chili bricks made with a hammer charcoal press familiar to the team from CCB training. So, the recipe that was developed was effective for small, highly-compressed bricks and is a dry mixture. For larger bricks it is possible that more soft porridge will be needed to give enough moisture to the mixture. But the producer should be careful to avoid adding too much porridge and water because the larger bricks will take too long to dry. Also, there were no whole chilies used in our testing, just store-bought chili powder from Ghanzi which will be too expensive for most producers.

TEAM & CONTACT INFORMATION

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Elephant Eco Paper

Sustainable paper made from elephant dung

THE OPPORTUNITY

The harmonic relationship between elephants and community is threatened as there have been cases of attacks on farmer's crops, houses and even deaths so sometimes elephants are seen as enemies. With the elephant dung paper we can improve their relationship, reduce poverty and improve their livelihoods through extra income and reduce the deforestation from paper industry.

TECHNOLOGY AND DESIGN PROCESS

The manufacturing process involves easily available materials that can be found in most shops in Botswana. Elephant dung is also easily recognizable and abundant.

1. **Collect the dung and seeds, tree barks in the surrounding areas of the village.** Materials: sack, plastic bag, gloves (or shovel) and axe. How: using shovel or hand with gloves and putting the elephant dung into sacks. The red seeds from Tsaudi trees can provide natural orange color (pick with the hands and put into plastic bags). The bark from Nllgou tree can provide red color and you cut with an axe.
2. **Preparation/Separation.** Materials: colander, 2xbuckets (one for the poop and one for the fiber). How: use a colander to separate the fiber from the dung.
3. **Grinding.** Materials: scissors, pestle & mortar. How: we use scissors and pestle & mortar so that all the fiber is smaller. Approximate size: smaller than 1 cm.
4. **Cooking.** Materials: pot, fire, salt and water. How: place the fiber inside the pot with water and salt and cook the fibers for 4 hours to kill all germs and bacteria.
5. **Mixing, coloring, pulping.** Materials: waste paper or newspaper (depending of the color you want). How: make a smoothie putting cooked fibers only + waste paper + natural coloring (boiled seeds and barks grinded).
6. **Screening.** Materials: frame, PVC rolling pin, drying cloth or towel. How: place the ball of pulp into the center of a large tray with a mesh layer (frame). Use the rolling pin to squeeze the water excess.
7. **Drying.** Materials: drying rack. How: put the paper drying on top of a drying rack in the sun during one or more days depending on the weather

Kaputura

Startup Costs		
Material	**Cost**	
Scissors	BWP	15.00
Bucket	BWP	50.00
Pestle & Mortar	BWP	150.00
Pot	BWP	300.00
Salt	BWP	5.00
Rolling Pin	BWP	20.00
Frame	BWP	100.00
Towel	BWP	50.00
Drying Rack	BWP	50.00
Colander	BWP	30.00
Total	**BWP**	**770.00**

Production Costs		
Material	**Cost**	
Labor	BWP	120.00
Number of Days		25
Total	**BWP**	**3,000.00**

Revenue		
Material	**Cost**	
Price 1xpaper	BWP	20.00
Number of Days		25
Number of Paper/Day		19
Total	**BWP**	**9,500.00**

Profit		
Material	**Cost**	
Revenue	BWP	9,500.00
Production Costs		3,000
Total	**BWP**	**6,500.00**

OUR PRODUCT

We transform elephant dung into artesanal sustainable paper, photo frames, notice boards, art portraits, gift cards and other products without the use of any harsh chemicals.After the paper is produced we aggregate value giving shape for different varieties of art products and travel souvenirs that are attractive by tourists.

Business: Customers, Costs, Revenues Streams and Supply Chains

Our products have more aggregated value and are more expensive than regular white paper. Because of that, they have a good fit for tourists, as there is a higher motivation to bring souvenirs/arts from Botswana to their home countries. Therefore, we will sell our products to Lodges, Hotels, Restaurants, Gift Shops and Safari Groups in touristic areas of Botswana (higher concentration of tourists).Our final product price will depend on the amount of paper used and type of art ranging from P10 to P500 e.g. a gift card can cost P10 while a unique crafted art frame can cost between P300-P500. Our estimated monthly profit is around P6500.

Suppliers & Supply Chain

Most of our raw materials are bought from local hardware and retail shops in Botswana at large. To make this business a success we need to maximize on the marketing and sales part of the business and this includes timely production and distribution of the products. Our main intended supply chain is through the use of public transport to distribute products from Kaputura village to our customers in all over Botswana, but as the business grows our supply chain will include local and international couriers e.g. sprint couriers and DHL Botswana. As mentioned above our revenue will comes from lodges, restaurants, art shops and safaris that bought our paper and through that revenue we will use some to courier or transport our products, which the cost is estimated to be P300 per trip (from Kaputura to Gaborone) and other locations or areas of distribution might be lower than that as Gaborone is the furthest

LESSONS LEARNED

We have a lot of things we would have loved to explore and improve in our project which includes;

•Paper Colour and flexibility
•Try to add starch or sugar as a natural binder.
•Vanish the frame to make it last long.
•Improve on the smoothness of the paper.

As challenges, separating fiber from the poop grinding is quite a difficult task to do. During the separation and grinding process, dung dust comes out which irritates when inhaled.

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Maata: feel the power!

Roasting machine

THE OPPORTUNITY

Villages grow food like peanuts and maize, which can be turned into snacks for greater value. The snacks can be sold at local markets and tuck shops. There is a need for technology to roast food in larger quantities than traditional methods.

We offer roasting services to community members. We roast, flavor, package and sell snacks to our own customers.

OUR TECHNOLOGY

Our metal rotating-drum roaster can roast large quantities in less time than traditional methods.
Some of the key features are:

- ✓ Easy and comfortable to use
- ✓ Large roasting volume
- ✓ Safe

2.5Kg of peanuts can be roasted in about 40 minutes. Smaller quantities take less time. We have not tested larger quantities yet, but we believe the roaster can roast 5 kg or more at one time.
The roaster is made from welded sheet metal and tubing. The door uses hinges (3) and a lock. The lock we purchased broke after 10 roasting cycles, and we believe a handmade lock would be better.

INSTRUCTIONS FOR MAKING POPCORN

1. Build a fire on the fire pan below the roaster and wait until hot coals.
2. Add popcorn and oil (approximately 90% popcorn and 10% oil).
3. Lock door.
4. Rotate in full circle or half circle for a few minutes (10 minutes).
5. Listen for popping, and when the popping slows down, it is done.
6. When popcorn is done remove fire tray with a spade and place on ground.
7. Put the pan on the brackets, rotate the drum so the door is facing down and open the door to remove the popcorn.

INSTRUCTIONS FOR MAKING PEANUTS

1. Build a fire on the fire pan below the roaster and wait until hot coals.
2. Open roaster door and add the ingredients to the roaster.
3. Lock door.
4. Rotate in full circle or half circle for many minutes (10-20)
5. Check for complete roasting every few minutes.
6. Maintain a good fire.
7. When peanuts are fully roasted, remove fire tray with a spade and place on ground.
8. Put the pan on the brackets, rotate the drum so the door is facing down and open the door to remove the peanuts.

BUSINESS

We plan to sell packaged snacks at the Kaputura Innovation Center, and at tuck shops and markets in the local area. We will offer delivery service of the snacks via taxi, when we receive orders from the phone.

At BAMB, we purchased 2.5Kg peanuts for P51. 10Kg of peanuts cost P104, we assume salt, bags, spices will cost less than P20 per 10Kg of peanuts. We assume firewood will be collected for free. 10Kg of roasted, flavored peanuts will be packaged into bags of 100g, and sold for P10 per bag, resulting revenue of P1000 per 10Kg.

We have not considered the cost of delivery or the wages of the roaster (person) or the seller.

Profit per 10Kg of peanuts : P876

Popcorn: At Choppies, we purchased 1Kg popcorn for P24. 1 Kg of popcorn results into 60 bags of popped popcorn. Each bag can be sold for P1. Assuming bags and salt/spices cost an additional P10, the profit would be:

Profit per 1Kg of popcorn: P26

Peanuts have a higher profit margin, but popcorn costs less overall, so may be a better product to start the business. We believe that customers like snacks flavored with different spices/flavors (like Exotic Thai, Barbeque, and raisins), and could increase prices, costs and profits.

Supplier and Supply Chains

All supplies can be purchased at a local supermarket like Choppies, but to reduce costs, the peanuts and popcorn could be purchased at BAMB or from local farmers, and the other supplies could be purchased at a larger city or ordered from a wholesaler as the business grows.

LESSONS LEARNED

We have tried two recipes for roasting peanuts: mixing peanuts, small amount of water and salt, and soak for a few minutes, and also using rice with the peanuts (80% peanuts, 20% rice).

The rice helps to keep the peanuts from burning. It is really important to keep the fire at a good temperature and check the peanuts frequently when they are near roaster.

We taste tested peanuts with Salt, Exotic Thai Spices, and Barbecue Seasoning with over 60 people. The results were basically a tie between all 3, but many people enjoyed the new flavors.

TEAM & CONTACT INFORMATION

Ketletseeng Sedumago (D'kar), Letang Sefako (Kaputura), Kari Santos (USA), Rebecca Joseph (Kaputura), Kealeboga Mochoviri (Kaputura) and Venduwa Mokoya (Kaputura).

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The Kali-Kart

Deep-sand wheelbarrow

D'kar

THE OPPORTUNITY

The current make of the wheel barrow is limited in its functions, therefore there is a gap in the market for a more multi-functional form of transport for domestic purposes. People in rural areas use either a wheelbarrow or a donkey cart to perform daily domestic chores for instance fetching firewood, water etc. However, donkey-carts are expensive, and the wheel barrow has limited functions and is not really ergonomic as it requires the user to bend a lot to push or pull it.

Kali-Kart offers a more multifunctional user-friendly and cheap alternative to the community, as it will be rented out providing community members with ease to perform, otherwise heavy tasks such as transporting water or firewood.

THE PRODUCT

The Kali-Kart is available as a complete custom made product for sale and rent depending on the model, functions and size. It is expected that local communities require mostly a renting scheme as upfront investments to acquire a Kali-Kart are probably too high.
We aim to focus on people living in rural communities and target mainly elder men and women as well as local builders and the general public by highlighting the time consuming aspect and the high capacity as well as ergonomic advantages which reduce body pain.

TECHNOLOGY AND DESIGN

A Kali-Kart is a 3 wheel cart which can be pushed by one or two persons. It uses bicycle wheels to generate a floating effect on the sand. Steering the Kali-Kart is conducted from the back by connecting the flexible front wheel over a long shaft with a steering in the back. It is mostly made of metal, angle iron, round bar and square tube. The Kali-Kart can load up to 100 liters of Water (it suits 5 20 liter buckets).

BUSINESS MODEL

Business

Selling price is assumed to be 3000 Pula, giving us an estimated profit of 750 Pula per Sold Kali-Kart. Nevertheless, it is expected that other costs such as maintenance and local bargaining occur which will reduce the profit of the sales. The calculation is based upon the manufacturing costs of the Kali-Kart. However, due to the high upfront investment it is expected that a rental service will be more accepted by our target customers.

It is expected to rent the Kali-Kart to the public at a rate of 50 Pula for the first 5 hours and after that for 10 Pula for every extra hour. The estimations for the rental fee are based on a water delivery service in Kuke, a nearby village, where people charge 5 Pula per 20 liters transported.

Suppliers & Supply Chains

Most of our material to design the Kali-Kart is sourced from Jamal Trading Company in Ghanzi and also from local hardware stores. However, Jamal trading has more diverse materials as it has a service where customers can opt to have a deposit account to purchase cheaper materials as they give discount to its customers who opened an account with them. They further agreed to keep our product in their store but they will get a commission of 30% of the profit per sold Kali-Kart which appears to be unreasonable. However, this statement was provided without providing Jamal Trading Company with more detailed information on the Kali-Kart as it was inquired early in the design process. They also transport material for free within 30 km of range. Most of the money goes to the material. Some parts like bicycle tires and rims we will source it from Gabarone Bicycle Garage.

Manufacturing Costs

Material costs	P. 1650
Transportation costs	P. 100
Labor costs	P. 500
Total	P. 2250

LESSONS LEARNED

On the business side of the project more work is needed. Such as the distribution of the product, the storage and the marketing side.

Currently the prototype is meant to be multi-purpose. However, it might be that there are preferences for firewood and water carrying which allows specialization on the product side.

For a bigger front tire the steering shafts need to be adjusted to prohibit the front wheel from touching the steering shafts. A wider front wheel is expected to be beneficial as it generates more surface.

We made a four wheeled prototype first, which can be pushed or pulled but it did not have the steering mechanism which was integrated later.

Puncture proof tires are beneficial due to the difficult terrain.

Future teams might need to reconsider the solutions and reduce material costs significantly as the product seems to be too expensive and money is rarely available in the community which is why they tend to barter. However, renting seems to be promising.

The Team

Jan Tshabu from D'kar, Katarina John from Kaputura, Alphynho van de Cg'ase from D'kar

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Abaa Dtcobe

Paper bags

D'kar

We make paper gift bags that vary in size, shape and purpose.

THE OPPORTUNITY

There is a rampant disposal of polythene bags in the country which has led to the government taking initiative to ban plastic bags as of November 1st. The plastic bags are a problem because they affect livestock in rural areas and cause litter in urban areas. This decision by the government has led to a gap in the packaging industry. The current method of packaging gifts still involves to some extent plastic material which we are trying as a company to deviate from.

TECHNOLOGY AND DESIGN

We make paper bags out of new and recycled paper. We also use cardboard parts to strengthen the base or bottom of the bag. The process of making the bag is an easy one as it involves only six folds and can be done in less than ten minutes. To make handles we use sisal twine, rope and also mother in law's tongue which is a local tree fiber that can be used as rope.

THE BUSSINESS

We are selling to book stores, women entrepreneurs, supermarkets and corporate clients, as well as individuals. Our bags are priced from as little as BWP 8.50 with BWP 184 as our daily profit.

The raw materials needed to make the project a success are paper, wood glue, string, cardboard and rivets. The suppliers for the aforementioned material have been identified in Ghanzi and they can sell in bulk at discounted prices with a warranty for refund of faulty goods. The innovation centre in D'kar will be our manufacturing factory, also the one in Dutlwe. Transport and other amenities will be paid for through the business account and according to our estimates will not cost much. The supply chain map is as follows:

Supplier--→ Abaa Dtcobe--→ Sales Personnel-→ Target Market-→ Individuals

LESSONS LEARNED

We didn't explore other styles or designs of bags that could be carried out. We did not do any product testing and with time we would have loved to make good carrying bags not just gift bags.

TEAM AND CONTACT

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OUR JOURNEY TOWARDS THE SUSTAINABLE DEVELOPMENT OF BOTSWANA, AFRICA AND THE WORLD…

Mmadinotshi, Abba Ji Mustafa and I, had a dream and so we shared it with others.

Debbie aka Mabudula hopped onto our train of thought and the IDDS Steering committee gave us their blessings.

Through all this I was with Bado, Dricky Drix, Nico, Manzana, Setsy Sets and Mary Mary.

We sold our dream to Sakhile, who for zero briquettes bought it and stepped to the plate and doubled its worth by spreading our wild fire via Maranyane at BIUST.

Dr Ravi and I met in Thailand and while there we bought some bamboo to set up our structure and plan of action.

The ever amazing Liz Hunt hacked into our dream and reached out to give our passengers a super experience. Along came the Chief MacGyver Tajmahal Corrales who mechanically engineered a German machine called Linus Braun. Through this machine we started on-boarding people……

At our 1st stop we met Mmaborotho aka Magwinya Lighty from Utah, then Mr Lee from Mmadikola who walked in with Mudamos Thiago and the life of the party Collen Tshebo then joined in.

As our train kept going, we came across a sensational poet called Lao Siana who was with the highly driven Anna Libey.

As we journeyed on, Uncle Francis called us from Ghana to remind us to give his carpenter sister Seiphuro a ride in Sekandoko.

All of a sudden our system was hacked from Colorado by a micro-bit lover named Kari and Wanjiru Lisa from the Volunteers for Kenya stepped in to help us with the ever so brave Hulk Hogen. Ssemphira Joseph then told us about another bold African woman called Amuna Vivian from South Sudan who could help us.

We reached out to her and she referred us to the gifted hands of Hadijah, who then called her friend Epi across the border in Tanzania, who reached out to the SADC network for Charles Ganeb in Namibia.

At our last stop we met a cool guy named Luiz from Brazil.

We then headed back home the next day listening to Noqhoma Dance by Alphyno.

We picked up Uncle Benji, Jan super-duper Tshabu, Ausi Ketty, Mma Nchindo, Shalani, Letang, Katarina, Vuvuzela, Mr V, Hutas, Tshepi and Godfrey in Dkar, Rakops, Kaputura and Dutlwe respectively…

We all joined hands, appreciated each other, solved problems together, hoped together and announced to the world our strong commitment to ***"Improving rural community livelihoods in Botswana"***

By Blak Mashaba

IDDS
Botswana 2018

PULA!!

THESE·HANDS D-Lab BIUST MOTE IDDS Botswana INNOVATION HUB IDIN International Development Innovation Network