

IDIN Summer Research Fellowship Final Report



*Local Innovation in Ghana
September 10, 2015
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PART 1: Summary of Research Conducted

Research Focus and Objectives:

We were looking for local innovators all across Ghana, of various sectors, as preliminary research for the International Development Innovation Network in order to learn the current state of the innovation space. We were interested in how the background of the individual innovators related to the innovation being done, and their decision to conduct innovative work. Our interviews gathered a variety of background and demographic data, and we plan to perform additional analysis of the data collected in the interviews to determine any relationship between backgrounds of innovators.

Research Activities:

We focused on innovators located in Accra, Kumasi, and Tamale, with some people located in the outskirts of the cities in more rural settings. Our research consisted primarily of semi-structured interviews with people we had identified as local innovators. We were able to identify these people through word of mouth. We asked people both before we arrived and in country to introduce us to innovators, which we defined as people who have come up with a creative solution to a local problem. Our interview protocol was informed by the IDIN's Interview Protocol for local innovators with some exceptions and additions. These interviews will be used to construct innovator bios and will also be used to inform any greater qualitative analysis we do of the innovation space in Ghana.

Although the interviews all have different focal points due to the different nature of each innovator, there were main points we targeted with each person to give us the foundation to perform qualitative analysis at a later time. However, we are most interested in the story of each innovator and how they choose to tell it, so many of the interviews were fluid conversations as we listened to background stories and founding journeys.

The main areas we focused on with each innovator included:

- What is the innovation? How has it developed?
- Where did this idea come from? Who/What has helped you along the way?
- What is your background? Where are you from? What do your parents do? What is the level of education you have?
- What is your impression of innovation in Ghana?

Research Findings:

One of our main findings is that while Ghanaians are naturally entrepreneurial, there is often a disconnect between entrepreneurship and innovative entrepreneurship. We define "innovative entrepreneurship" loosely as starting a business that is significantly different or particularly creative as compared to other businesses in the same sector. We do not have a defined system for quantifying this yet, but will work on our research analysis to develop some sort of metric; here the findings are very general. This finding was most directly supported by our interviews with manufacturers in Suame Magazine, who all seem to be engaged in identical businesses competing directly for customers. This "copy-paste" mindset was also found elsewhere in Ghana and in other industries. Often with manufacturing jobs, entrepreneurs will train apprentices because they need skilled employees, but then the apprentices leave and start their own identical business, taking customers away from the original technician. Neither apprentices nor masters seem particularly concerned with innovating to keep market share. This also begs more research into intellectual property rights and practices across the country, because lack of protection undoubtedly affects the sharing of ideas within innovation.

In terms of motivation for entrepreneurship, our interviews showed that Ghanians frequently start businesses out of necessity. There are not enough jobs to go around, even for college graduates and especially for those with less education. Therefore, people view entrepreneurship as a crucial way of creating employment for themselves and others, which presumably would encourage innovation and expansion in the long run.

As we conducted interviews in very different geographic regions, we noticed differences in entrepreneurial mindsets within each city. Innovators in Accra tended to focus their business endeavors on Accra and even at international customer bases, and when they started social enterprises, these were also mainly targeted at Accra. In Kumasi, due in part to Suame Magazine, there is a strong informal sector; KNUST seems to also be producing many creative students who are trying to solve problems throughout Ghana. In Tamale, a city often seen as the gateway to the Northern regions, there is a strong focus on development. The city is mostly made up of NGOs, and this has created a strong interest in social entrepreneurship, to the point where other innovative endeavors are almost discouraged. The rural areas we visited contained mostly agricultural innovation, because outside of cities there are not really markets for anything else.

We also noted the main challenges facing entrepreneurs and innovators with whom we spoke. Many of the challenges stem from infrastructure difficulties inherent to Ghana as a developing country – such as lack of power (the country has had an energy crisis for almost three years), lack of access to affordable and reasonable financing, lack of internet connectivity, and a lack of support from government for entrepreneurship.

In terms of challenges specific to innovative entrepreneurship, the main one we noted was lack of capital. This affects all businesses, but particularly those involved in manufacturing. Here it translates into entrepreneurs being unable to build anything before an order (and pre-payment) from a customer. Without the ability to purchase raw materials or pay for labor ahead of time, innovation is stifled, because the business depends on solely on filling specific customer orders – meaning there is no incentive or ability to innovate.

Next Steps:

This research was broad and preliminary, so there are many avenues for future inquiry. Specifically, a research project with a defined focus on rural innovation would be useful. Rural areas are more logistically challenging to visit, and have a lower population density (and therefore density of innovators). We had a very limited time in country, so it made more sense for us to spend our time in cities where we could interview more people in a shorter period of time. Another future project would be to focus on female entrepreneurs; we were only able to locate a handful of them out of all of our interviews, and we are unclear as to why they were suggested less often for us to talk to (perhaps there are fewer female entrepreneurs? Or perhaps they are less innovative?). Future research would also benefit from a longer period of time in country. This would allow more time to locate innovators for interviews, and potentially the ability to conduct follow-up interviews with innovators, which would help tell their stories in a more complete and accurate manner.

PART 2: Findings Related to Local Innovation

Understanding Local Innovation:

Our project focused on the background of the innovator him or herself, instead of focusing on the innovation sectors. This allowed us to meet with a broad range of people working across many sectors. This type of survey is helpful for constructing innovation maps and identifying areas of future innovation research. Our research findings as a whole are directly related to understanding local innovation, and we have outlined them in the section above.

Local Innovation Processes and Local Innovators:

Our main research findings related to local innovation are presented in the attached appendix, titled Innovator Profiles. This consists of detailed profiles of each of the local innovators we spoke to, and includes details as to why their business was innovative (or was not, in some cases). The profiles also include information about helpful institutions or organizations (enabling stakeholders) as was discussed during the interviews.

Enabling Ecosystem and Stakeholders:

The innovator profiles attached also include information about helpful institutions or organizations (enabling stakeholders) as was discussed during the interviews. However, some institutions we visited were particularly involved in encouraging local innovation, so we have listed them here:

- Meltwater Entrepreneurial School of Technology (MEST) and the MEST Incubator: an educational program for entrepreneurs, and a start-up incubator program for technology-based companies (located in Accra)
- Impact Hub: Accra: A co-working space and maker space for start-up companies in any sector (located in Accra)
- iSpace: A co-working space for start-up companies (located in Accra)
- Creativity Group at KNUST: entrepreneurship development for students at KNUST, and a maker space to turn student projects into fully developed businesses (located in Kumasi)
- ITTU and TCC: technology and machine assistance for manufacturers, and provides some business courses for entrepreneurs and small-business owners (located in Kumasi)
- AfriLead: A co-working space and business plan development center for start-up companies in any sector (located in Tamale)
- HopIn Academy: Educational courses, internet and computer resources, and a co-working space for entrepreneurs (located in Tamale)

Other data related to local innovation:

We have a contact list of innovators who we may or may not have spoken with on the trip, which we have attached.

PART 3: Lessons Learned and Recommendations

Challenges Encountered:

- Visiting rural areas is hard logistically to coordinate lodging, especially in a short period of time.
- Insufficient understanding of Ghanaian culture at the start which led to changing questions as we gained knowledge on the trip.
- It would be beneficial to do followup interviews with the local innovators, but isn't feasible with our timeline in country. We were not selective with the innovators we were looking at because we wanted to maximize our limited time in each city, so we were not pre-selective. Our focus was on quantity of innovators instead of in depth interviews, which helps with initial mapping.

Recommendations for Future Work

After meeting with Asante, and seeing the database of 500 entrepreneurs from Suame Magazine, and then meeting with several there ourselves, we realized that the definition of innovation for our project was different from that of IDIN. Many of the entrepreneurs in Suame Magazine are makers,

but not innovating on the skills they were taught as apprentices, or problem-solving. We would recommend IDIN to look more at the definition of innovation they wish to use throughout their research, for it deviates from the definition we have developed for our research project.

IDIN should consider looking at the definition of innovation and decide what avenues are important to them. Are they looking for a D-Lab type innovator? Or could it be someone more high tech who is still building an app that helps a Ghanaian social problem? Where does technology fit in the definition of innovation? What is the different between makers and innovators? Small business owners versus makers versus innovators? Our focus was on innovators as people solving problems creatively, but this isn't restricted to the more "grassroots" innovators.

There is a lot of western influence which effects the definition of "local" innovation. Do they have to be completely Ghanaian educated? Additionally, are you a local innovator if your process is influenced by an NGO or a Peace Corps Volunteer?

It might be more helpful for someone to look by sector at local innovation, because it might be easier to find people. It would be beneficial to be selective with the innovators you choose to talk to, and conduct followup interviews as time allows.

Appendix: Local Innovator Profiles

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The following innovator profiles are constructed from interviews done in Ghana during September 2015 as IDIN Summer Research Fellows. The interviews were conducted in Accra, Kumasi, Ejura, and Tamale.

Local Innovators in Accra

Asoriba team: Saviour, Jesse, and Patrick (at MEST)

Saviour: Aged 26; Chief Product Officer for Asoriba. His father was a pastor, and was not very supportive of entrepreneurship. Saviour used to take things apart and rebuild them -- he wanted to be a mechanical engineer but studied computer science at the urging of his father. His parents are supportive now. He started coding while at KNUST. He had side projects at MEST: he out-sourced some coding that he was being contracted to do. In secondary school and university, he used to re-sell things to friends and fellow students as side projects. He has interned three times where he worked for another company 9-5; he found his salary wasn't sufficient and he wanted to work for himself.

Jesse: Aged 25, mobile developer for Asoriba. He wanted to learn to code since the first time he saw a computer. His parents were always supportive -- he actually didn't want to take the interview for MEST because it was scheduled at 11:30 PM, but his dad forced him to do it and facilitated the logistics (reserved a hotel room for him). His uncle was an entrepreneur, while his dad's side was academic. His family has the "entrepreneurial spirit:" his younger brother started selling games; Jesse has sold things, like ice cream, since year 2, and his dad has a sword-making side business. Jesse has done internships and hated them because he doesn't like working 9-5: he actually wants to work harder, and that's why he likes working at a start-up. He likes working on something "that is yours." He was introduced to computers at school.

Patrick: Aged 25, Chief Technology Officer for Asoriba. Patrick grew up in Kumasi and went to KNUST where he studied mathematics. He learned coding on the side, starting in his second year at university. His dad started his own pharmacy, and wanted Patrick to come work for him after school. Patrick didn't want to, and started his own printing press. The first day he only made 0.20, but then he started making more revenue and expanded to more machines and equipment. This proved to his dad that he could do it, and now he doesn't want to work for anyone. He has never worked for anyone (he started his printing press right after university). He came to MEST later, after working for a consultancy unit.

Flippy Campus (at MEST)

Bright: Aged 25, software developer for Flippy Campus, which is a digital message board for college students. Grew up in the Volta region, and went to school there, until university where he studied aerospace at KNUST, and learned coding on the side after his friend introduced him to it. He has worked as an intern during his schooling, but he didn't like getting to work at 8am. He also had a lot of side projects, like building apps for people, an election platform, and other small companies. His dad was a teacher, and there are no entrepreneurs in his family. His family was generally not supportive of him becoming an entrepreneur because they wanted him to make money right out of college, but now because Flippy is generating some revenue, and he can help support his family so they are more accepting. Without MEST, he wouldn't be able to dedicate all his time to this project. In fact, he also has developed skills like public speaking, confidence at pitching, business plan writing, and others which have made his start up much more successful. He would not have been an entrepreneur without MEST - instead he would have gone into a mechanical engineering field, maybe with automation, or something closer to aerospace engineering to get a good job.

Tsonam: Age 31, CEO and cofounder of TechCOM Visions, which is a branding and website development company, and has a developing branch called eduboot which is giving schools in Accra access to technology. Tsonam grew up in Keta, a town on the coast in the Volta region. Both of his parents were teachers, and he moved to a worse school district when he was 8, where his mom was teaching. During basic school, he worked on his mathematics and writing with his mom at home in addition to in school, and was the only kid from his basic school to move onto Junior Secondary School. From JSS, he was the only student to move to university, and studied economics, where he joined the Achievers Foundation and met his future cofounder. The Achievers Foundation offered him many opportunities, and educated him on great businessmen in the western world, which is what he modeled his business after. After the vision competition at university, he got funding to do a my vision project, where there were TV segments showing local innovation. After this TV show ended, he decided he wanted to be an entrepreneur as well, and started a business creating websites for his clients, the first big one of which was Kwami Nfumah, which gave him an opening to a successful business. He interestingly created a software development business with no software development background, which was groundbreaking at the time. Many businesses in Ghana are not set up for longevity or life after the owner leaves, they are based on the owner's skills and talents. Tsonam changed that with a business model of delegation and structure, closer to that of his western role models. Tsonam also loves to read about successful men, and has learned a lot over his lifetime of reading and researching his role models. He also finds inspiration and motivation from his mother, who taught him to love to learn.

He wishes that Ghana was providing better opportunities for entrepreneurs. The financing is impossible to get and interest loans are too high. There is not enough access to internet, and power outages are killing productivity. He is a member of the Ghana Chamber of Commerce, where he is using his credibility to drive change. He doesn't believe in startup

accelerators; he believes that if the government and financing abilities were there, more people would want to start their own businesses.

Tsonam has created EduBoost in order to increase technology in schools. Right now, he has set up programs in 4 schools in Accra, where students pay a small fee, but students and teachers are learning to integrate technology into their daily lives. The program reaches 2000 students currently, and Tsonam is looking to expand. He is passionate about this project to increase the skills students have leaving basic levels of schooling, especially in a technology age.

Samlara: CEO and Founder of Loo Works (prototyping stage). Studied at University of Maryland, MBA at Georgia Tech. She is currently consulting for Biofil Com in addition to working on Loo Works, which will be a solution for public restrooms in Ghana. She was inspired to start this project when she was running every morning around her neighborhood here, and seeing people defecate and urinate out in the open because it was their only option. There are KVIPs or the Kumasi Ventilated Improved Pits, which are a pay per use solution, but tend to be very unclean and people are only willing to pay once a day. People strip down to go into the KVIPs in order to avoid getting feces on their clothing. Instead, Samlara wants to have advanced, sanitary solutions which are owned by someone in the bottom of the pyramid, who is trusted in the community, and will take over as full time operated of the toilet. Samlara was very interested in this project because her family is full of doctors in Ghana, and they have seen diseases from the lack of sanitation, and she believes that it takes a village to solve this problem, and her solution will bring people up in the community and offer someone a great job to provide clean sanitation in a village.

Kwaku: Age 60, Managing director of BioFil Com. Kwaku was educated at a Cape Coast secondary school, and he went to KNUST (then UST), and worked in a machine shop on his holidays. His dad worked for a long time, as hard as anyone possibly could, as a deputy governor of the central bank, and he was suddenly fired. From then on, his family believed that working for yourself was a great decision, and his siblings were all entrepreneurs in different fields. Kwaku was a child who took apart all his siblings' dolls, wanted to see how they worked, and would put them back together. After college, he took a job working for a construction company, and when in the junkyard, seeing machines that were all beat up, he could visualize how to restore them and make them purposeful. Eventually, he quit and worked full time on restoring machines. His first machine was a hydraulic compressor for septic tank problems. It was a huge hit - he was able to build a large tower with layers of porous concrete, and pumping the water through this tower solved the septic tank problems, and when the tower was taken apart in 5 years, there was no effluent. This showed Kwaku the validity of an aerobic composition of waste, which is the foundation of BioFil Com. Working with an American, he was able to prove the validity of a biodigester as a solution to Ghana's waste problem. BioFil Com has now attaches biodigesting toilets in middle class Ghanaian homes. His bathrooms also use only Ghanaian materials. Kwaku won a Gates Foundation Grant, and now has a mission to put a toilet in every home in Ghana under whatever capacity that person can afford. His toilets now have biodigesters, options of mini flushes to save water, and then he uses the water to create well nourished gardens. His tinkering with machines has created a very successful and environmentally

friendly solution to human waste. Kwaku unfortunately doesn't have the business background to manage the company - he is truly an engineer at heart, and therefore has had people like Samlara come through as business consultants to help run the business side better.

Regina Agyare: Age 32, CEO of Soronko, which builds software for profit, and has a non-profit side called Tech Needs Girls where young girls are taught how to code at weekly classes. Regina came from a different household than most. Instead of teaching her to be "seen and not heard" like many parents do in Ghana, her parents let her speak her mind. Her mother was a trader and her father was an internet service provider, but they both started their own businesses. The first time she saw a computer was when she was 12, and she loved playing pac-man and wanted to create her own version of pac-man. In secondary school at Cape Coast, she studied science. After seeing the movie Rocket Man, she wanted to create her own version of a rocket so she could fly and travel. When she showed this to her physics teacher, he replied that girls aren't meant to do that, and it would be impossible for her. After that, she never took "no" for an answer. She went to university at Ashesi, and she was the first graduating class. She would have considered going to university in the United States, but didn't want to be part of the "brain drain" in Ghana. Her education was so different than the rest of Ghanaian schools. Instead of teaching memorization, Ashesi taught critical thinking, and placed a high regard on ethics. She studied computer science, and even after failing the first class, she worked hard and studied more and became one of the top coders in her class, even though she was only one of 3 girls. While working on group projects for coding, she said she worked hard to never be the one who took notes or made coffee for the group (as the only woman). After Ashesi, she went to work for a bank, where she felt like she was only working to make the CEO happy; she wasn't making change even though she ultimately wanted to make a difference. This led her to quit her job in a spur of the moment decision; even her manager thought she would be back after 6 months because nobody believed she was serious about entrepreneurship. She then started Soronko, and her first client was actually the bank for which she used to work. As business picked up, she hired some employees. Early on, she worked to equip her team with skills and resources to do things without depending on her, and she tried not to micromanage. She soon started a rural pilot program for STEM education; she quickly noticed that boys were dominating the workshops, and so decided to switch to only educating girls -- and founded Tech Needs Girls. After starting her business, she realized how useful the entrepreneurship class she took at Ashesi was; at the time she took the class, she never thought it would be useful because she did not intend to start her own business. This ended up being very useful, for she could look back on what she had learned then when she now was running a business, and needed to be able to write a business plan, and pitch well to investors.

Regina believes that personality and attitude are the important parts of what make an entrepreneur successful. When she was running a marathon, she noticed the amount of people who were telling her to stop because the winners had already finished and there was no point any longer. It never occurred to them that she was persevering and wanted to finish, and it didn't matter that she wasn't winning. However, too many Ghanaians were content with complacency which is why many of them do not want to start their own

business, especially because it is so challenging. Some people also look at starting a business as throwing away an opportunity for a steady job, and adding risk to the outcome of life. Regina believes that even if you fail, you can come back to the corporate jobs, but it is worth the risk for something that she truly cares about.

Ebenezer: Age 23, Founder and CEO of Addi Lights Africa. Ebenezer is from Takaradi, and has gained much of his technical training and interest in engineering from the FabLab, a fabrication lab donated to Takaradi by the National Science Foundation. Starting at the age of 13, Ebenezer started going to the FabLab after school, for it was closer to his school than his house, he had never seen a computer before, and he wasn't very talented at sports. Here, he built toy cars and motorbikes which could move forward and backward and steer themselves. Ebenezer went to school in Takaradi and just recently graduated from Takaradi Polytechnic Institute, where he studied mechanical engineering and he interned at the port, where he worked on cars, trucks, cranes, and boats. His interest in mechanical engineering came from the FabLab, but his true passion is lamps. From an early age, he had an obsession with light - its availability, and what life would be like without it. He also was obsessed with the intersection of aesthetics and lights, so he started creating beautiful lamps from the materials in the FabLab. At first, his lights were very basic, just alternating current and a bulb, but he has grown in complexity, adding direct current, a switch, clappers, dimmers, windmills and solar panels, phone chargers, and the ability to use a phone battery to power the light. Additionally, Ebenezer uses many different materials, including plastics, metals, woods and woodworking, ceramics, fabrics, and any locally available materials to make beautiful lamps for his friends and family. This business has been a side business for him in Takaradi out of the FabLab, and he originally sold only to his friends and family. He currently is running his business from his own home, where he lives with his grandmother and aunt, who are relatively unsupportive because of their lack of interest in lamps. They, however, are entrepreneurs - Ebenezer's grandmother started a maternity clinic, and his aunt works there now. Ebenezer now sells his lamps on his Facebook page, but has to do his national service for a year. Once he has completed his national service, he wants to go back to his lamp making business, expand throughout Ghana and hopefully Africa, employ more workers to increase capacity, and create a sustainable business. For business help, he goes to local seminars, including the Springboard Roadshow where they teach business skills and inspire entrepreneurs to keep at their hard work. He has also learned about business from travelers who have visited the FabLab, where he now works as an instructor teaching children to love engineering like he did through the FabLab. Even though over the years, interest has declined, the FabLab has launched Ebenezer's business and turned him into an incredible engineer.

Alloysius Attah: Age 26, co-founder and CEO of Farmerline, which is a business that disseminates helpful information to farmers via SMS and voice platforms. His father was a teacher, and therefore it was assumed he would complete school. When he was 5, he moved in with his aunt. He grew up with his aunt, who was a small-scale farmer and he watched her struggle with not being able to read the weather, and not knowing market prices, which limited her income and efficiency. He went to boarding secondary school; his family wasn't always able to afford tuition, so sometimes he could not get meals at school and had to eat leftovers from other students. When he went to KNUST, he used his student

loans to buy himself a laptop. He joined a website-making club even though he had never learned how to code; he showed up and was way behind the other students, but this motivated him more to learn quickly and he picked up HTML, CSS and PHP. He started a business making websites and doing PR for student groups, which turned into a quasi-modeling agency because people saw him taking pictures and he had learned about video and photo editing on a mission trip with KNUST. This business was a great learning opportunity for a career in entrepreneurship because Alloysius learned a lot about having the resources to make a successful business, which he did not yet have and therefore disappointed clients. He also met his cofounder, Emmanuel, at KNUST, and they shared a passion for helping farmers achieve higher incomes. Emmanuel and Alloysius both went to the world wide web foundation conference in Accra for three weeks, where the idea for Farmerline was born. Alloysius returned to KNUST for his national service, where he spent much of him working on Farmerline; building the platform for voice and SMS based dissemination of information. Alloysius and Emmanuel won a few grants and competitions to gain money and support. Once they were selected as semifinalists for Echoing Green, everything changed - they were connected to a much larger network, and gained international attention. Even though there were hard days, and many people urged them to get real jobs, they saw the opportunity for success and knew that if they failed, they needed to change. He initially didn't tell his family about Farmerline, until they had won a few awards. They were unsupportive at first, and didn't understand how it would make money, but now they are supportive.

Alloysius believes that there are major problems with entrepreneurship in Ghana - financing is impossible to come by, and the taxes are extremely high. However, he believes that one success story will show people how they can make a change, and encourage more people to become entrepreneurs.

Emmanuel: Age 31, CTO and Cofounder of Farmerline, where he works to lead the technical team in building platforms. Emmanuel grew up in the Ashanti region, 15km from Kumasi, where his father was an electrical engineer and his mother set up a clinic there - both of his parents were entrepreneurs. At his mother's clinic, many farmers couldn't afford the services, and many school kids would be sent home because their parents couldn't afford the school fees, and therefore wouldn't get educated. He went to school all the time, even during vacation, and he was fascinated by electronics. He went to one of the best schools in Ashanti region, where his goal was to become a pharmacist. However, he didn't have the grades, so he became a land surveyor, where he was using GIS, and was very interested in tech. He did his undergraduate and master's degrees at KNUST, where he met Alloysius, and their experiences seeing farmers struggle due to lack of connectedness inspired them both. His parents were skeptical of his entrepreneurial activities, including his business during his masters where he was building web applications. He started Farmerline after the World Wide Web conference, and his parents were supportive, even though they didn't really understand what Farmerline does.

Farmerline seems to always take customer feedback into account when they create new products. One of the ways they tried to get farmers to realize that they should invest in a service like Farmerline was to offer a free trial for a short period of time, and show people

the benefits so they would be willing to pay for a service they saw increase their own income. One of the problems for their tech business is the electricity situation in Ghana, for their servers would fail. Now, with connections at the Kofi Anon center in Accra, they host their servers there and have more reliable electricity.

Bernice: Age 35, Cofounder of Ghana Bamboo Bicycles, which solves environmental problems and is a mouthpiece for educating farmers about the multiple uses of bamboo and Cofounder of Bright Generation, which is an overarching NGO which focuses on sustainable rural development in whatever project seems impactful. Bernice grew up in Kumaru, and she moved in with her grandfather at age 7 in a farmer dominated rural region. Her grandfather worked for the forestry commission as a civil servant, where he built houses in the bush and had a poultry farm. After senior high school, she stayed home for 7 years, but then she decided she wanted to do something on her own and go back to school. She worked for the private sector and volunteered at local NGOs during that time training youths. She was inspired to start something on her own, so she called her friends to start Bright Generation. She went back to university at Christian Science College in Kumasi to study marketing, and she received a laptop as a donation. Her philosophy for Bright Generation was to teach someone how to fish rather than just giving someone fish. Bernice was a distributor of the donated Toms shoes to rural areas, where she was exposed to many local issues. She saw a small girl who was missing exams due to lack of sanitary pads, so she started a program to pair girls with mentors to send them supplies every month, and she looked into ways to locally produce cheaper sanitary pads. She realized one of the problems was that people weren't saving their money to buy necessities, so she linked up with financial institutions to educate people about savings. She also started a project to support microcredit for local women. Bernice always felt that she wanted to put a structure into place where people can support themselves when donations aren't flowing in. Her family was very supportive of her entrepreneurship because they were fed up with her borrowing money and she wanted a way to support her siblings as she was the oldest of 5, and her network of close friends were also very supportive and she can ask for advice or help. She believes that social entrepreneurs are the change-makers.

She thinks that space is important, and she thinks incubators can give space which would otherwise be expensive.

Johannes: age 31, CEO and founder of waste factor, which makes furniture out of collected plastic bottles. Johannes was born in Tima, but his father was transferred to a typical village along cape coast road when he was in 5th grade. He went to senior high school for 3 years, and he wanted to be an electrical engineer in college, but his test scores prohibited him, so he stayed home for 3 years. Then, he applied again, and was admitted for communication design. He lived off campus at KNUST and he didn't have his own furniture and furniture was too expensive. He tried to buy furniture but he noticed that it was all covered and the user couldn't even see the framework, so he decided to make it himself. Wood was expensive, so he decided to use sawdust, which was in abundance, but he needed expensive glue and termites were attracted to it. Instead, he tried to use newspapers, because his parents had a lot around the house, but that proved to be too heavy. Due to his father's work, where he worked on a program where schoolchildren

collected plastic waste, and he could sell it to support the children, Johannes always had waste around his house. A friend of him joked that he should use the plastic bottles, so he tied them together to make the framework for a couch, and quickly expanded to other furniture. He majored in packaging design at KNUST, and he started his business, the waste factor, as a non-profit, in his final year. Johannes believes that nothing is waste, instead everything is material in transit. Johannes was accepted to the young African leaders initiative, where he came to America, and worked in Philadelphia for the resource exchange, where he learned about recycling and waste management in the United States. Now, his business is expanding into making bags from the melted down plastic sachets. His business is looking to have a non profit and for profit sector. He has many ideas for waste management in Ghana, and is striving to educate people how to reuse waste, and dispose of it in a sustainable way.

Johannes has found it hard to get support from government officials - many of them are shocked and impressed by his products, but that hasn't translated into financial support.

Kwaku Fosu: Age 60, CEO and founder of Miracle Metal Works, which is a safe manufacturing business. Kwaku went to school for 10 years, through junior high school, but he was not performing academically, so he decided to learn a trade instead. His father was also a workman in Suame Magazine, so his father sent him to the master craftsman to learn about safes. For 8 years, he served as an apprentice, and then he told his master he could start his own business, but he stayed for an extra 2 years to show his appreciation. His father was very supportive of Kwaku starting his own business. His father, while was a small business owner, was a secondhand automotive parts dealer. Kwaku's first business was an Electric Welding Machine, but then he moved to safes. He was an apprentice for a master craftsmen for 10 years before starting his own business. He thinks his business is better than others because of the quality of materials he uses when manufacturing. His safes look better than others, and he uses thicker materials for doors to make them safer. He has 1 master in addition to him, and 2 apprentices, which means the business can continue without him. He uses ITTU as a training hub, where he has learned business skills. Some of the challenges he faces are the lack of electricity, which is due to the power outages in Ghana, and lack of capital to buy his own machines, so he often has to use ITTU's machines or turn to other craftsmen in Suame Magazine for help.

Montari Seidu: Age 45, Manager/Owner/Director of Montals Engineering, which manufactures gas ovens, stoves, and other gas appliances including a warmer and a grill. He started making charcoal stoves, and expanded to repairing imported gas stoves, which were too small for African pots. Then, he had the idea to open up the stoves so that they were suitable for African pots. He then moved to gas oven which were used for making bread, and opened them up to make them large enough for many loaves of bread, which was improvement upon the firewood ovens, and safer in terms of smoke pollution. His stoves are very attractive and durable. He only uses new material. Montari uses a trial period as a sales, where people can use the gas stove and see if they like it. Then, his customers want it as a result of the trial period. Montari always changes the design to make it better upon customer feedback, and reviews of the factory workers. They have incorporated a regulator as a result of feedback. They have rethought design criteria to

make it safer, while talking to the masters. Montari uses ITTU as a resource for literature as well as for machinery. ITTU also helps with business management, including bookkeeping. Now, Montari wants to expand and regulate manufacturing. He wants more machinery and a larger working facility. Montari's father made charcoal stoves in the magazine. After Montari moved to gas stoves, his father followed. Montari went to school for welding and fabrication at KTI, but didn't finish. However, he could build any machine after his schooling. Montals Engineering now hosts international and national students for hands-on engineering and business management. The fabrication methods including welding, bending, and cutting. When the power goes off, they switch to small manual machines to continue production. Now, Montari is innovating on the machines themselves to create the manual machines that they can use when the power goes out as a way of coping with the infrastructure challenges. Montari has 28 masters currently, and 8 apprentices. The masters are specialized in small parts of the stove. *Interestingly, if each master is specialized, they cannot leave and start a competitive business.* If Montari isn't there, the masters can run the business. Montari uses business techniques like advertising to grow the business. He is looking to get more space and automated machines for mass production. The challenges facing entrepreneurs in Ghana is that people can steal each other's designs, but Montari's designs are better quality and cheaper than others, so he avoids competition.

David Yaw Frimpong: 60 years old, mechanical technician for Frimpong Engineering, a company that specializes in making food processing machines. Frimpong went to local school for 14 years before starting an apprenticeship in mechanical fabrication. His parents are cocoa farmers in a village 50 km from Kumasi. His father brought him after middle school. His uncle has a mechanical business in Lyberia, and convinced his father that Frimpong should do the same. Frimpong did mechanical engineering at polytechnic. He then worked at the university (TCC) and taught for 2 years there. Then, he traveled to Nigeria to do mechanical work. In 1983, Ghanaians were deported from Nigeria, and he was forced to return. Frimpong decided to not work for the government or his previous job, for the salary was low, and he instead decided to start his own business. He started from scratch, with no capital, just with a hacksaw and a vice. The first machine he made was a brick laying machine, which was a copy of a prototype from TCC. His parents are supportive of him starting his own business. His customers are people who need to process their food. The machines add value to the food, for otherwise the food would be wasted. For example, he makes cassava graters, palm oil presses, and vegetable processing machines. He needs specific components, like stainless steel, to create the food processing machines, for it is a specialized trade. He started making soap processing machines and clay brick extruders. Within the cluster, each business is making similar machines. The cluster support each other and lend machine time to one another. Capital is a struggle for Frimpong. He can only make a machine once one is ordered, so he must rely on pamphlets for demonstrations, and orders to pay for machines and products. If Frimpong has a business question, he can ask TCC or the association of small scale industries. He imports electric machines, which are problematic during power outages. His challenges include lack of capital and poor housing; he wishes to move from the magazine, for he views it as a springboard, and he cannot expand because trucks have no access. He has 12 people

working with him: he has 3 masters, including himself who have spent almost 20 years with him, and he has many apprentices. He trusts them to work when he is not there.

Abu Adams: 51 years old, the owner of a metalworks business which makes donkey carts, wheelbarrows, and other things out of sheet metal. Abu went to elementary and middle school, while working for his father after. After middle school, he worked for his father full time. Abu went to ITTU for business training that he needed. This shop has no differences from other sheet metal fabrication shops. His customers are mostly people from the north, but business has declined because more people have access to motorbikes, and don't use wheelbarrows or donkey carts. Another concern is lack of capital - he has to rely on customers to come first before he can make anything. He has mastered sheet metal fabrication and welding, for he has worked in this shop for so long. He worked alongside his father, who started this business, for 30-35 years. He has modernized from his father by making charcoal stoves and donkey carts. Now, Abu has no money to build. He has no support, or help now. Business has been slow because products are being mass produced in Burkina, and the government is importing them and motorbikes. Abu wants support from institutions. He can't expand, or do work even though they have the technology and capacity to build due to financial problems.

Ibrahim Musah: 53 years old, owner of a casting shop, where he casts aluminum, bronze, lead, and cast iron basic parts. His family had a business in Tamale casting aluminum. Ibrahim was educated with intermediate technical instruction. The TCC director discovered him after he had started a little shop doing aluminum casting in Tamale, and brought him the TCC in Kumasi. He came to Suame to do iron foundry, which was supported by the TCC director. He traveled to Indonesia and was exposed to other types of casting, including foam, CO₂, and lost wax.

His business has 7 people working there. He has trained many apprentices, even though they start businesses which compete with his own just out necessity. Apprentices become his main competition, and take clients away from him. However, he needs apprentices because he can't do everything himself. He only casts simple parts that don't need a lot of post machining, like fittings. ITTU and TCC both have helped him with his business, for an employee from TCC discovered Ibrahim in the north and brought him to Suame Magazine to set up his business. He has had a lot of short trainings on business development through ITTU and TCC. When he has a problem, he goes to the ITTU, TCC, and ministry of trade for help. Ibrahim can make special ordered parts with instruction, but must be easy enough to machine with the small machine shop. Ibrahim believes that he has the capacity to do more, but isn't.

Kofi Boa: 60 years old. His father died at an early age. His mother was a cocoa farmer, and at age 6, her farm caught fire, and he was inspired to fight fire on farmland through sustainable farming practices. He went to the University of Nebraska and lived off the land at a WWII ammunition bunker. He had a lot of time alone to think, and he realized that people needed focused education and he decided he wanted a research extension trading center. Kofi pioneered no-till farming, where you leave organic matter on the field, and allow the next batch of crops to grow through the mulch to preserve water content on the fields. A large component of his business is the education of farmers on no-till farming, as

well as other sustainable farming practices, or as he calls, conservation agriculture, for the best results. The way he teaches farmers is through showing them the results of his practices, and getting them to do hands on demonstrations. Kofi has several programs for farmers to participate in, including on site visits and travel demonstrations. He has lodging so farmers from far away can come stay with him. He teaches soil cover, cover crops, and plant nutrition. He also has special sessions on weed control. Kofi taught a course in South Africa for seed producers, and now it is taught in Ghana. He also has a fellowship program for students to work on his farm for one year and learn his practices, after they have completed their national service, and then they disseminate his practices to their homes and farms. He is trying to fulfill the need for a network of agricultural experts in Ghana. He feels pressure to spread his services because he has seen such good results, so he came up with the fellowship so that his fellows can do that for him.

A problem in Ghana he has seen is that farmland is decreasing, but population is increasing, and there is negative impacts of climate change, and farming practices are very unsustainable - for example slash and burn agriculture. People also don't understand how water goes through the soil through capillary action, and by tilling the field, the capillaries are broken and the field will not get groundwater. He has gotten a lot of attention for his results, including world food prize and a no-till plains conference in Kansas. He believes that farming is hard to scale up due to need for machinery. He often demos the roller crimper, which can flatten the organic matter from a growing season. As the vegetation browns, the green plants can grow through, which is why he calls his practices the Brown Revolution, for brown gives rise to the Green. He has three pilot farms: one in the upper east, one in middle, one near Accra. He wants people to start to use cover crops to cut down on weed control and to stop evaporation from the top soil. Kofi's value proposition to farmers is to conserve water and soil so that the farmers need to buy less inputs, to create less of a cost burden for small and medium scale farmers. Kofi linked up John Deere, so as people want machinery, he is provider for John Deere. He has manufacturers making him copies of his imported roller crimper. He is battling machinery for small farmers. He believes that push planters are useless in Ghana for the farmland isn't flat. He cannot find a local manufacturer for the jaw planter, which he believes is the best for farms in Ghana, so he imports from Brazil.

A problem faced by Ghanaian farmers is that the weed eater doesn't fit between the rows of maize, so Kofi believes in the use of cover crops to stop weeds from growing. Kofi's success attracted the attention of Howard Buffet, who offered him a lot of support including contacts and building a center for education of farmers. Kofi has always used his farm for teaching others, for he was motivated to push for his beliefs and the success of other farmers. He also does roadside demonstrations. Because he is unique as an agriculture professional who spends time on the farm, he understands the needs of farmers better than others. He wants MOFA to see his farm as a way to reach out to illiterate farmers, who will only be convinced by doing and seeing. However, the director is not interested, even though he has been getting a lot of media attention. Kofi's center is the only one in Ghana that people from all over the country will travel to see. His role model is Howard Buffet, who works hard and is a great farmer. Kofi now is involved in the community level philanthropy, and is looked at like a father figure.

David Asiamah: Age 27, Founder of AgroMindset, an agriculture education provider. His goal is to educate young people about agriculture, including a demonstration farm, logistics coordination company for access to market, and an online agriculture program. He has a poultry farm with 1 million eggs and 120,000 chickens. David went into poultry farming because all other kinds of farming are seasonal, but chickens lay eggs every day. David believes that feeding his chickens healthy feed, like moringa, increases the nutrients and benefits of his eggs for his eggs have omega-3s. He is targeting the middle class: "poor people are hungry, but not all hungry people are poor." He is selling a higher quality egg; he receives endorsements from doctors on the health benefits of his eggs. He is starting a fellowship program for students to work consistently on his farm and learn from him. The educational system in Ghana has stopped emphasizing agriculture in its curriculum, and therefore many educated people don't know anything about agriculture, which creates a lack of food security going forward. AgroMindset has practical demonstration aspects along with its curriculum. David went to KNUST to study actuarial science, but lost interest and ended up in agriculture. While in university, he visited the best poultry farm in Ghana, which peaked his interest. He had a board of directors from the beginning of AgroMindset, who are influential in agriculture and well practiced, and he looked for support from his university.

David was born in Kumasi, but his mother has been living in England. His father was a Deacon at church, so it was a very religious home in Ghana. He went to Redding in the UK to complete his masters, where he learned how to farm. David spent 5 years in England learning how to farm from one of the foremost farmers in England. His boss was a real role model; he started the farm at age 25. David's exposure to this farm, where the farmer was now a millionaire, inspired him to work hard and remain dedicated to agriculture for success. When he started AgroMindset, he had the support of his friends, and his father would have rather him have gotten a real job and was not incredibly supportive, but admires his success. His role models include inspiring young people, like Rami the Peace Corp Volunteer. David learned many of his business skills on the job, for he believes that entrepreneurship is like jumping off a cliff. He was incredibly serious about it, unlike his friends who were more interested in working 9-5 jobs. Early on, he joined an incubator program called bridge for billions, based in the United States, where he received help on his business model. David has many challenges, including lack of capital, no office space, branding expense, and the workforce is not used to his business approach to farming. For instance, they often take their salary in eggs, instead of waiting for a monetary salary. His strategy for marketing is to hire the best people for the job, which is not him. David thinks that entrepreneurship is a necessity in today's world, for there is not enough employment, and entrepreneurs are the game changers. He wants to expand his poultry farm to be able to provide for KFC, and win best poultry farmer in the district.

Jorge Appiah: Age 26, Executive Director of Creativity Group, which is a non-profit which has created a platform where students can solve problems via entrepreneurship. There are 5 chapters in universities across the country. Jorge also is a researcher on KNUST's campus in the college of engineering, and is the executive director and co-founder of a solar panel consultation and installation company. Through the Creativity Group, Jorge wants youth to

be able get access to the resources needed to innovate for social benefit. Jorge believes that the youth have the knowledge to solve problems, but are lacking the platform. Jorge was an electrical engineer at KNUST, and started Creativity Group then. Jorge came from a rural town with many social problems, and expected KNUST to be full of motivated problem-solvers and resources. When he got to KNUST, many students were there to just pass exams, and KNUST wasn't encouraging any innovation, so him and his friends began meeting to find ways to help encourage more innovation for social problems.

Many times, there are school projects, which end up abandoned upon end of term. Creativity Group is looking to create a platform where those projects can continue and turn into businesses. Creativity Group also runs a makers-fair with 15 startups, and give students business training and marketing skills. Essentially, Creativity Group is looking to take ideas from the university through to the people. Jorge himself didn't have a strong business background. He learned his business skills on the job, and read a lot. Now, Jorge is enrolled in an MBA program. Creativity Group is currently self-funded. They used to charge dues, but students were deterred from joining due to payment. Now, they partner with similar organizations, and the organizations fund it, they take equity from their startups, there are donors, or the Creativity Group can serve as a consultancy. KNUST has been supportive, and now are looking for an agreement for co-working space to expand Creativity Group.

Jorge was born in Accra, but then he moved into a really rural village with no electricity with his grandmother at age 5. He was very creative at an early age, creating a virtual world of high detail where him and his friends discovered the entrepreneurial spirit within them. He read everything he had access to for entertainment. Living there exposed him to many problems. In order to have light at night, he used lanterns, which gave off smoke, or candles, which were expensive. It sparked an interest in doing solar light in the future, and his interest in electrical engineering. At university, he did well and ended up with a job offer from a bank, but did not pursue it - Jorge wanted to stay with Creativity Group at KNUST. He moved back to Kumasi without a set plan because he felt the entrepreneur within him. Jorge believes that Ghanaians are bold, and natural entrepreneurs. The problem is not that people are not entrepreneurial, it is that they have no concept of how to grow their business, or keep financial records.

Prince Boadu: Age 27. CEO of MapTech Registers, which makes technology solutions for businesses based on location. Prince's basic product is GIS based intelligent marketing. Currently, there is one employee, who does marketing and administration. The company started 8 months ago, and their financing model consists of international business plan competitions for the next year to increase funds. The clients for MapTech are based mainly in Accra, and his goal is to become to "go-to GIS company."

Prince's education is in logistics and supply-chain management. He did a master's in logistics and then worked for Clean Team. He noticed there was a problem with locating customers for Clean Team, and thought the solution would be an app that could track the location of the customers. He left Clean Team because his mother was sick, and came back to the working world as the founder of MapTech after spending time in Accra with her. He

believes MapTech is the only company using GIS for marketing purposes. He entered a Kumasi business incubator with support from the World Bank and KNUST, where they get one year of office space, laptops, and training. MapTech has also been recognized in many business plan competitions. Prince always had a passion to do something. In high school, Prince volunteered for a non-profit which started bible clubs in rural communities. He went to KNUST and got his first degree at the same time as Alloysius and David. He started a non-profit, called Evolve Africa, the second year of undergrad to provide trainings and classes to develop the next class of entrepreneurs in Africa. A friend and him went to Accra to register the non-profit without support or direction for the future. Prince has an inclination towards entrepreneurship and calculated risk taking. He grew up in a police barracks with his mother, who was a police officer. His dad was an entrepreneur, but doesn't know what he does now. He went to high school in Cape Coast, and then came to KNUST where he studied building technology. Prince did his national service teaching at a business school, which is why he decided to get his MBA in supply chains and logistics. He also started a management consulting company with a college professor of his. When he has a problem, he turns to his colleagues who also are entrepreneurs, like David, or his mentors including his pastor and close professors.

Prince believes ideas are currency, and there are no platforms for entrepreneurship. Prince is also the founding curator of TedX at KNUST, for he wants an ecosystem of innovators and entrepreneurs at KNUST. He encourages entrepreneurship during college. He thinks its strategic to set up two offices in Ghana, so he has operations in both Kumasi and Accra. He believes that Kumasi is more driven by the informal sector, and there is a migration of ideas as they come to Kumasi for KNUST and then return home. He also believes that every business needs a presence in Accra for it is more formal and active in the business community.

Ibrahim in Ejura: Age 46, Owner of a storage enterprise in Ejura. His business is working for the interest of people. He wants to make money so he can also make money. He wants to finance people in agro-inputs. He also brings a GPS to other farmers' land so he can survey and show them how to space their crops, to assist them in farming. Ibrahim shows that a farmer, when they space out their crops properly, can get a much better yield per square acre than previously thought. So he started educating people about farming. His vision is that there will be an equitable and efficient market for commoditized food stock.

He also goes to houses with a moisture meter, to help farmers achieve a lower moisture such that their maize can last several years instead several months. The problem is that other growers are selling their maize in 100 kilo bags, but putting over 130 kilos in them. Ibrahim saw the opportunity to standardize the amount of maize in each bag. Growers don't know how to manage resources or reinvest back into their farms. Growers also are forced to make deals with market women which undercuts the price of their good, for they also do not know market prices. Ibrahim also believes that poverty is a choice; that people choose not to do the right thing, and to not change the circumstances. Ibrahim believes that people need to be taught to manage resources to add value. Unfortunately, there is no government support.

He leased a silo for several months so he could assist other farmers on the processing side. However, he learned that the production side is significantly cheaper, so he began growing his own maize in addition to processing their maize and storing it for a better market price in the future.

Ibrahim grew up in the northern region with his aunt and uncle, where he went to primary school. However, after primary school they no longer decided to school him. At 21, he decided to travel around north Africa, where he worked his way through several countries. However, after 12 years, he decided to come back because he is the oldest man in his family, and he needed to support his parents, so he came back to Ejura. His parents are both farmers. As a side job, Ibrahim also teaches Arabic.

In the future, Ibrahim wants to use his own capital to build a storage facility, and help with development causes. He believes that when people gain capital, development will come by the people. He sees every grower waiting for the government to bring a fertilizer subsidy, but he believes that if he is working the right way, there is no need for a subsidy. He has friends which act as a support system, especially for farming and production advice, like when to apply fertilizer. His role models include Steve Jobs, and he is inspired by quotes including the one from the Godfather: "The master has failed more times than the beginner has even tried." He wants a large branch in the Northern region, for there is land and cheap labor, and opportunity for growth. Ibrahim doesn't use machinery because he doesn't want people to believe that his success is attributed to machines. He is working on a new sieve idea for blowing the maize, for that is his current bottleneck. He is focused primarily on quality control - he wants all the maize to be standardized.

Ibrahim has been working closely with Rami Nofal, a PVC who is stationed in Ejura. Together, they have come up with many ideas to grow his business. Rami has coached him through the process of adding value to crops successfully. Ibrahim is the first to welcome the change brought by Rami and his ideas for how to promote sustainable agriculture.

Raymond Tete: Age 27, Masters student from the University of Developmental Studies in Tamale studying soil and water conservation. Raymond has been working on a drip irrigation system which helps farmers with planting during the dry season in the northern regions of Ghana. Raymond believes that farmers can use harvested rainwater to plant during the dry season, and can manufacturing drip irrigation through local materials like PVC piping, and use a filter for the harvested rainwater or potentially waste water to create a new water source for growing. He is targeting small farmers for his irrigation system. In the upper east, if there is no high water table, nothing can grow. The drip irrigation system efficiency is being compared to that of shallow wells being drilled. This is the first year of a three year pilot project. The results have been good, but they need to know the effect on yield of crops, so need to do in depth studies on soil, groundwater fluctuation, and other factors that contribute to yield.

Raymond is working alongside a lecturer from UDS to design the system. A modification they made was to add valves such that some parts of the system can be open while others are closed. The drip irrigation system can be built by local artisans in the north, so the

money filters back into the community. In order to harvest rain water, the roofing on the homes of the farmers cannot be thatch, so they have targeted 5 farmers for their pilot project.

Raymond grew up in Accra, where he had his basic education. He liked traveling, and came to UDS in 2008 where he studied fecal sludge and sanitation solutions. He became a research assistant where he studied the effects of dry beds, pouring sludge, and the reduction of pathogens. Raymond has always had an interest in bottom on the pyramid solutions, so he wants to be in sanitation, hygiene, and waste water recovery. Currently, farmers are growing vegetables using waste water, which is extremely unhealthy, so Raymond is interested in teaching farmers safe practices for waste water recovery. Raymond's father is an accountant, and Raymond himself wanted to be a journalist. However, in JSS his teacher wrote "agriculture," and although he wanted to change to the arts, he just continued. Raymond studied crops and soil in secondary school, but there was no practical experience due to lack of land owned by the school, so he could not even identify crops. Raymond studied crops at UDS to get more practical experience. Raymond had the opportunity to work with several international organizations during his two years as research assistant and visit over 50 communities in Ghana helping with water, soil, and irrigation. At UDS, the emphasis on research is to help farmers practically, not for publications. His role models include people in his department at UDS who help him showcase his skills.

BoBoBoo: Age 56, Works at Taimako Enterprise, her family's business of medicinal healing and processing of local crops. BoBoBoo took over the family business from her mom. She was not educated, except in Arabic, but now has an honorary doctorate from UDS. BoBoBoo worked closely with her mother and grandmother, who were both medicinal healers. Her mother started her business by harvesting local plants for medicine, but as time passed, was traveling further and further away, for the plants were receding into the wild. Her solution was to start growing her own medicinal plants. BoBoBoo's mom went to the AgroForrestry, where she was given three seedlings, and was under the agreement that if she was able to grow them, the AgroForrestry would train her. BoBoBoo's mother received help from a UNDP coordinator at the University of Ghana at Legon. BoBoBoo's mother saw the need for BoBoBoo to stop school and continue with herb planting for the family business. BoBoBoo participated in three months of agricultural training, and moved to help farmers. BoBoBoo started to help farmers by processing their crops. GIZ gave BoBoBoo a solar dryer so that she was able to process fruits, vegetables, and spices. BoBoBoo took many trips to more rural areas in order to see how she could help women. She trained many local men and women on how to use plants to prepare local sauces and powders, which is good for income generation and nutrition of children. BoBoBoo is particularly interested in using local plants to help with malnutrition, targeting Baobob, Moringa, and Sesame as the best.

BoBoBoo then started processing soy beans using a soy milk machine, and is currently meeting regulations to get the soy factory up and running to produce soy milk, yogurt, and tofu. BoBoBoo is also a UN women ambassador for the three northern regions because she has done so much good work, has used her own money to help women organize themselves

to pay for school fees and other expenses. The government has brought interventions, so were not as successful as BoBoBoo in helping rural women. BoBoBoo, when she visits rural communities, teaches them what she does, and helps them add value to the crops produced. She believes that people in the North are entrepreneurs at birth because those in the north need to process everything, but need help in adding value and adding hygiene. Once hygiene is added, they can be registered by the FDA, which is a problem for most. BoBoBoo's role models include her grandmother, who was a healer. BoBoBoo had the opportunity to travel, and learned about increasing income by adding value to crops, and brought that back to her family business. BoBoBoo has been involved in many international trainings including trips to Burkina and China, where she learned about processing soy beans. Her grandfather was a chief, and her father was an Imam. She comes from a strong culture of giving, where she should give half her income to those in need.

Her plans for the future include finishing the solar dryer, completing the soy bean factory, and getting a center for rural women to come and train with her directly. BoBoBoo has a relationship with a German man who helps rural women by paying fare rates for their processed goods. BoBoBoo is also working on a contract for Shea Butter.

Fiaza Taimako: Age 38, CEO of an ornamental plant and landscaping company called RainCorp. Her grandparents on both sides are traditional healers, viewed as custodians of the healing tradition. Faiza was the youngest of 9 siblings, and had no choice but to play a role in the family business. She was born right after the death of her father, so she was looked at as the replacement of her father, and therefore her family expected a lot from her. She was very close with her mother and grandmother. She is part of the same family as BoBoBoo; her mother started this business as she saw the medicinal trees disappear.

The rural forestry project trained her mother, but only in foreign plants, for books only described the growing of foreign plants. However, for healing, the plants needed were indigenous. Her mother used the foreign training to grow the indigenous plants. Her mother was the head of the traditional healers, who believed that only natural plants could be used during the healing process, for they were blessed by God. Some of the differences between wild and nursery trees are the rate of growth, for using manure speeds up the growth of the tree, so a 2 year old nursery tree can look the same as a 10 year old wild tree. Therefore, in order to appease the traditional healers, Faiza's mother tried to let the trees grow as naturally as possible such that they would resemble the wild trees.

Faiza had formal education through high school, but was working and learning at the same time. Her mother was the head of the traditional healers association, and because she was one of the only literate ones, had a lot of responsibility at an early age - she was taking notes at the meetings, and translating things to English. Now, Faiza is the CEO of RainCorp, and she is trying to build upon her mother's work. Her mother has an honorary degree from UDS. RainCrop has 26 permanent workers, and 157 seasonal staff. She considers the workers staff and family, which she attributes part of her success to. The family business has formalized branches, so she runs a more commercial branch, where she sells birds, chickens, guinea fowl, and eggs, and uses the manure from the birds as fertilizer for trees. RainCorp also does landscaping and sells trees. Faiza believes that many people are not

used to long term investment, and therefore do not want to plant trees because they will die before the tree flourishes. One of the benefits of technology is that trees are now fruiting sooner, so people have to wait less time to see the benefits. Faiza's mother saw changes occurring where others didn't. Faiza's dad also played a role in helping her mother be progressive, for he allowed her room to be.

Senyo Pelly: Age 44, CEO and co-founder of SeKaf Ghana Limited, which is a social enterprise which produces natural Shea cosmetics. There is a social program to help poor people out of poverty. He recognizes the need to provide jobs and training, and the need to build wealth in addition to earning, so he introduced a savings scheme, and have set up microfinance organizations such that the interest is kept and shared among themselves. The goal is to address poverty, so they get their supplies from women who they equip with shea butter processing skills. Ultimately, they register all the women as a cooperative. They target 22 communities in the Northern region, and have over 3000 women. They want to add the maximum shea value in Africa, and want to keep the value of shea in Africa. The products they make include lotions and soaps, and they are all high quality with therapeutic benefits. The target by 2016 is to have 6000 women. They are pioneers in the industry; in less than 10 years they have increased the demand from virtually zero of hand processed shea products, to much higher. In 2003, the shea products were poor quality in Africa, so the production was dominated by European markets, and there were many inefficiencies in the production of shea butter in Africa. Senyo saw opportunity to employ women, who couldn't find other jobs because they weren't educated. Senyo saw the opportunity to pair the employment of women with the high quality of hand crafted butter. Senyo did a lot of research into the bottleneck of the market, where he traveled to communities. He studied the process of harvesting shea fruit, and realized that bad quality production comes from bad quality of inputs, for currently the shea fruit is spending too long on the ground before processing. Senyo discovered that quick processing will keep the fatty acid in the shea butter down, and improve the overall quality. Senyo also observed the way shea butter was being made, and it was more of an art than a science; no one had studied it to see inefficiencies.

SeKaf introduced a grinding mill so the nuts don't have to be pounded, which improves the quality. Senyo also showed the women the need to dehydrate the nuts before milling, which keeps the fatty acid content down. Senyo also saw the importance of kneading the butter until it was fully aerated. The SeKaf method increased the yield to being comparable with industrial machines in Europe. The SeKaf butter now can be used without refining in cosmetics, which cannot be done in Europe. In Europe, they must refine the butter because they have low quality nuts, which is expensive and destroys the therapeutic qualities of shea products. TAMA was certified as high quality organic butter from an international organization in France.

SeKaf has showcased the problems with the shea industry in Africa, and has gotten a lot of positive feedback for being an advocate for sustainability in the African shea industry. Senyo saw the evil of the supply chain for shea nuts, for middlemen were ripping off the local women. SeKaf decided in 2006 to buy directly from the local women, and made a lot of noise in the shea industry about this injustice, and founded the Global Shea Alliance,

which includes many large cosmetic companies, and is driving the sustainability of the shea industry.

Senyo is from the south, and grew up in Accra. He went to secondary school in the Volta region. He studied sciences, including chemistry, and did a business course in high school. He went to the university of professional studies in Legon, Accra, where he studied management accounting. He founded the University of Profession Studies chapter of ISBC, International Association of Students in Business and Commerce, and ran the club like a business. After college, he did his national service, and went right into founding SeKaf. Originally, he was going to be a trader, doing exports. His father was a health inspector, and his mother was a trader. They were unsupportive of him starting his own business; they both wanted him to get a job. He, however, wanted to use his skills, and was confined by bureaucracy in his national service, which led to boredom. The national service management was very inefficient; he was supposed to be posted at highways, but there was no role for him there, so he switched to teaching in Accra.

Senyo believes in getting the best talent from around the world, so he posts volunteer positions internationally. When he started in 2006, he didn't know the term social enterprise, so it was hard for him to be identified in the business world, for they had a social cause, but were a for-profit company. They developed a management system by trial and error. SeKaf is a very ethical organization from the top down. Senyo believes that the women groups should manage themselves efficiently, so they retain help from SeKaf for 3 years, and gain trainings. SeKaf is located in Tamale to be closer to the production of shea butter, and the women they are training. Senyo is inspired by the Bible, and running a Christian business. Senyo is also inspired by his own instincts. His view is that formal education only develops logic, not instinct. His role models include Martin Luther King, Kofi Anan, Kwami Nkrumah, and a Ghanaian pastor.

Joshua Wuntimah: Age 31, runs a tilapia and poultry farm, and is a beekeeper. He started with a poultry farm in school, and then once he graduated, increased the quantity of birds. Now, he has a 4000 bird capacity, and a 1000 tilapia capacity pond, and 10 beehives. There is a high tilapia demand in Ghana; more than any other fish. This year, he is cultivating corn and soy beans, so he will cut down the cost of production by growing his own food for his poultry. Most people see farming as a hobby of side job, but he looks at farming as his main job. He used to work at an NGO, and lecture part time at Methodist University. He went to UDS, and got a masters from University of Ghana at Legon. He has done his best to streamline his business; even though it is a farm, everything is run as a business. He enters business plan competitions, and has won several, so he has gotten business training. One in particular was 7 weeks long. He is younger than other farmers in the north, and is more educated. He has been talking about UDS about false yams, which can be used as an animal feed, and is doing a trial with UDS. He is always looking for ways to cut costs, and streamline his farm. His mission statement is giving farming a business edge. One of the problems he sees is that Ghana is not food secure. Ghana imports 95-98% of its meat products. The government has changed its policies, and the currency is weak, which makes importing expensive, and gives Josh a larger market to work with. Africa is growing in

population, which means there are more mouths to feed and jobs in the food industry will be secure for the long run, which is why Josh wanted to enter.

In school, Joshua always had an entrepreneurial streak. He had a printer, and a CD burner to make money on the side. Joshua always wanted to be a farmer. He studied agriculture in secondary school, and agricultural technology at UDS. For his masters, he did animal genetic breeding. He started farming out of his pocket money. When he was working for the NGO in Tamale, he was funneling all his extra money into his farm. His mother had her own poultry farm, and was able to advise Joshua on best practices. He learned a lot of business skills from reading and watching television, like shark tank and the apprentice. He became interested in entrepreneurship through his church, where they speak about doing something for yourself, learning from your mistakes, and embracing challenges. The formal educational system does not train entrepreneurs; it trains students to look for jobs. The government is the main employer in Ghana, so students all look for government jobs. Almost no one who studied agriculture with him in school went into industry.

Joshua was born in Tamale, and then moved to Accra. His family moved to Canada for two years, for his parents were missionaries who translated Biblical text into local languages. He went to boarding school in Accra from age 10 to 17, and then to university at UDS. During UDS, he started his poultry farm in Tamale. He came back to Tamale after his masters in Accra because there is less competition. There are no malls, no KFC, and with the right mindset, Joshua can be ahead of the queue. Soon, when a mall is opened in Tamale, he will be the food supplier. There will be an international airport in Tamale soon, which will create rapid growth. He didn't tell his parents about the switch to full-time farming. He only told his wife, and he saved up enough money to pay for school fees for an additional year before quitting his job at the NGO. Joshua believes that starting one's own business plays an emotional role, for there are many stresses, including late payments, but these struggles are endured by all entrepreneurs, so he was expecting hardship. Joshua read a lot about entrepreneurs, mostly western success stories. He also takes his faith very seriously, and has gone to seminars for starting businesses. Joshua also interned at one of the largest farms in Ghana, and had the opportunity to watch many youtube videos about successful farms.

Entrepreneurs need more training opportunities. Many Ghanaians have side projects, but need help turning those hobbies into revenue-generating businesses. Ghanaians also do not have the greatest business sense. Joshua believes that everyone should be thinking in business terms. (He gave an example of not making a long-lasting wooden mortar, so people would have to buy one more frequently from you.) He thinks that startup capital should be in inputs because people aren't ready to manage their budgets. He also believes that Ghana needs more educated people to go into farming, and the government should facilitate farms. However, right now, government subsidies are corrupt. For example, tractors are going to people aren't farming, and the government buys technologies that are not suitable for Ghanaian farms, for no one picking out the farming equipment is an engineer. Joshua also wants to support the pan-African world view where Africans do more for themselves, which came from his frustrations after working for the NGO. Many projects are sent in and fail, and the money cycle is very hard. Not all projects work well

everywhere. Right now, Joshua has four employees. He considers himself a social entrepreneur for he wants each farm to build up each other's capacity.

Maccarthy: Age 26, Co-founder and director for Hop-In Academy, which advances the skills and capacities, and educates young entrepreneurs, professors, corporations, and business people who want to use technology. The niche of Hop-In is communication technology. Hop-In uses tools online merged with operations to help people change mankind using technology. Hop-In is a for-profit company, but has a strong corporate social responsibility. They offer online communication training to 25 journalists in the north to report on injustices in their communities to connect with the global world on these issues. They also offer semester-long courses and other shorter courses. They want to train people on tools which will make global communication more effective. They also have a production aspect where they use story-telling to communicate with investors, customers, and people. People who can afford to pay for their trainings pay, and others who are using their services for their business and cannot afford to pay can either be sponsored, or will give equity of their company back to Hop-In. Hop-In Hub will launch in September, which will be a co-working space for young people, and supply computers, internet, and trainings for young entrepreneurs. One of the problems in the north is that people learn from NGOs but there is no long-term strategy from NGOs to turn the skills or knowledge into a business. Hop-In is also going to try to help to find jobs for people by finding contracts for people, and assisting in the job search. They have an agreement with journalism schools in the north to train students on new media communication. There are no competitors in the North for Hop-In.

The Hop-In model is very different from formal education; there is emphasis given to teamwork and to facilitate practice and they want people to work in areas that they are passionate about, for it creates a better work and learning environment and better overall product. They have facilitators building tutorials, who they pay based on products, but no full-time employees.

In 2011, he got a job as a waiter in a guesthouse, where he serve a Danish customer, who had an exchange program and needed an employee to facilitate communication between the two high schools. One day, while trying to skype with the teacher from Denmark, Maccarthy accidently sent a Facebook request to the wrong Danish person. They started talking, and eventually collaborated on a documentary. To film the documentary, Maccarthy self-taught himself many techniques, which foreshadowed to the hop-in method of learning. In 2013, he went to Tamale Polytechnic to study marketing and communication while simultaneously working on hop-in. He used students as a test for the products, and offered many free trainings to get feedback. In 2014, he started training over 200 students, but were working out of the Vodaphone internet cafe, which was not ideal because their time in the space was limited. He works closely with his Danish cofounder, who was also the only investor in the company at the time; they still have not met in person, but collaborate effectively online as they did for the documentary. They are currently working on getting a space ready for both tutorials and an internet cafe, for revenue and to offer a place for young entrepreneurs to work.

His mom is from Accra, and moved to the North. His father was from the North, but died when he was 6. Maccarthy grew up in Accra, but moved to Tamale to complete senior high school where he studied science. After secondary school, he could not go to college; he had to work to support his family. His mom was a business woman, and watching her go through hardships prepared him for the hardships of entrepreneurship. He believes that in Ghana the only guaranteed jobs are medical careers and teaching jobs. He wanted to be a doctor, but did not have the right mentorship to make that dream a reality. He found his real passion when he was working after secondary school. He wanted to be an entrepreneur and use his skills to tell stories, not go into medicine. Although his family wanted him to go into the medical field for job security, his mom understood his goal, and became supportive. He saved a lot of money, and went to as many trainings as he could. In the North, there are many NGOs which help with entrepreneurship training, but it the traditional style of lecturing, and these trainings do not encourage questions, or target the entrepreneurs towards their passions. There is also no followup or incubation after the NGO training. There is no investment in the north like there is in Kumasi and Accra. In order to create investment, Hop-In is looking to create a platform to connect their entrepreneurs to the global world. Hop-In also provides mentorship opportunities.

Maccarthy's role models include the founder of Ali Baba because he also had no training, Steve Jobs, Denzel Washington, Brad Pitt, Ken Robinson, and local entrepreneurs including the founder of UT Bank. Hop-In is searching to create a bridge for people to connect themselves to the global community.

Emelia: Age 36, Business Entrepreneur who used to work for the guinea worm program, but now owns two restaurants in Tamale. Her motivation for starting the Desert Rose was that she used to like to cook for parties, and one time her and a friend competed for attendance one night, and no one came to her house for her cooking. From then on, she decided to cook and sell. She opened one of the restaurants while she was still working on the guinea worm program in Ghana. She decided to cook, and bought space because people needed shelter from the rain. It took Emelia two years to put up the building, and she kept room for outside seating. She had part-time jobs as a mosquito breeder, and running an insectary. She put everything she earned into the restaurant. She never got financial support; she never had a loan. She grew up in Bolgatonga in the Upper East, where she did her secondary school, and then went to university at Tamale Polytechnic. She did her national service with the national health service, which is how she ended up working on the guinea worm program. Her mother is a nurse, and her step-father is an agriculturalist. She moved to Tamale for school, and loved it. Her family was not very supportive of her opening a restaurant, but she did give her some start-up money. She eventually opened a second location more centrally located, where her sister manages. She studied accounting at secondary school and business management at Polytechnic. Her role model is her mother for she didn't earn very much money, but managed to make enough and work hard enough to put all of her kids through school. Her mother also manages to great everyone with a smile.

Emelia thinks that hospitality is something that should be taught in Ghana. Competition is all over, and one can easily lose their customers, and dealing with other people all day can be tiring. However, in order to be successful, one must treat their customers well.

Portia Derry: Age 26, Social Entrepreneur where she promotes literacy, creative writing, and reading for pleasure. Students read only academic books, and read only for exams in Ghana. It's hard to change adult's habits, but if children pick up good habits early, they will continue to love reading. She wants children to have fun while learning, and she wants her clinics to be active and fun, unlike school which is passive learning. The clinics are called the "Funky Read Write Clinics," which are weekend programs for primary school students from schools all around Tamale to learn more about reading and creative writing. The clinics train 30 students for 5 months, where at the end of that time, the students return to their communities and start their own reading clubs. She is also using qualitative progress tracking techniques to see the progress of her clinics. She is looking to empower children and build their confidence, even though the culture of Ghana doesn't support that. She creates new games so the learning is not static, and uses positive competitions to encourage learning, and has an arts component. She also invites mentors from the community to join the clinics, and connects her students to African writers around the world via skype. The goal is that at the end of 5 months each student can write a short story, and she can compile and publish the work. Portia wants to promote the telling of African stories.

Portia founded African Youth Writers Organization (AYWO), which is trying to improve the Ghanaian book industry. No one reads storybooks in Ghana, so writers do not write storybooks. The only way for writers to make money is if the government buys their books, which is not sustainable and does not promote the writing industry. She wants to groom readers to create a better writing market. She wants to target 1000 students each year. Portia is able to target children via schools and libraries. She wants to target deprived communities where the parents cannot afford to send their children to good schools. She funds this program complete out of her own pocket, where she budgets enough out of her paycheck each month. Volunteers can also donate time and materials to the clinic.

Portia has no background in education, but she has always loved reading. Her father used to bring storybooks home, and she read all the storybooks she could find. She picked up writing because she loved reading so much. However, she was frustrated that none of the stories were African. Her father died when she was young, and she used reading and writing as a therapeutic method for coping with the loss. Her national service was in Brong-Ahafo where she taught English. Portia saw problems with the educational system where the students did not know how to speak English, but were forced to write exams in English. Then, she started developing card games and debates, which ended up helping the students improve in all subjects. Portia went to university at UDS in Wa where she studied integrated development studies with a focus on development communication. Her father was an accountant. Her mother was a weaver; she was semi-literate, and understood the importance of schooling, so sent Portia to school. Portia saw this as a sign that literacy will increase education. Portia works now as a community development officer, where she

works full-time 4 hours from Tamale, and she comes down every weekend to run clinics. She also runs a clinic in the village where she works, and during her breaks from work, is able to run reading and writing workshops there.

Her goals are to reach more children, and to create a packaged game set to send to parents and teachers and communities where they don't work, so even if the children don't go to the clinic, they can still learn. The families of the children with who she works have been very supportive. During the third month, she invites the families to join during on clinic. Portia is looking to partner with other organizations. Her role models include Michael Kashan, a children's writer, which was the first book she saw by an African writer, where the illustrations were of black children. She is 10 weeks into her first permanent clinic, and the children seem to understand that the children are here to help their communities. Each week, new students are chosen to run the clinic in preparation for starting these workshops at their own schools.