

OPEN DATA'S IMPACT  
[www.odimpact.org](http://www.odimpact.org)

# GHANA

Esoko – Leveling the Information  
Playing Field for Smallholder  
Farmers in Ghana

By Francois van Schalkwyk, Andrew Young  
and Stefaan Verhulst

JULY 2017



**OPEN DATA'S IMPACT\***

www.odimpact.org

# GHANA

Esoko – Leveling the Information  
Playing Field for Smallholder  
Farmers in Ghana

By Francois van Schalkwyk, Andrew Young and Stefaan Verhulst\*\*

**JULY 2017**



This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License

\* Project conducted in collaboration with the Web Foundation, United States Agency for International Development (USAID), and the Mobile Solutions, Technical Assistance and Research (mSTAR) program at FHI 360.

\*\* “Special thanks to Akash Kapur who provided crucial editorial support for this case study, and to the peer reviewers [odimpact.org/about] who provided input on a pre-published draft.”



# ESOKO – LEVELING THE INFORMATION PLAYING FIELD FOR SMALLHOLDER FARMERS IN GHANA

## Open Data for Developing Economies Case Studies

## SUMMARY

Smallholder farmers generate much of Ghana's agricultural production. However, they have only limited access to important information that underlies increasingly complex global food chains, and this prevents them from fully maximizing the value of their crops. Esoko, a company operating in Ghana, sought to address this problem by using multiple data sources, including open gov

ernment data, to permit farmers to secure better prices for their produce and level the playing field in price negotiations between farmers and buyers. The provision of information to smallholder farmers is being replicated by Esoko in other developing countries, and new organizations are entering the market to provide similar services to smallholder farmers.



## CONTEXT AND BACKGROUND

### PROBLEM FOCUS/COUNTRY CONTEXT

As global agricultural value chain continues to grow in importance. This is especially true for many developing countries, where a larger proportion of the workforce and economy are reliant on the agriculture sector.

Africa loses billions of dollars due to its inability to produce enough and process its agricultural commodities. In its 2014 report, the Africa Progress Panel, an NGO advocated for sustainable development chaired by Kofi Annan, estimates that Africa spends US\$35 billion per year on food imports. Connecting farm production, processing and distribution could introduce vari-

ous efficiencies into the value chain, in the process creating numerous jobs and lifting millions of Africans out of poverty.<sup>1</sup>

The importance of agriculture is only likely to increase in coming decades. According to the World Bank, global food demand is set to double by 2050, and Africa's agriculture and agribusiness markets could reach US\$1 trillion in 2030 (World Bank 2013).<sup>2</sup> Ghana could potentially be one of the key beneficiaries of this process, given that, according to the Food and Agriculture Organization of the UN, over 53 percent of the Ghanaian workforce is in the ag-

1 Africa Progress Panel, *Grain Fish Money: Financing Africa's green and blue revolutions*. Africa Progress Panel, 2014, [http://app-cdn.acwupload.co.uk/wp-content/uploads/2014/05/APP\\_APR2014\\_24june.pdf](http://app-cdn.acwupload.co.uk/wp-content/uploads/2014/05/APP_APR2014_24june.pdf).

2 World Bank, *Growing Africa: Unlocking the Potential of Agribusiness*. Washington DC: World Bank, 2013, <http://siteresources.worldbank.org/INTAFRICA/Resources/africa-agribusiness-report-2013.pdf>.

riculture sector.<sup>3</sup> The country had made some progress in recent years: Ghana is one of a few African countries to have achieved its Millennium Development Goal (MDG) hunger reduction target as well as the World Food Summit goal of halving the absolute number of hungry in the country by 2015. The Government of Ghana is currently elaborating a long-term national development plan to steer the country through the next 40 years.<sup>4</sup>

Yet if Ghana—and Africa more generally—is to build on this success, the agriculture sector will have to undergo certain changes. As global food and agriculture chains become increasingly complex and information-driven, there is a need for new, innovative approaches that can

adapt to the complexity. Agricultural methods will need to become more information-driven, more adaptable to new trends in technology, and more resilient to withstand climate change. Small landholders, in particular, will need support as they move toward a new agriculture paradigm. According to the International Fund for Agricultural Development (IFAD), there are more than 500 million smallholder farms globally that produce about 80 percent of the food consumed in Asia and sub-Saharan Africa (IFAD 2013).<sup>5</sup> This suggests the vital importance of programs and tools—such as the one under study here—that help smallholder farmers adapt. Their viability is particularly important in Ghana, where the production of key crops like coffee and cocoa is dominated by smallholders.

## TECHNOLOGY, OPEN DATA AND AGRICULTURE

Technology is already being used in several instances to help African farmers make better decisions and make meaningful forays into national and/or global value chains. For example, in Kenya, the SMS information provision app mFARM gives farmers important evidence to inform decision-making. In Nigeria, the Hello Tractor service is an Uber-like tractor-on-demand service. In Ghana, the USAID Feed the Future Program is working to implement technology-driven efforts to improve competitiveness, sustainability and the transfer of research insights into practice.<sup>6</sup>

But while such applications and services can create new value, they could also lead to the creation of data monopolies and information asymmetries that may ultimately hurt or otherwise limit the potential of African agriculture. The economic concept of asymmetric information is that there is an imbalance of power in a transaction when one party has access to more information than the other.<sup>7</sup> This results in buyers not being able to bid as much or in sellers not knowing how to price a commodity. Open data can play an important role in breaking down

3 Food and Agriculture Organization, “Ghana: Country Fact Sheet on Food and Agriculture Policy Trends,” FAO, March 2015, <http://www.fao.org/3/a-i4490e.pdf>.

4 Food and Agriculture Organization, *Ghana and FAO: Partnering for agricultural development and resilient livelihoods*, 2016, <http://www.fao.org/3/a-az484e.pdf>.

5 International Fund for Agricultural Development (IFAD), *Smallholders, Food Security, and the Environment*, IFAD/UNEP, <https://www.ifad.org/documents/10180/666cac24-14b6-43c2-876d-9c2d1f01d5dd>.

6 Feed the Future, “Fact Sheet: Feed the future USAID agriculture technology transfer project,” IFDC, 2014, <https://ifdc-org.files.wordpress.com/2014/12/att-factsheet.pdf>.

7 D. Kleine, A. Light and M.J. Montero, “Signifiers of the Life We Value? Considering human development, technologies and fair trade from the perspective of the capabilities approach,” *Information Technology for Development*, 18, no.1, pp. 42-60.

such asymmetries of information. It can do so, for example, by introducing greater transparency in agricultural value chains, in the process making actors in those value chains more accountable to attentive citizens, civil society organizations, and to others, including farmers.

Open data also makes possible the entry into agricultural ecosystems of a larger number of intermediaries, adding both complexity and new value propositions to value chains. Research has shown that open data “intermediaries are vital to both the supply and the use of open data ... Intermediaries can create data, articulate demands for data, and help translate open data visions from political leaders into effective implementations.”<sup>8</sup> Research that delved deeper into how open data intermediaries are able to link actors in data supply chains found that “intermediation does not only consist of a single agent facilitating the flow of data in an

open data supply chain; multiple intermediaries may operate in an open data supply chain, and the presence of multiple intermediaries may increase the probability of use (and impact) because no single intermediary is likely to possess all the types of capital required to unlock the full value of the transaction between the provider and the user.”<sup>9</sup>

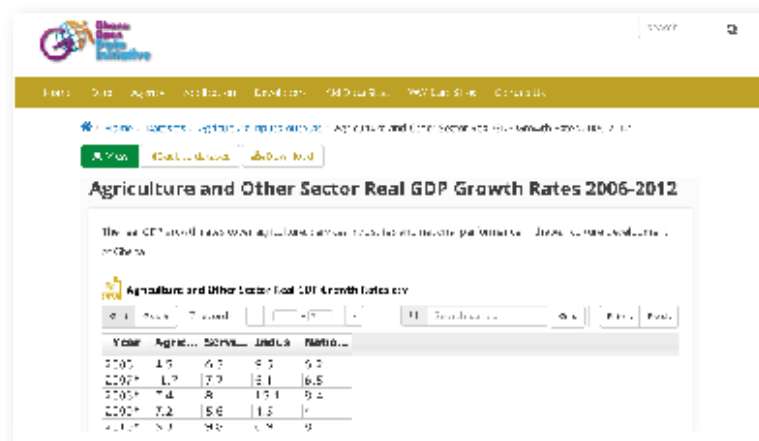
A growing international consensus regarding the potential of open data in agriculture is evidenced by the Global Open Data for Agriculture & Nutrition (GODAN) initiative, which brings together nearly 500 governments, NGOs and businesses seeking “to harness the growing volume of data generated by new technologies to solve long-standing problems and to benefit farmers and the health of consumers.”<sup>10</sup> Also, in this series of case studies, we examine the use of open data to benefit smallholder farmers in Colombia through the Aclímate Colombia initiative.<sup>11</sup>

8 T. Davies, *Open Data in Developing Countries: Emerging insights from phase 1*, Washington DC: World Wide Web Foundation, 2014, <http://www.opendataresearch.org/sites/default/files/publications/Phase%201%20-%20Synthesis%20-%20Full%20Report-print.pdf>.

9 F. Van Schalkwyk, et al., “Open Data Intermediaries in Developing Countries,” *Journal of Community Informatics*, 12, no. 2, 2016, <http://ci-journal.net/index.php/ciej/article/view/1146>.

10 <http://www.godan.info/about>

11 Andrew Young and Stefaan Verhulst, “Aclímate Colombia—Open Data to Improve Agricultural Resiliency,” Open Data’s Impact, **DATE TBD** <http://odimpact.org/case-aclimate-colombia.html>.



(data.gov.gh)

## OPEN DATA IN GHANA

Ghana, along with Kenya, was one of the early pioneers of open data on the African continent. The Ghana Open Data Portal was launched in November 2012, as a result of a partnership between the Web Foundation, National Information and Technology Agency (NITA), and a number of civil society organizations within the country.<sup>12</sup> The portal launched with 100 datasets available, and a mobile version was released the next year.

Unfortunately, this early success has dampened in some ways. The most recent Open Data Barometer Survey shows a deterioration in the implementation of government open data initiatives relative to Kenya and other African countries such as Mauritius, Nigeria and Rwanda. However, this is mainly attributable to the government open data portal being inac-

cessible for an extended period of time.<sup>13</sup>

Neither the Open Data Barometer nor the Global Open Data Index has published data on the availability of open data related specifically to agriculture (e.g., weather data or market price data). Currently, the Ghana Open Data portal<sup>14</sup> makes available six datasets in the “Agriculture” category. These relate mainly to financial or economic data from the agricultural sector. The Ghana Statistical Office, CountrySTAT,<sup>15</sup> an initiative to aggregate and increase the interoperability of datasets, also publishes statistical data and metadata on food and agriculture from different sources. In addition, the Ministry of Food and Agriculture publishes data on average crop yields for major crops, production estimates and weekly market prices.<sup>16</sup>

12 World Wide Web Foundation, “Ghana Open Data Initiative,” <http://webfoundation.org/our-work/projects/ghana-open-data-initiative-godi/>.

13 The portal might have been done as a result of extended maintenance in preparation for a revamped new offering, but when the Barometer assessment was being conducted no explanation was made available for the outage – so even if the outage was the result of ultimately beneficial work, trust in the platform and Ghanaian open data more generally likely suffered. World Wide Web Foundation, *Open Data Barometer 3rd Edition: Africa Regional Report*, 2016, <http://opendatabarometer.org/3rdedition/regional-report/africa/>

14 Website of Uganda Open Data Initiative, <http://data.gov.gh/>.

15 CountrySTAT, “Ghana,” <http://www.countrystat.org/home.aspx?c=GHA>.

16 Website of the Ministry of Food and Agriculture, Republic of Ghana, <http://mofa.gov.gh/site/>; and for data on weekly market prices, see [http://mofa.gov.gh/site/?page\\_id=13613](http://mofa.gov.gh/site/?page_id=13613).

## KEY ACTORS

### KEY DATA PROVIDERS

Overall, data sourcing by Esoko is structurally complex: open and proprietary data, some self-generated and some from third-parties, are curated and combined to provide information to customers.

#### **Government of Ghana**

The Ministry of Food and Agriculture (MOFA) is the primary government source of data. MOFA publishes data on crop yields, production estimates and market prices. Even though agricultural data are obtained from government, the data are extensively curated by Esoko. Curation activities include the structuring of the data, its packaging, and its translation into local languages.

#### **Center for Agriculture and BioSciences International (CABI)**

An additional source of data is CABI, an international not-for-profit organization. CABI has an extensive repository of information on agricultural issues like invasive species, food security and trade.

#### **aWhere**

Esoko is a client of aWhere, an agricultural intelligence firm. It accesses aWhere's weather data via an API service. Esoko translates daily data as well as an eight-day forecast into relevant and accessible weather updates for farmers. Farmers receive information on precipitation, temperature, wind speed, humidity and growing degree days.

#### **Markets and Farmers**

Although a portion of the data sourced by Esoko is open, the company also collects its own data. Esoko actively collects data from farmers that may be of interest to agencies

and businesses in the agri-sector. In addition, Esoko deploys its own agents in the field to collect price data in about 50 markets in Ghana (some of these agents are in fact employees of the Ministry of Food and Agriculture).<sup>17</sup>

### KEY DATA USERS AND INTERMEDIARIES

#### **Esoko**

Esoko is a for-profit private company with private investors, although it should be noted that the company maintains close ties to the public and foreign donor sectors. Managed from its head office in the capital city of Accra, Ghana, Esoko's principal market is agri-business, while individual farmers constitute a secondary market.

### KEY BENEFICIARIES

#### **Farmers in Ghana**

The principal objective of Esoko has always been to empower smallholder farmers to make farming more profitable. As the company's website states: "Though we'll geek out any day about supply chain efficiencies and organizational cost savings, we live for the human part of this work."<sup>18</sup>

#### **Esoko's clients**

In fact, however, smallholder farmers constitute a secondary market for Esoko. In order to develop a more sustainable business model, and because the acquisition of individual farmers is expensive, Esoko principally targets larger agri-business, NGOs, governments and mobile operators with its data collection and communication products. This allows the company to generate additional revenues, and its mixed business model (targeting both large and small customers) is in many ways critical to its survival and success.

17 These data are validated by the Council for Scientific and Industrial Research (CSIR).

18 Website of Esoko, <https://esoko.com/about-us/our-story/>.



# PROJECT DESCRIPTION

## INITIATION OF THE OPEN DATA ACTIVITY

The origins of Esoko may be traced to TradeNet, a company that was created in 2004 in Uganda, in partnership with FoodNet and with support from the Food and Agriculture Organization of the United Nations (FAO). In 2005, TradeNet entered into the network of regional Market Information Systems and Traders Organizations of West Africa (MISTOWA) project, which seeks to better coordinate regional efforts around the creation, dissemination and use of agriculture and food-security information.

In 2009, Esoko emerged from TradeNet, with the aim of providing a richer and more comprehensive product. One of the key motivating factors in the creation of the company was an identified gap or market failure in the Ugandan agrarian ecosystem. Esoko's founders realized that while information concerning market prices did exist in Uganda, farmers were often unable to access to the information. TradeNet originally tried to bridge this gap by connecting farmers to the available data by means of mobile-phone technology.

Esoko has sought to address similar shortcomings in Ghana. On the one hand, Ghanaian farmers were actively seeking information concerning market prices and weather (in particular, data on rainfall); unable to retrieve such information, they often traded their produce at low prices and were vulnerable to climate variations. On the other hand, the information did in fact exist at a governmental level and from other sources. However, the government 'extension agents' tasked with conveying this type of information to farmers were inefficient and

costly. Consequently, Esoko emerged to bridge the gap by connecting farmers to the available information they required.

Currently, there are two main branches of Esoko in Africa, one located in Ghana and one in Kenya. Even though the offices in Ghana and Kenya function under the name Esoko and provide similar products, they constitute two distinct operations managing the two respective markets. In addition, there are resellers and offices in Mauritius, Malawi, Uganda, Mozambique and Benin.

Esoko's main offering to farmers includes automated alerts containing agrarian and economic information, sent to cellphones in the form of SMS and voice messages. The products offered include information on market prices (58 commodities in 42 markets countrywide, collected at markets daily), weather forecasts, crop price bids, and crop production protocols. Esoko also developed the first call center (called Helpline) for farmers in Ghana to improve communication and usability of the provided information. The messaging and call centers operate in English and 12 local languages (Dagbani, Mampruli, Twi, Kusaal, Frafra, Sissali, Dagaari, Wali, Ewe, Ga, Fante and Hausa). Esoko's non-mobile products include deployment support for surveys in the field (e.g., the deployment of the company's own agents), strategic planning and field training. While farmers do use these services, they are mostly directed at agri-business clients.



Most products offered by Esoko use mobile technology. In addition to its information products, it offers a number of B2B products aimed at larger, paying customers. These include marketing products, monitoring and evalua-

tion products, as well as goods sourcing products. These products can take the form of bulk messaging, SMS polling, call center monitoring and call surveys.

## FUNDING

The founder and the first CEO of Esoko was Mark Davies. Investors, who provided the bulk of the capital, were the International Finance Corporation, the Soros Economic Development Fund, Lundin Foundation, and Acumen.

Currently, Esoko relies on a mix of donor funding and self-generated revenue from the products and services it has developed for agri-businesses, NGOs, governments and mobile operators.



## DEMAND AND SUPPLY OF DATA TYPE(S) AND SOURCES

As mentioned, Esoko was born from Ghanaian farmers' need for data on market prices and weather to help inform planting and other market-related decisions. Esoko sources this data from a variety of data suppliers, including the

government, international NGOs and agri-data companies such as aWhere. Esoko Ghana also collects its own data from about 50 markets in Ghana and directly from farmers.

## OPEN DATA USE

Esoko's offerings and pricing models rely on a combination of data sources and types. Its services are based on a tiered franchise/subscriber model in several sub-Saharan countries, including Ghana, Burkina Faso, Cote d'Ivoire

and Malawi.<sup>19</sup> The company's SMS price alerts, monitoring capabilities and information system management products are all made possible by the use of open government data.

<sup>19</sup> U.S. Agency for International Development, "Using ICT to Provide Agriculture Market Price Information in Africa," Briefing Paper, 2010.

# IMPACT

As with the other case studies included in this series, the impact of Esoko can be measured in a number of different ways, using a variety of quantitative and qualitative information. These include:

## USAGE STATISTICS

According to its website, Esoko has reached 350,000 farmers in 10 countries across Africa. It has sent 9.5 million messages on one million prices in 170 markets collected by 150 field agents. In 2014, Esoko operated 29,344 calls in Ghana, of which 40 percent were related to weather data. Although usage is not always a perfect proxy for impact, the breadth of use and interest in Esoko's offerings is clearly evident, and points to real usefulness for the company's intended audience.

## IMPROVED BARGAINING POWER

A key goal of Esoko is to help farmers better navigate the complexity of global value chains, and in particular to improve their bargaining power versus some of the large, global actors in those chains. Although there have been no widespread studies of the value and impact of Esoko's service, the company has done some targeted surveys of farmers who have reported being able to negotiate prices more confidently and sell their harvests in more distant markets.<sup>20</sup>

One empirical research study on the impact of Esoko's market price information was conducted by Pierre Courois and Julie Subervie for the *American Journal of Agricultural Economics*.<sup>21</sup> Courois and Subervie set out to establish how price information affects the balance of power in the bargaining of prices. They found that farmers typically sell to traders at the farm gate rather than at district markets because of high transportation costs, and are thus at a disadvantage when negotiating prices because they are unaware of what prices are available in markets. The study also found that Northern Ghanaian farmers who are clients of Esoko were able to negotiate better prices for their produce. Specifically, farmers receiving market price information from Esoko received 10 percent more for maize and 7 percent more for groundnuts than those farmers who were not receiving the market price information.

## VALUE CHAIN TRANSPARENCY

One important effect of Esoko's activities as an intermediary in the agricultural ecosystem is to increase the transparency of the value chain. Farmers are able to compare prices at various markets in the country, and compare prices to those offered to them by traders at the farm gate. They can also better recognize the structure and the roles of other agents involved in the food production system. As a result, farmers can negotiate higher prices and discover entirely new markets—in short, they can trade more effectively. This transparency also affects the activities of other agents in the ecosys-

20 U.S. Agency for International Development, "Using ICT to Provide Agriculture Market Price Information in Africa," Briefing Paper, 2010.

21 Pierre Courois and Julie Subervie, "Farmer Bargaining Power and Market Information Services," *American Journal of Agricultural Economics*, 97, No. 3, pp. 953-977, 2014, <http://ajae.oxfordjournals.org/content/97/3/953>.

tem. For instance, being aware of farmers’ understanding of the ecosystem, traders modify their own bargaining and trading strategies. Because all actors are more aware of each others’ positions in the ecosystem, the net result is greater transparency.

## SEEDING THE ECOSYSTEM

According to Andrason and van Schalkwyk,<sup>22</sup> Esoko, along with similar intermediaries such as Farmerline, have stimulated the emergence of new niches in the local information and communication technology (ICT) ecosystem. At least four new (albeit interconnected) niches are identified in the study:

First, the presence of Esoko has created room for additional research and thus the need for companies dedicated to agro-data capture and processing. Esoko seeks data that goes beyond what is currently available or provided directly from open sources present in the ecosystem. That is, it generates a need for experts, data collectors and data processing personnel.

## RISKS

Open data offers tremendous opportunities, but also carries certain risks. As with all the case studies included in this series, it is important to balance the potential rewards with the challenges and pitfalls that may also arise as a result of new and potentially disruptive technological interventions.

Second, Esoko creates a demand for a range of educational and training organizations that can interact with individuals and communities.

Third, Esoko contributes to technological innovation. By discovering more efficient means of conveying information and connecting agents in the ecosystem, it creates an additional need for technical personnel, for instance programmers and mobile-phone specialists. In fact, the efficiency of the services offered by Esoko may also contribute to a more rapid development of the mobile phone sector.

Fourth, the emergence of Esoko enables a more adequate use or even a reuse (or relocation) of elements already present in the ecosystem. To be precise, the previously mentioned government extension agents—relatively ineffective in the traditional framework—have seen their roles and objectives reframed to ensure they are better targeted to the real-world needs and opportunities. This relocation has turned out to be successful and beneficial both for these agents themselves and for the data flow.

## MARGINAL SHORT-TERM GAINS MAY JEOPARDIZE FUTURE BENEFITS

The success of Esoko depends in many ways on balancing short-term and long-term benefits. The risk exists that some farmers may decide that information helping them accrue a 7 to 10 percent increase in farm-gate prices is insufficient to compensate for the cost of subscribing

<sup>22</sup> Alex Andrason and François van Schalkwyk, *Open Data Intermediaries in the Agriculture Sector in Ghana*, Research Paper, Washington DC: World Wide Web Foundation, 2016, <http://webfoundation.org/docs/2016/12/WF-RP-Open-Data-Intermediaries-in-Agriculture-Ghana-Update.pdf>.

to the market price information service. Should they elect to discontinue their subscription, they may lose out on the future benefits that could accrue from new information made available by Esoko.

There does exist some evidence that non-governmental organizations subsidize the subscription costs of farmers and this lowers the risk of losing out on future benefits. However, the role of NGOs introduces secondary risks: (1) farmers rely on an organization type that in itself does not have sustainable income and may therefore have to discontinue the subsidy scheme at some point, and (2) aggregating access via NGOs may unintentionally exclude some farmers who may not be aware of, or have access to, these NGOs.

### **NEW FORMS OF BARGAINING EMERGE THAT NEGATE THE BENEFITS THAT SOME FARMERS ENJOY**

Courtois and Subervie acknowledge the possible risk that the availability of market price information is not uniform. That is, some farming communities, especially larger or otherwise privileged ones, may be informed while others are not. They describe the following scenario:

“Specifically, he [the trader] should seek to deal in uninformed communities when the market price is high, because in that case uninformed farmers, who systematically make incorrect estimates of the market price, agree to accept relatively low prices. On the contrary, the trader should visit informed communities when the market price is low, because it allows him to avoid costly negotiation failures.”<sup>23</sup>

Such a scenario does not necessarily correct the pricing information asymmetry in a food supply chain.

### **PERSONAL DATA**

Esoko collects personally identifiable data from farmers and repackages and sells this data to the agribusiness sector. Details on the levels of aggregation and anonymization of personal data collected and shared could not be found. However, the risk remains that either Esoko or its clients (or both) may use personal data to target smallholder farmers and that any misuse of personal data in this way could damage any trust that may currently exist between smallholder farmers and Esoko. This, in turn, could reduce usage of the Esoko platform in general, and more generally lower trust in and usage of open data products.

23 Pierre Courtois and Julie Subervie, “Farmer Bargaining Power and Market Information Services,” *American Journal of Agricultural Economics*, 97, No. 3, pp. 953-977, 2014, <http://ajae.oxfordjournals.org/content/97/3/953>.

# LESSONS LEARNED

Lessons learned can be broadly divided into Enablers (positive lessons) and Barriers (negative lessons). Both types of lessons are import-

ant in assessing the success of the project, and more generally in assessing the potential and feasibility of other open data products.

## ENABLERS

### EXISTING MARKET FAILURES

Esoko came into being due to a propitious combination of phenomena: an inefficient agricultural information and support delivery system (extension agents); pervasive and relatively low-cost communication technologies (mobile phones/SMS); and the availability of data combined with the ongoing demand from farmers for relevant agricultural information. All these factors together created a market failure and thus a genuine opportunity, or niche, that could be occupied by an organization such as Esoko. Organizations seeking to develop similarly successful open data projects may therefore consider beginning by trying to identify similar market failures and niches.

### MULTI-TIER BUSINESS MODEL

A further enabler was Esoko's business model of providing low-cost, affordable services to smallholder farmers and targeting established agriculture organizations to generate sufficient income to establish itself as a viable business. This mixed revenue model has enabled more farmers to access Esoko's services. It also allows Esoko to collect its own market price data (which is of value to farmers) because it can resell this data as information not only to farmers but also to its business clients.

## EMERGING ECOSYSTEM

Esoko is operating in a maturing ICT for agriculture ecosystem. As research by Andrason and van Schalkwyk shows,<sup>24</sup> there are at least two other players operating in the same space as Esoko: Farmerline and CacaoLink, both data-driven agriculture businesses seeking to benefit farmers across many African countries. Each of these organizations has been careful to differentiate its particular niche in the Ghanaian agricultural market, but their presence is nevertheless indicative of a maturing data ecosystem.

## BARRIERS

Despite its relative success, Esoko faces four main challenges: deployment costs, infrastructure reliability, information quality on the supply side and information quality on the demand side.

**Costs:** As far as costs are concerned, deployment constitutes the bulk of Esoko’s expenses (95 percent) while the actual technology only contributes a small amount (5 percent). The costs of deployment place limits on the extent to which Esoko can provide free and equal access to its information products.

**Infrastructure Reliability:** In terms of infrastructure, the access to mobile network infrastructure is at times difficult, restricting Esoko’s ability to provide a reliable, real-time service to its customers. An unreliable supply of electricity places a similar burden on Esoko’s operations.

Lastly, Esoko was endowed with an effective constellation of “capitals”—mainly economic and social—that enabled it to exploit the niche that presented itself. Specifically, reliable funding at the outset, a strong B2B model, connections to a network of likeminded organizations and a technically proficient team positioned Esoko for success. The lesson is clear: Not all actors are equal in the ecosystem, and only some possess the requisite capital to make the most of the niches that open up in an ecosystem.<sup>25</sup>

**Supply-Side Information Quality:** The quality and timeliness of data received from the government’s Ministry of Food and Agriculture can also be an issue. While the government published open data on agriculture more regularly and more frequently in the past, it does not appear to be able to sustain the publication of relevant and timely data. At the time of writing, for example, the most recent published data on market prices was for the first week of June 2014.<sup>26</sup>

**Demand-Side Information Quality:** Certain information provided by Esoko can also be difficult for farmers to understand, and this limits the usability and the potential impact of the information provided. While Esoko does provide telephonic support in local languages to help farmers use the data, providing information in formats that smallholder farmers can understand remains an ongoing challenge.

24 Alex Andrason and François van Schalkwyk, *Open Data Intermediaries in the Agriculture Sector in Ghana*, Research Paper, Washington DC: World Wide Web Foundation, 2016, <http://webfoundation.org/docs/2016/12/WF-RP-Open-Data-Intermediaries-in-Agriculture-Ghana-Update.pdf>.

25 Ibid.

26 Ministry of Food and Agriculture, Republic of Ghana, “Weekly Market Prices of Food Commodities,” [http://mofa.gov.gh/site/?page\\_id=13613](http://mofa.gov.gh/site/?page_id=13613).



## LOOKING FORWARD

The fact that Esoko currently operates in a number of African countries is indicative of the replicability of its product. In addition, the existence of other organizations (e.g., Farmerline) offering similar products and services in Ghana suggests the existence of genuine market opportunities in the local ICT ecosystem, and perhaps a sustainable business climate for open data projects. As more data sources become available, and as the needs of smallholder farmers evolve, it seems likely that new information products that rely on data will enter the market, and that value chain transparency will continue to change how prices are negotiated in the agricultural sector.

## CONCLUSION

This case study on the use of open data in the agricultural sector in Ghana offers one of the few instances where solid empirical evidence is available to support claims of the positive impact of open data in developing countries. However, it is important to note that the empirical evidence provided by the cited Courtois and Subervie study relies on data collected in 2012. Similarly, while the study by Andrason and van Schalkwyk on open data intermedi-

Partnerships between data intermediaries and data owners may also evolve as both intermediaries and the data owners benefit from having access to better quality data. Already Esoko is working with the Ministry of Food and Agriculture to collect data on market prices. In this case, the Ministry has access to human resources in the form of extension officers and other staff that would be financially burdensome for Esoko to retain, while Esoko has the technology and expertise to collect, curate and disseminate the data.

aries in the agricultural sector is more recent, its findings are inhibited by limited access to primary source evidence from Esoko and from the smallholder farmers themselves. Therefore, while there is strong evidence that open data can make a positive contribution to development, additional research is required to build on and further validate the positive findings currently available, and to better understand the risks and barriers identified in this case study.