

## BRIEFING PAPER

# Measuring and evaluating socio-economic progress of smallholder farmers in formal agribusiness chains

October 2016

## 1. Why is measuring impact on farmer livelihoods both important and challenging?

The business case for supply chain sustainability has evolved significantly in recent years. An increasing number of agribusiness companies have realized the importance of incorporating sustainability requirements into their supply chain programs in order to secure their own brand value, manage legal, regulatory and reputational risks as well as foster product innovation and explore new markets.

While many companies have incorporated smallholder farmers into their supply chains, it remains difficult to access data on how trade is impacting these farmers' livelihoods. There is a dearth of empirical evidence on which trading practices and investment vehicles can best deliver development benefits to poor farmers while also strengthening commercial efficiency and stability.<sup>1</sup>

Tracking progress on sustainability and livelihood conditions at the farm and household level is challenging. Smallholder supply chains present complex social and economic questions relating to sustainability. They are characteristically diverse, containing many producers who may or may not keep written records and often include a wide range of farm sizes and livelihood statuses.

Companies are looking for cost-effective ways to measure sustainability to increase transparency about the impact of their supply chains and be better informed about when and where investment in sustainability initiatives is warranted and where it is not. This note describes some of the methodologies currently under development around measuring impact on farmer livelihoods within supply chain. It does not attempt to capture the full range of measurement methods used in poverty alleviation and rural development programs.

### What is Supply Chain Sustainability?

Supply chain sustainability is the management of environmental, social and economic impacts and the encouragement of good governance practices, throughout the lifecycles of goods and services. The objective of supply chain sustainability is long term viability of production, which can be achieved by ensuring long-term environmental, social and economic value for all stakeholders involved in bringing products and services to market

Through supply chain sustainability, companies protect the long-term viability of their business and secure a social license to operate.

## 2. The starting point for impact measurement: defining the purpose

There is a large range of assessment approaches in terms of their scope and precision. The options for measurement can be placed along a continuum from no measurement at all, to proxy or basic commercial metrics, towards a deep dive, rigorous impact assessment that is able to attribute change to a specific intervention. There are different costs, timeframes, and levels of robustness and credibility involved (see Figure 1).

The starting point for any company exploring the different options is to clarify the specific purpose of the assessment and the desired change. With a strong theory of change and a clear purpose and audience, learning questions will become apparent, which then determine the appropriate indicators to track. This process increases the likelihood that data collection will be useful and produce actionable results.

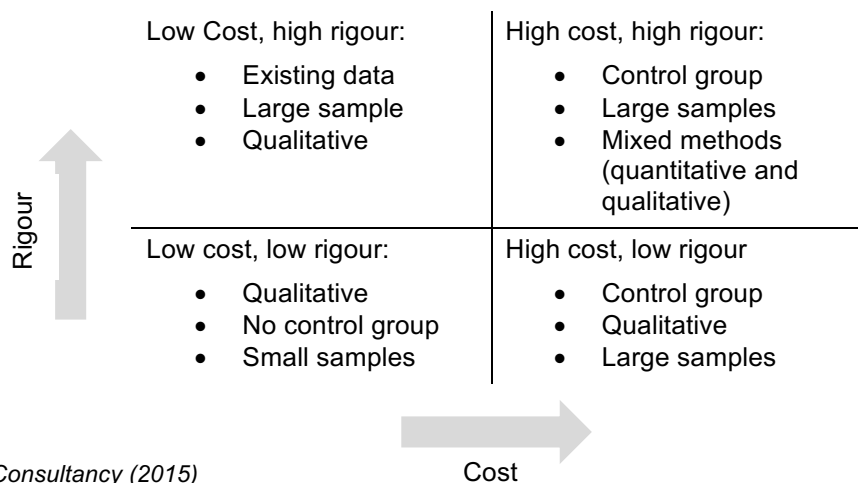
<sup>1</sup> <https://www.theguardian.com/sustainable-business/2016/aug/31/unilever-africa-farmers-inclusive-business-agrifood-development> 31 Aug 2016 and IIED Growing inclusion? Research Report, January 2015. [pubs.iied.org/pdfs/16563IIED.pdf](https://pubs.iied.org/pdfs/16563IIED.pdf)

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The purpose of measuring impact is strongly influenced by the context of the investment and its desired effect. For instance, a company that is part of a large donor-supported sustainability project to improve productivity and has a reporting requirement to the donor may choose and have access to resources to carry out a robust household level impact evaluation. However, that may be more difficult if a company were paying for the impact evaluation through core business funds.

It's likely that a company plays different roles in different projects which can alter the type of assessment carried out as well as any additional activities required to enable the assessment to take place and be effective. For instance, as the lead firm in one supply chain, with levels of subsidiary companies which deal more directly with producers, the focus may be on certification. Whereas in another supply chain, the same company may trade directly with a farmer organization and be better placed to collect additional farmer level data. In other contexts, where a company purchases crops from third parties who manage the entire supply chain, the supply chain would need to be mapped to understand the players and the relationships before carrying out an impact study.

Figure 1: Study types by categorisation of cost of implementation and scientific rigour



Source: Kuit Consultancy (2015)

### 3. What is being measured and how?

#### What indicators to use

In recent years, the focus of agribusiness has been on increasing farm productivity. Productivity gains among a diverse smallholder supply base can be difficult to measure given the cost of data collection, a lack of standardized metrics and questions of quality from farmer self-reported data. In addition, it is often assumed that higher yields lead automatically to increased incomes and improved livelihoods for farmers, and this is not necessarily the case. Measuring increases in yield alone do not take into account additional investments, both in cash and in labour, made to achieve higher productivity. The costs of additional investments may exceed the benefit of increased productivity for farmers, meaning there is no net benefit. Oversupply and market volatility, which drive down prices, also reduce income at producer level.

Some companies are shifting from a focus on productivity to profitability (see box). Profitability (or efficiency) can be measured on the main cash crop or the whole farm operation. Small farmers often have a diversified farming system, which includes both cash and food crops. In addition to farming, they

#### A tool to measure profitability

Measuring total household income in smallholder supply chains can be complicated, given the range of livelihood activities that one household can engage in and the challenges of recall, as well as the sensitivity (privacy) of income information.

The Sustainable Trade Initiative (IDH), with NewForesight, has developed a tool to help companies to gain insight into profitability at all levels of the supply chain, with particular emphasis on the farmer and service operator level. In the 10 models analysed, there was a large variety in the impact on farmer profitability: from 24% decrease to 364% increase. The average profitability increase was 57% over the 8 year period, which was a good result but will not be sufficient in some countries to keep smallholders in agriculture.

may also derive income from off-farm activities. Food crops play an important role in both the nutrition needs of a household, as well as potentially generating additional cash flow during the lean season. To adequately assess impact of farming on the household's economic viability, the entire farm and non-farm economic activities need to be taken into account.

The following metrics are central to assessing economic sustainability of a farming operation: Land area, household size, net incomes of key crops (revenue-costs), estimated value of self-consumed crops, and net off-farm income.

### **Context matters**

Sustainability, by definition, necessitates balancing social, environmental and economic factors. An oversimplification of sustainability, by prioritizing economic factors takes a short term perspective and risks the omission of key factors that can compromise long term viability of projects, investments, and reputation.

For example, if yields are increased by clear-cutting a forest, which results in soil erosion and silted waterways, this is unlikely to lead to a sustainable outcome. Improving incomes may benefit the farming household as a whole, but income and expenditures may not be equitably controlled or distributed among household members, especially women.

Economic metrics should therefore be both understood and interpreted in a broader social and environmental context. A multi-dimensional view of sustainability would include measurement of the following impact areas: livelihoods, gender, environmental performance, farm productivity, access to services and trading relationships.

### **Different types of data collection system**

Broadly speaking there are three main types of data collection system in use:

- Commercial systems - these capture basic information on trade flows, volumes, prices, qualities and sometimes future crop expectations.
- Internal Control systems - these are often added on top of commercial systems and tend to cover basic household and farm information such as: farm size (estimated, or GPS measured), location, household size, education level, yield estimates, number of trainings received, and level of compliance with one or more certification standard(s).
- Surveys, deep-dive studies, case studies - these deal with a small sample size of the supply base, but provide a much greater level of detail. Such surveys tend to be donor-driven and contracted to third party researchers, although some companies conduct their own research.

Surveys, deep-dive studies and case studies can be assigned to three categories when comparing cost of implementation and scientific rigour:

- Case studies, qualitative surveys - cost savings are achieved by using a small sample size, rigour suffers as control groups are not used and sample sizes tend to be too small to be considered representative. Usually a single measurement is taken.
- Qualitative surveys - sample sizes can be larger, control groups may be used, but not per definition. Cost is contained by not relying on advanced statistical modelling and pairing of comparable farmers in control and treatment groups.
- Deep-dive impact assessments - if properly done these types of studies provide the best insight in causal relations of project interventions and observed effects. Larger, representative samples are used. By taking multiple measurements over time change can be observed. The use of control groups allows change to be attributed to project interventions. Cost is driven by sample size and the use of relatively expensive data analysts.

In an effort to reduce the costs, sample sizes, and the time needed to gather complete socioeconomic data, a number of newer and less detailed poverty assessment tools have been created (see section 4). Another way to make measurement affordable is by switching from deep dive studies that assess impact at a snapshot in time (and compare it to a baseline year), to measuring sustainability and progress in real time. More frequent monitoring allows the practitioner to build rapid information feedback loops in order to enable adaptive management,

experimentation and learning from evidence about what works when engaging with smallholder supply chains.

The lightweight data collection method known as Performance Measurement is designed to measure status (current stage of conditions) and track change over time. The goal of performance measurement is to provide modest (in scale, scope, and cost) approaches to measuring conditions and change that complement other more sophisticated impact measurement techniques. Performance measurement can be useful for a single study to measure current conditions of producers within a supply chain (such as average farm productivity at the farm level or average household revenue), and for repeated measurements of whether activities are being accomplished as expected, and whether the main outcomes are moving in the right direction. This approach can allow for some general analysis of correlation between the adoption of better management practices and specific outcomes e.g. crop yields, but is not rigorous enough to demonstrate attribution of outcomes. An example of this approach is the annual metrics collected by voluntary standards systems complemented by the rigorous, third party impact evaluations commissioned by ISEAL's Demonstrating and Improving Poverty Impacts project<sup>2</sup>.

#### 4. What are the different methodologies in use by agribusinesses to measure impact on smallholder farmers?

The following include examples of methodologies in use:

- **Progress Out of Poverty Index (PPI)**<sup>3</sup> – this was developed by Microfinance Risk Management L.L.C. and Grameen Foundation. It is a simple poverty assessment tool that collects objective information to determine household poverty levels. The PPI provides organizations with poverty information in terms of globally accepted international poverty lines and nationally recognized poverty lines. Organizations can understand if they are reaching populations living under the \$1.90 day/PPP or national poverty lines. If users continue to track poverty status over time, they can understand whether they are moving out of poverty.

The PPI tool has been assessed by both Committee on Sustainability Assessment (COSA) and the Sustainable Food Lab (SFL) for its suitability for use in agricultural supply chains. SFL carried out a pilot study of the PPI with the Kenyan Tea Development Authority. The test increased the SFL's confidence in the use of the PPI in agricultural value chains and raised some questions, such as whether the PPI can replace household income and asset questions in performance measurement surveys. COSA conducted a similar study in 2015 built on data from four projects in Mexico, Guatemala, Peru and Colombia. The findings supported the PPI's use in agricultural supply chains. In the studies, there was a strong negative correlation between net income from crops and the poverty rate calculated by the PPI, reinforcing expectations. There was also a clear relationship between the PPI and food security.

- **Farmer Field Books** – this methodology has been used in coffee and cocoa for over 15 years in around 10 countries covering thousands of farmers. It has been selected as the most capable farm data collection tool by the Sustainable Agriculture Initiative Platform<sup>4</sup>. Costs are reduced by focusing on a limited number of indicators and by using data that companies could collect themselves to support their project interventions.

The protocol is designed to answer questions on 4 impact/outcome areas: yield, farm income, diversification (the importance of main cash crop relative to other income sources) and loyalty (what share of production is a company able to buy). It is a sample based methodology that relies on self-reporting, as farmers keep track of their income/expenses and yield. There is a standard methodology for how farmers measure their yield to ensure consistency. The data are collected from farmers every two weeks and during the visit, guidance and oversight are provided to ensure accurate record keeping.

<sup>2</sup> <http://www.isealalliance.org/tag/demonstrating-and-improving-poverty-impacts-project>

<sup>3</sup> Progressoutofpoverty.org

<sup>4</sup> Sustainable Agriculture Initiative Platform is a **non-profit organization** to facilitate sharing, at precompetitive level, of knowledge and best practices throughout the food value chain

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Farmer Field Books are currently being tested in Ghana by Ecom Trading with support from IDH. Prorustica have integrated a similar approach within their “Farming as a Business” training with Tanzanian maize farmers.

The benefits of the approach for different stakeholders include:

- **Farmers:** carry out Profit & Loss statements, which gives them information on inputs, labour, costs, sales; in total and per ha or tree for their farm. This provides farmers with insight on costs, cost allocation, turnover and profits and enables farmers to optimise their investments.
  - **Farmer groups:** group reports are compiled and training is provided on how to interpret results and apply them to improve farm management. Farmers can compare themselves to peers and learn from each other.
  - **Companies:** company level analysis reports provide a better understanding of suppliers, the possibility to fine-tune crop forecasting, insight into effects of project interventions, insight into correlation between farming practices (pruning, weeding, etc.) and yield/income and comparison with other companies (anonymous if needed).
- **Rural Development Framework** - Nestlé sources material from over 4 million farmers across 50 countries and to ensure that sourcing takes place in a responsible and sustainable way, the company developed their Rural Development Framework (RDF). The RDF is a diagnostic tool which allows the company to develop an understanding of the status of smallholder farmers, farm workers and communities it sources from. This then allows the identification of interventions that will align business and social needs in order to ensure long term supply of raw materials and simultaneously deliver upon their ambition to create shared value.

A RDF baseline has been established in 11 markets since 2013, mainly in the coffee sector. The focus is on supply chain interventions, as well as wider contextual issues. Eight core areas have been identified as elements of successful rural development: farm economics, farmer knowledge and skills, farm workers, women’s empowerment, water & sanitation, nutrition, land & land tenure, and natural resources stewardship. The findings have now shaped a roadmap for the next few years for Nestlé’s work on rural development, both in terms of improving the RDF process itself and in designing national and global interventions.

The RDF was designed as a framework to be flexible enough to accommodate different business needs. In China the RDF helped the company to frame a study to understand better the needs of existing farmers in order to help build trust. In Myanmar where Nestlé does not have operations, the RDF exercise was about collecting a broad understanding of the current status and capabilities of farmers. In other countries such as Vietnam, Mexico and Côte d’Ivoire the RDF has helped to define strategy.

- **True Price** - True Pricing is a new business methodology that uses existing models of impact assessment to push the envelope further and improve transparency throughout the entire supply chain of a product by identifying and measuring hidden social and environmental costs. Using information on externalities<sup>5</sup> can enable companies to manage risks, steer innovations and improve the social and environmental impacts of their own operations and their supply chain. This methodology ultimately allows companies to restore trust and retain their licenses to operate.
- True Price, a social enterprise organization, carried out a study with IDH on the external costs of cocoa, coffee, cotton and tea. In the cocoa supply chain the analysis focused on smallholder cultivation in Ivory Coast and compared the external costs of conventional cocoa beans with certified cocoa beans. The results showed that the cultivation of smallholder cocoa has total external costs of €5.75/kg cocoa beans. Adding the external costs to the farm gate price

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<sup>5</sup> Externalities are the effects of economic activities and externalities that are valued and monetized are called external costs. These are costs caused by economic activities which are not reflected in the prices charged for the goods and services being provided. External costs can be environmental if they have a direct effect on the environment and as social costs if they have a direct effect on the well-being of people

(€1.35/kg cocoa beans) reveals a true price of €7.10/kg cocoa beans. The vast majority of the total external costs took place during cultivation (compared with processing and transportation) and were mainly social costs, particularly underpayment of workers. Certified farms had lower (16%) external costs than conventional cocoa mainly because of better social conditions (child labour and occupational accidents). The study showed that reducing the external costs of cocoa cultivation in Ivory Coast could be achieved by focusing interventions on i) increasing income and wages for farmers and workers, ii) reducing land degradation, iii) reducing child labour and iv) reducing forced labour.

- **Household Economy Approach (HEA)** is a method by which assets and livelihood classes can be understood across a farming population. It includes an analysis of: i) how people in different circumstances meet their basic needs; ii) their assets, the opportunities open to them and the constraints they face; and iii) the capacity to face shocks and crises. This approach has been used in certified supply chains by Rainforest Alliance and the Food Economy Group.<sup>6</sup>
- **Tailored Performance Measurement** – Many companies have adapted farm level surveys, which may include some of the methodologies mentioned above, and incorporated a standard set of periodic measures which are then taken on a subsample of farms on an annual or biannual basis. The Committee on Sustainability Assessment (COSA) is an example of a consortium that develops these approaches with companies. COSA's socio-economic indicators are employed in either direct farmer surveys or focus groups, and are tailored in their degree of robustness, depending on the context. The indicators include a range of revenue and cost metrics, combined with measures of economic risk and resilience.

### 5. Embedding livelihood measures in the supply chain

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Embedding a performance measurement program in the operations of a supply chain can provide key stakeholders with regular reporting of producer level data, which builds company information and knowledge over time and can directly influence management decisions around the effectiveness of sustainability strategy. Embedding the data collection in the chain may lead to opportunities for more frequent data collection than occasional collection efforts from outside the system.

In supply chains where there is little visibility, it can be hard to reach producers. There may not be enough traceability to determine which specific producers work within the identified supply chain, producers may be selling into multiple markets at once or there is a commodity exchange system. In these instances, embedding data collection within the supply chain is unlikely to be possible.

Where there is visibility into the chain, and producers are known, coordinated supply chain engagement is necessary in order to successfully embed the data collection in the business systems. Practitioners must work with those often in contact with the producers to understand their systems and the ways they work with smallholders in order to design an approach that does not place too much burden on one party.

Some opportunities for embedding data collection include coordinating it with:

- Training and extension services
- Data collection for certification audits
- Internal Control audits where farmers are organized in groups that have hired technical auditing staff
- Ongoing data collection that takes place when crops are delivered and farmers receive payment.

### 6. Shared approach to performance measurement

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<sup>6</sup> <http://www.heawebsite.org/about-household-economy-approach>

Sustainability can be tackled in a non-competitive space, where companies can share best practices and insights for greater impact, especially as it relates to farmer productivity and community development. Shared approaches have the potential to reduce costs significantly.

There are several initiatives taking place that are supporting collaborative efforts to ensure consistency and alignment of indicators to measure the short, medium, and long term outcomes of agriculture systems. For instance, The Committee on Sustainability Assessment (COSA) is a neutral and non-profit global consortium with a mission to accelerate sustainability in agriculture via the advancement of transparent and science-based assessments. Its objective is to provide practical measurement tools and to help interpret reliable data for firms, producers, and policymakers to better manage their efforts. ISEAL Alliance works to strengthen sustainability standards systems by developing codes of conduct and promoting standards as crucial tools to meet sustainability targets among business and government.

COSA, ISEAL Alliance and the Sustainable Food Lab are collaborating to promote a shared approach to performance measurement in situations where the same types of learning questions are being asked. A “shared approach” can be appropriate around the use of common indicators, metrics, survey questions and data collection methodology. This is an ongoing, iterative process and new studies are frequently being carried out to test indicators and metrics in smallholder chains. It is expected that collective understanding and agreement will evolve and improve over time.

## 7. CASE STUDY

### *SABMiller<sup>7</sup>: Impact Measurement Approach and Deep Dive in Uganda*

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#### **Why measure impacts in smallholder supply chains?**

For many years, SABMiller has relied on several agricultural supply chains, including local smallholder supply chains for sourcing its brewing crops such as barley, sorghum, cassava and maize among others. It has aimed to develop and work with these supply chains in a way which delivers commercial growth and positive socio-economic impacts for farmers and local communities.

Implementing systems to map local supply chains and measure impact on business metrics and farmer livelihoods is important to business because:

- **Visibility and transparency** – It provides business with an overview of which farmers are in their value chains, farmers’ demographics and location (e.g. via GPS mapping). Having this understanding is critical to building stronger and more secure supply chains. Greater visibility, transparency and communication with farmers’ drives improved practices and increased loyalty.
- **Understanding and improving farm-level performance** – Measurement is important to understand the level of adoption of good agricultural practices, yields, productivity and quality levels which is key to creating competitive supply chains
- **Understanding and enhancing livelihoods impacts** – A measurement system is required to help understand whether supply chains have resulted in positive social impacts for farmers and their families – in terms of increasing incomes, improving food security and creating opportunities for women. This is key to building security of supply and positioning farming as an attractive option for young people.
- **Communication and stakeholder engagement** – Having robust data and information enables a business to communicate its impacts to local governments and other relevant stakeholders. This helps build reputation and enhances licence to operate.

It is important to measure both commercial and social impact metrics and these are inextricably linked. For example, increased yields is directly related to improved farmer incomes and livelihoods (provided farmers have access to markets for increased production)

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<sup>7</sup> SABMiller plc was a FTSE 10 global fast moving consumer goods (FMCG) company and the second largest global brewer. On 10 October 2016, SABMiller was acquired by Anheuser-Busch InBev.

### Measurement Approach

SABMiller has adopted a two-fold approach towards measuring impact in agricultural value chains:

- **Systematised data collection and analysis** – SABMiller worked with the Bureau for Food and Agriculture Policy (BFAP), a non-profit organisation that provides independent research-based policy and market analyses, to develop a tailored, central repository of data collected from a variety of supply chains across a number of countries. The system has been piloted with barley farmers in Uganda and Tanzania with plans to support further roll-out across the business. The ultimate aim is to use this platform to facilitate two-way communication i.e. collecting data from farmers and facilitating outbound communication of relevant information back to farmers.
- **Deep-dive studies in specific markets** – The aim of carrying out deep-dive studies in selected markets is to: (i) understand in greater detail the socio-economic and livelihood impacts at farmer level and (ii) identify impact, challenges and gaps along the entire supply chain in order to optimise its effectiveness from a commercial and social perspective (see Uganda example)

### Background to the Uganda impact study

In 2002, Nile Breweries Limited (NBL), a subsidiary of SABMiller, launched Eagle Lager – a branded beer made with locally grown sorghum. Sorghum was widely grown for food consumption in Uganda but had never been commercialised. This pioneering approach required the establishment of a new supply chain: NBL worked with around 20,000 farmers, helped set up farmer associations and supported them with training on business skills and improved agronomic practices. NBL also launched several projects to support the socio-economic development of farming communities including access to water, scholarships and awareness on HIV/AIDs and health. As well as sorghum, NBL sources barley from around 4,000 farmers as a key ingredient for mainstream brands.

### Impact study methodology

In 2015, at the request of SABMiller plc and NBL, an independent study was carried out by the International Institute of Tropical Agriculture (IITA) to measure the impact of sorghum and barley supply chains on the livelihoods of farming communities, and to identify opportunities to further optimise these supply chains and to enhance social impact.

Interviews were carried out with a sample of 805 farmers (including control group) as well as other supply chain actors including aggregators and agents. A similar study had not been carried out before these supply chains were set up, therefore it was not possible to compare results against a baseline. However the researchers spoke to farmers to understand their perceptions of changes since joining the NBL supply chain and they interviewed a control group of 200 sorghum farmers (i.e. farmers not supplying NBL) in order to compare results. It was not possible to identify a control group for barley because nearly all barley farmers in these regions supply NBL.

Data was collected on a range of metrics, including access to markets, farmer productivity and incomes, net crop income and household income, crop profitability, adopting of farming practices, gender and women's empowerment, food security, post-harvest losses as well as the business relationships between different supply chain actors.

### Using insights to deliver against NBL objectives

The study generated valuable insights for NBL and its supply chain partners; including on access to markets; yields and incomes; food security; and gender. These are summarised in an annex to this paper.

NBL's key objectives include:

- maintaining competitiveness by improving productivity and quality



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- strengthening the company's licence to operate
- improving farmer livelihoods and incomes

These objectives were defined across internal departments, making it easier to prioritise which results will be taken forward and to identify possible solutions. NBL is now working with TechnoServe to use the insights from the impact study to define programmes and initiatives which will deliver against the above objectives. A quantified business case is under development as a basis for implementing these initiatives.

### Challenges in collecting impact data

- Resources to collect data on an ongoing basis, particularly in areas where extension capability is limited, both within the company as well as from public extension services.
- As deep dive studies are expensive and time consuming, they can only be carried out every few years and cannot be repeated annually.

### Key learnings from impact study approach

- The ability to carry out in-depth impact studies is dependent on the nature of the supply chain and the level of transparency. In Uganda, Nile Breweries had a relatively high level of visibility of the chain which included aggregators, agents and farmers. In other contexts, where a company purchases crops from third party suppliers, the supply chain would need to be mapped to understand the players and the relationships before carrying out an impact study.
- This impact study was funded by SABMiller, but in the future there may be opportunities for multiple organisations working with the same groups of farmers to share the cost of impact measurement. For instance, private sector and public sector stakeholders could align and collaborate on data collection in areas where they interact with the same farmers. Leveraging existing supply chain actors and/or partnerships could assist with sharing of resources, as well as sharing of findings.
- It is important that insights from an impact study are used to strategically inform supply chain development activities – including defining programmes and interventions, exploring partnership opportunities, identifying co-funding from other public or private sector organisations (e.g. donors, banks, input companies etc) and ensuring there is a strong business case for driving this forward.

## ANNEX 1

### *Examples of insights from the IITA impact study on NBL supply chains*

Summary of Finding	Learning
<p><b>Access to Markets –</b> Farmers supplying sorghum to NBL sell 96% of their crop compared to 17% of crop sold by the control group. These farmers also sell 62% of other crops grown compared to 21% for the control group, which means they are more commercialised in general. NBL barley farmers sell 76% of their crops.</p>	<p>Providing farmers with access to a secure market, coupled with training on business skills and agronomic practices, is critical to improving farmer incomes and livelihoods.</p>
<p><b>Yields and Incomes –</b> Sorghum yields on farms supplying NBL are higher than the control group (798 kg/acre</p>	<p>Once a market is available, increasing yields through adoption of good agricultural practices and appropriate use of inputs is a</p>

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<p>compared to 645 kg/acre). However there is a 34% gap compared to the average attainable sorghum yield of 1,200 kg/acre. Furthermore, it is estimated that 23% of sorghum is lost across the value chain after harvest.</p> <p>NBL barley farmers have an average yield of 1,059 kg/acre which is 40% lower than the average attainable yield of 1,740 kg/acre.</p> <p>87% and 71% of sorghum and barley farmers said they feel that household welfare has improved compared to before they supplied NBL. Total household income of NBL sorghum farmers (\$1,227) is more than double the total household income of the control group (\$507)</p>	<p>key factor in improving farmers' incomes and livelihoods.</p> <p>Good progress has been made, however yield gaps remain. There are opportunities to explore new approaches and partnerships to enhance delivery of training, for example by up-skilling the aggregators &amp; agents and empowering them to train farmers. Also it is important to explore opportunities to help facilitate access to finance (for inputs) and technology (for improved transparency, communication and data management) as enablers of yield improvements.</p> <p>Partnerships with relevant stakeholders (NGOs, technical assistance providers, government, financial institutions and technology companies) is key to delivering this.</p>
<p><b>Food Security</b> – Based on the food self-sufficiency ratio, the percentage of households who are food insecure is 12% and 16% of sorghum and barley households supplying NBL, compared to 36% for the control group. However farmers' perceptions of food insecurity are higher.</p>	<p>Various approaches are required to address the challenge of food security, including improving food availability (through increased production of food crops) and increasing incomes (through sale of cash crops)</p> <p>Food insecurity during 1-2 months could potentially be caused due to the lack of income-smoothing mechanisms which make it difficult for farmers to manage during non-harvest months. Savings schemes and other similar mechanisms could play a role in addressing this.</p>
<p><b>Gender and Women's Empowerment</b> – According to NBL data, an estimated 40% of the top ten farmer associations supplying NBL are led by women. However in most farming households, it is mostly men who participate in agricultural extension services and farmer groups while women's participation is relatively limited. The study found that sorghum earnings can increase from \$106 per acre to \$124 per acre when husband and wife allocate and manage plots together and both have access to agricultural training.</p>	<p>There are significant opportunities to further promote joint participation and decision-making by women and men in all aspects of crop production- from ensuring adequate women's representation within aggregators, agents and farmer groups to identifying how delivery models for training services can be made more suitable for women (e.g. female trainers, inviting men and women to trainings, suitability of timing and curriculum etc). It is important to understand the local context and culture so that any efforts towards gender mainstreaming are appropriate to local norms.</p>

### ANNEX 2

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