

Sustainable Supply Chain Investment: Is There Evidence to Support Keurig Green Mountain's Livelihoods Theory of Change?

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Abstract

Keurig Green Mountain makes significant investments into their coffee supply chain with the intended dual purpose of improving the livelihoods of the farmers who grow the coffee and stabilizing the long-term supply of quality product available to Keurig. The investments are made with various NGOs and NPOs across the globe as part of an overall strategy summarized in two internal documents known as the Theory of Change and Livelihoods Methodology. These two documents hypothesize the method with which investments in supply chain projects will lead to intermediate beneficial outcomes such as improved yield or quality and eventually to the desired impacts of improved farmer livelihoods and increased supply of quality coffee.

This practicum paper summarizes the results of research done to support the hypotheses behind the Theory of Change and Livelihoods Methodology documents. The work finds that the majority of the hypotheses hold true but that there are a few large gaps in studies, especially those showing that improving farmer livelihoods leads to increases in steady supply or other benefits for those who invested. The paper summarizes the gaps, highlights areas where Keurig should complete more research before further investment, and makes recommendations on various stakeholder communications and project tracking techniques. In conclusion, Keurig is in a unique position to show other for-profit businesses how improving livelihoods can ultimately benefit their bottom line by monitoring, recording, and publishing results of their supply chain investments.

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Introduction

The idea for this Master's practicum stems from the question: how can companies benefit from instilling sustainability in their supply chain? While this question is broad, this paper identifies a small space to investigate closely with an industry leader committed to improvement in sustainability. Preliminary research was conducted via companies' sustainability webpages and their annual sustainability reports. Most published similar focuses on carbon and waste reduction, but one company, in particular, rose to the top: Keurig Green Mountain (KGM).

KGM's sustainability report balanced the more typical sustainability goals and measurements with an interesting dialogue with the new CEO as well as details on large-expenditure supply chain projects. In the 2012 report, KGM split its reporting into three subcategories: resilient supply chain, sustainable products, and thriving people and communities. Within those sections, there were both CSR-usuals (waste, energy, emissions, and certification measurements) and a focus on the success of their entire value chain. The latter focus piqued my interest. Brian Kelly, the company's new CEO, mentioned that focusing on sustainability "ultimately will benefit our business too" (KGM, 2013). Also, Keurig Green Mountain dedicated a large section of the report to proactive efforts within their supply chain. The company spent \$10.5 million in 2012 on supply chain projects, mostly centered on farmer livelihoods. All of this led to the driving question behind the proposal here—how would these KGM investments "ultimately benefit" their business?

This initial question ignited a series of other questions about the sustainability report and the Monitoring and Evaluation Guide for Supply Chain Outreach Funded Projects (M&E Guide), which eventually led to the initial proposal to KGM:

- Why are you investing where you investing? How are you tracking it? Are there incentives?
- What does and does not work to alleviate poverty?
- What are the positive impacts you hope to achieve?
- If you wanted to measure the benefit to KGM—since this metric is not covered by the participatory guidelines of the M&E Guide—who would measure it and how?
- Why are you investing in sustainability and spending philanthropic dollars in these ways specifically?

These questions and others were proposed to Erb Institute alum Monique Oxender, Senior Director of Sustainability at Keurig Green Mountain. After discussing potential for a Master's Project and honing the project's focus, contact was handed off to Colleen Popkin, Senior Manager of Sustainability, and other members of her team. Colleen thereby introduced the KGM Supply Chain Investment Theory of Change.

KGM's Theory of Change is the visual representation of the company's theories around how their supply chain projects and investments achieve their strategic sustainability goals. The original document from Colleen is seen in Figure 1.

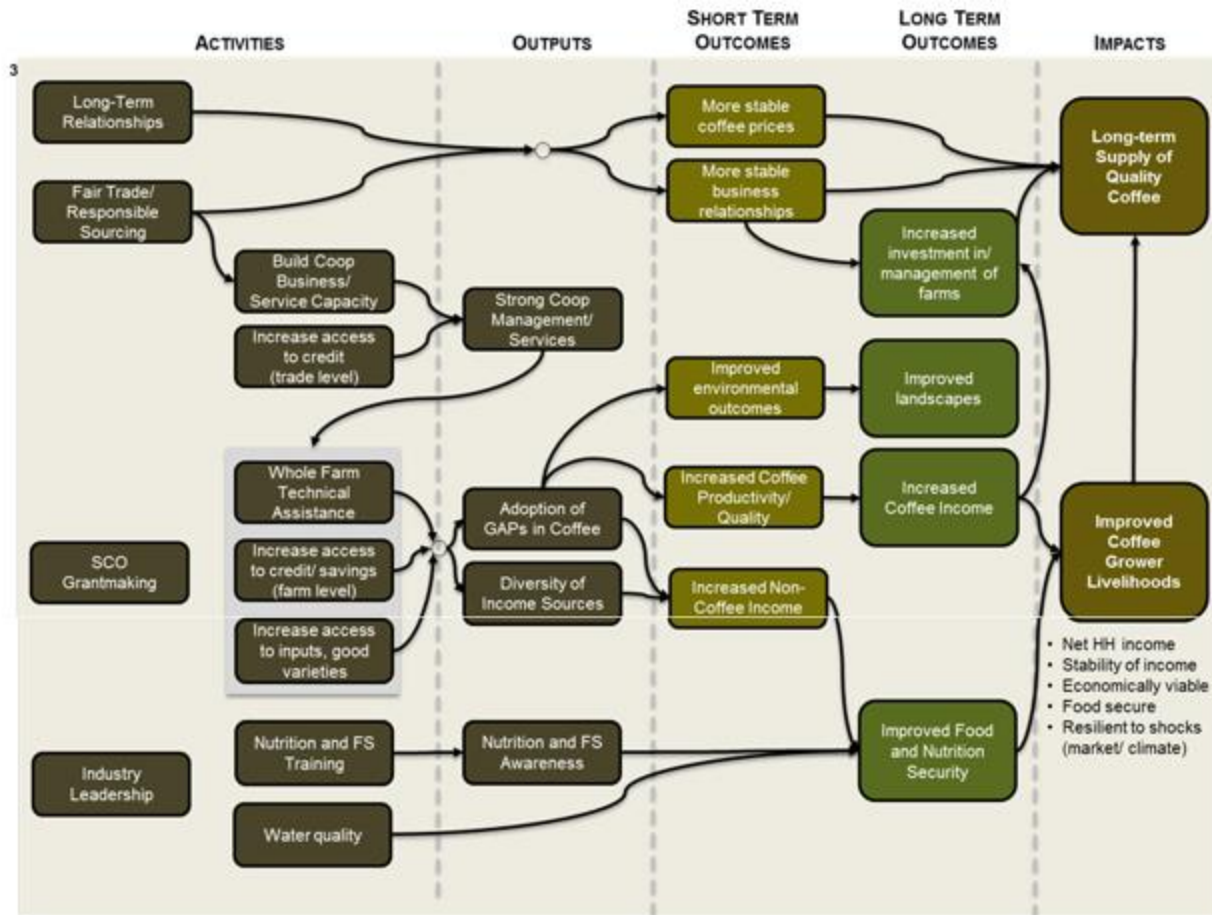


Figure 1. Green Mountain Coffee's Supply Chain Sustainability Investment Theory of Change

The document works as a set of hypotheses, working left to right from investment activities to outputs to outcomes and impacts. The most informative part of this document is the "Impacts" section since it defines KGM's continuing goals: Long-term Supply of Quality Coffee and Improved Coffee Grower Livelihoods. The former ties nicely to Brian Kelly's quote about sustainability and investment in the value chain ultimately being beneficial for the company. The latter explains how they see their investments affecting the farmers and the long term benefits to the coffee-growers they source from. From here Colleen explained how this project could help KGM while also completing a Master's Practicum requirement.

Though the Theory of Change was a great step forward in explaining the ways in which the company's investments led to stable supply and improved livelihoods, it was still only a theory. Colleen and her team explained that they had formulated these hypotheses through internal discussions, research into non-profits' work with smallholder farmers, and other experience and information from outside sources. However, the team was in need of concrete evidence to support the set of hypotheses composing the Theory of Change. Most of KGM's investment projects were less than 3 years old and could scarcely provide statistically significant results for the short term outcomes, let alone the long term outcomes and impacts. Also, since both the Theory of Change as well as the company's investment strategy had been evolving, their own work was unlikely to provide the proof they needed. Finally, they

wanted to provide evidence for the Theory of Change before they invested tens of millions more into the programs.

This project's scope began to quickly take shape. The paper would focus on the Theory of Change as a set of hypotheses and provide statistical and longitudinal studies that helped back-up or "prove" that the hypotheses were indeed true for similar situations. For each study found, KGM would be provided with an abstract, a set of critical quotes to help explain the document and the relevant results, and a bit about its "use" for KGM. In the end, it was determined that one of the most valuable outputs of the research would be to provide an explanation of the breadth of the literature landscape, identify what is missing from that landscape, and what investment measurement techniques should be implemented at KGM.

It should be noted that certain portions of the Theory of Change did not make it into this research. This paper did not address "Long-Term Relationships," "Improved environmental outcomes," or "Improved landscapes." Also, since some of the connections could have causality in either or both directions (does increased coffee income lead to increased investment in farms or vice versa? Or both?) and certain connections have more depth than others, there are gaps in the research here. The paper attempts to acknowledge these gaps, as well as what areas need additional research to prove causality, in the discussion section.

In this paper the reader will find an explanation of the methodology of research, a discussion of results and findings, as well as a conclusion with some final insights and recommendations.

Methodology

The methodology here was an evolving process over the course of the Master's Project. The one constant is that the original version of the visual Theory of Change (as seen in Figure 1) was used as a guide. The ways in which supporting studies were gathered was an iterative process.

The Theory of Change can be broken down into a series of individual hypotheses, each of which has been attempted to prove or confirm by finding statistical or longitudinal case study. For instance, one set of theories is highlighted in Figure 2.

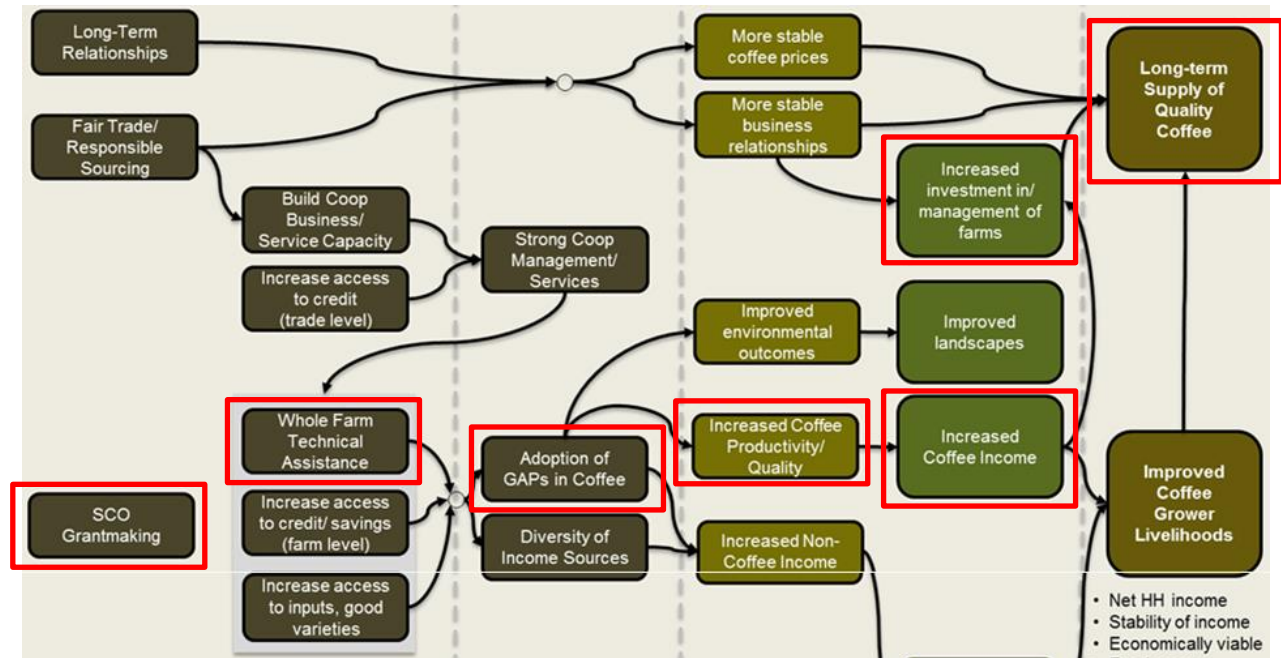


Figure 2. Highlighted set of hypotheses in Theory of Change

Starting on the left side, grant making for a non-profit or NGO to give technical assistance to farmers will lead to smallholder coffee farmers adopting Good Agricultural Practices (GAPs). When the farmers adopt GAPs, this will lead to increased coffee productivity and/or quality. Increased coffee productivity and/or quality leads to increases in farmers' income and, in turn, increased investment in the management of their farms. With increased investment in their farms, KGM achieves one of its two over-arching goals—a long term supply of coffee.

This one series of connections has many points to investigate:

- 1) Does technical assistance lead to farmers adopting Good Agricultural Practices? Do any studies investigate the staying power of the instruction or does the increase in farm output serve as all the necessary “proof” for farmers having adopted Good Agricultural Practices?
- 2) Does the adoption of Good Agricultural Practices lead to increased productivity and/or quality? Again, is this specific link fleshed out in any kind of statistical study or is it implied through studies on the efficacy of technical assistance?
- 3) Does increased productivity and/or quality lead to increased income?
- 4) Does increased income lead to investment in the management of the farm?
- 5) Will increased investment in the farm associated with the original technical assistance lead to a long-term supply of quality coffee for KGM?
- 6) What is the overall return on investment for a grant for technical assistance? Can it be measured outside of an improvement of the farmer’s livelihood? What is the measurable benefit of a steady, long-term supply of quality coffee to KGM?

In attempts to answer each of these questions it was discovered that there were no available studies of supply chain investment that covered the initial investment all the way through to a result of a better long-term supply of product, or any other return on investment (ROI). Thus, there are some gaps in the research here purely based upon available resources.

Since the Theory of Change is a living and working document (much like a scientific hypothesis), it changed throughout the year. With Colleen's guidance, this paper tries to provide the most helpful research and focused on the consistent pieces from the Theory of Change from version to version. Across KGM's Livelihoods Target Approach & Methodology (Livelihoods Methodology) and Theory of Change documents their goals of being an industry leader in sustainability for product, package, community, and supply chain, and improving one million livelihoods remained consistent. As this project progressed, KGM became more focused on improving livelihoods and thus this work does as well.

It should be noted that the majority of research was a result of extensive Google searching (often the best results for keyword search—anywhere) in addition to a number of different databases within University of Michigan's Kresge Library's database connections. Many times a Google search would provide a study or article that had a work cited that included the actual statistical, or "hard data," studies desired. With that study name and author in hand, websites such as ProQuest's ABI Inform, JSTOR, LexisNexis Academic, Social Science Research Network, Google Scholar, and Science Direct were used to find an accessible version of the article, paper, or study. Research was also conducted via the Initiative for Smallholder Finance Wiki and its Smallholder Impact Literature page, which provided many crucial links to this research. However, as stated above, the research method used here was an iterative process and the success rate for finding relevant studies varied widely.

The first round of research was difficult and turned up almost no results. There was an attempt to find studies that connected companies' philanthropic investments with the goals or results as detailed by KGM above. When a generic search for the outcome of philanthropic investments didn't turn up any relevant studies, research shifted to specific problems that companies addressed by investing in their supply chain. For instance, worker health issues led to large losses in productivity and increases in health care and hiring costs for mining companies. There were a few case studies that documented mining companies' education on sexual health to prevent AIDS amongst its workers and even associated the prevention with avoiding the cost of "lost lives." However, this vein of research quickly dried up since there were no studies about companies investing in food, income, water, or other securities and its resultant fiscal benefit to the investor. Finding a different angle was essential.

In order to support the link between improving livelihoods and long-term supply of quality coffee, the link between farmer health and farm yields was investigated as a first step. Inherent in this search was an assumption that better yields lead to a more stable supply for the buyer, KGM. Smaller assumptions like these were made throughout the research in order to focus on the larger assumptions, such as worker health leading to better yields. The stable supply assumption was particularly difficult to find confirmation of because there really were so few statistical or longitudinal studies of companies' benefits as they related to farmer livelihoods. Once a number of statistical studies around health and productivity/yield were identified, a new strategy took shape.

Taking a look at the Theory of Change and Livelihoods Strategy document, it was essential to break them down into a series of links to be investigated. In addition to the visual links, there were some links not included in the original document but still useful for KGM. For instance, a higher caloric intake for farmers can lead to higher farming productivity and yields. Once this more successful method of researching was established, the work was conducted to find proof of causality between any two nodes of the Theory of Change. The research (and thus the Discussion section of this paper) was split up by KGM's two desired outcomes on the right-hand side of the Theory of Change:

- 1) Improved Livelihoods
 - a. Income Security
 - i. Extension Services
 1. Access to Inputs
 2. Microfinance
 3. Business Skills Training
 4. Technical Assistance
 - ii. Certification
 1. Certification group commissioned
 2. Positive to Mixed Results Studies
 3. Mixed to Negative Results studies
 - iii. Quality
 - iv. Environmental Sustainability
 - v. Producer Groups/Rural Enterprises
 1. GAPs and Technical Assistance
 2. Business Skills and Training
 3. Co-op Finance
 4. Certification
 - b. Food Security, Health and Nutrition, and Water Security
 - i. Nutrition and Health Security
 - ii. Food Security, Nutrition, and Farmer Productivity
 - iii. Creating Food Security through Income Security
 - iv. Water
- 2) Long-term Supply of Quality Coffee
 - a. Quality
 - b. Productivity
 - c. Rural Enterprises
 - d. Migration

Project cadence and work

Throughout this one-year Master’s Practicum Colleen at KGM was kept abreast of the findings, giving feedback on the progress of work and general guidance about what was helpful to them in terms of research. As can be seen in the Appendix, KGM was provided with abstracts, essential quotes, and a “use for KGM” section for each study or paper that was determined to be relevant to the Theory of Change.

In the next section this paper will go deeply into examples to help substantiate many portions of KGM’s Theory of Change. The section then moves on to attempt to answer some of the main questions about the research—where are the gaps? How can this be used? What were the biases? And so on.

Discussion

Income Security

Looking at the original Theory of Change map, income security was tied to nearly every other link as highlighted in Figure 3.

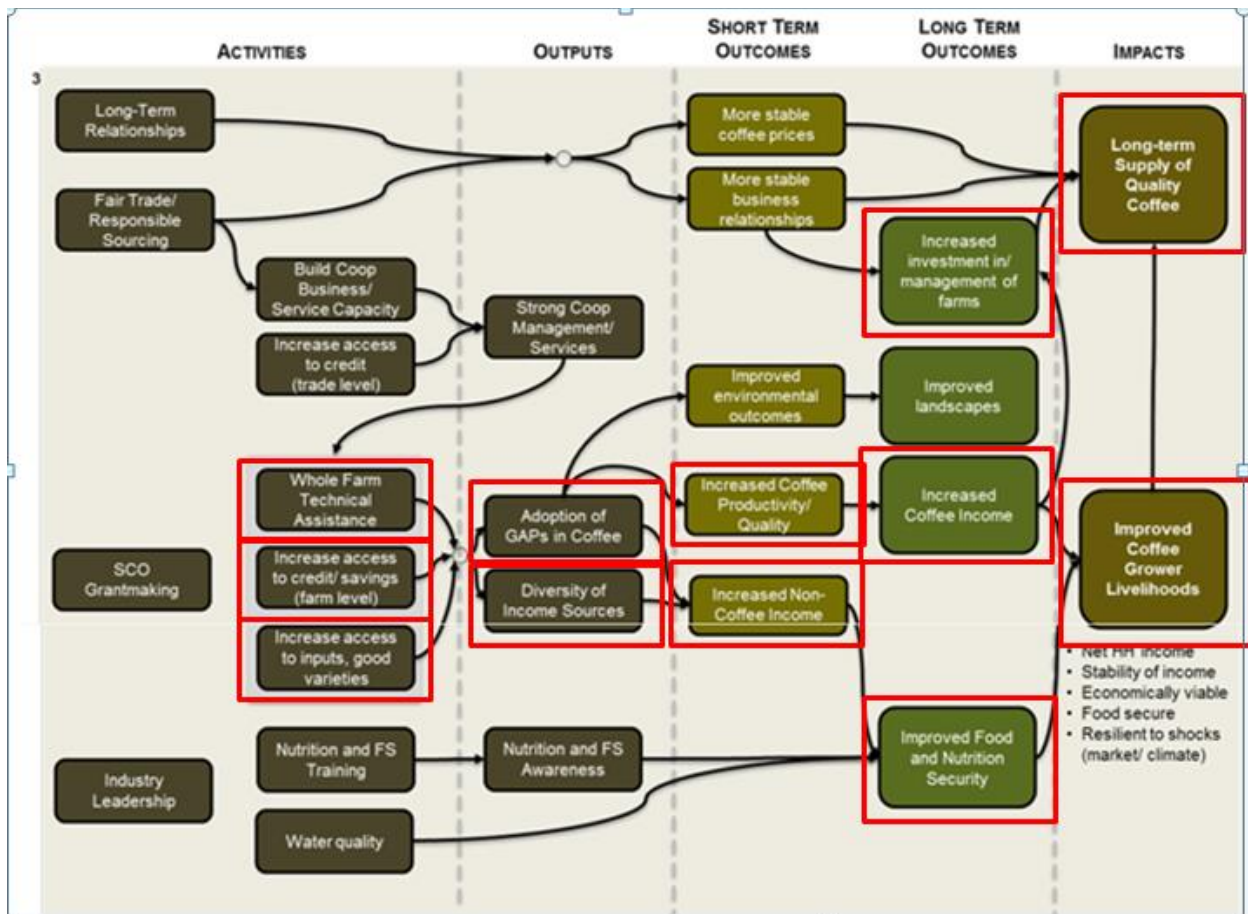


Figure 3. Income Security in the Theory of Change

KGM's multilayered approach to income security has support in the general literature about improving farmer livelihoods. An International Finance Corporation (IFC) report from 2012 stated:

Agriculture remains a powerful instrument of poverty alleviation across the globe and its growth through productivity improvements...will continue to have a direct and lasting impact on incomes and poverty alleviation. This legitimizes in particular the emphasis on supply chains to break the vicious circles of low productivity and household incomes by improving access to inputs, technology and financial services while improving producer capacity and overcoming infrastructure gaps (IFC, 2012).

An example of one of these “vicious circles,” or causal loops, that KGM is trying to break can be seen in Figure 4.

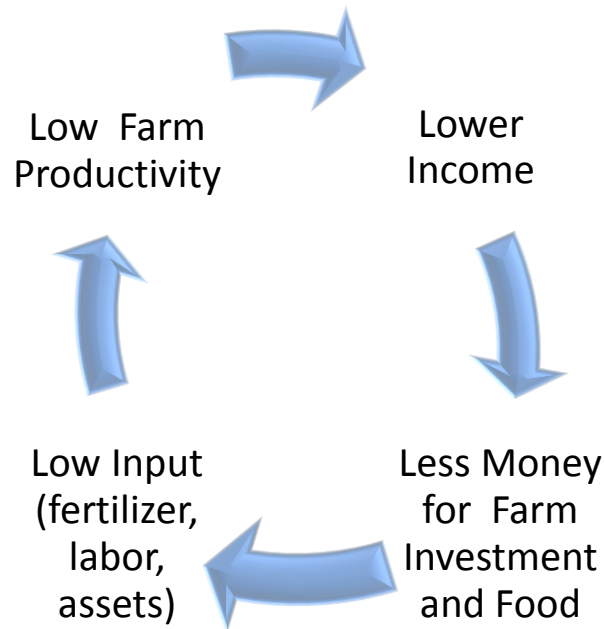


Figure 4. Reinforcing Low Income Causal Loop

KGM theorized that access to inputs and credit, technical assistance, and adoption of GAPs lead to increased productivity and quality—which in turn leads to increased coffee income. With increased access to inputs and credit, and adoption of GAPs, farmers could increase their non-coffee income as well. What’s more, income security is intricately tied to both food security and nutrition. Together, this allowed for many avenues down which to look for studies on the topic of income security.

During the research, six main areas associated with increasing income security were found: extension services, certification, quality, environmental sustainability, labor productivity, and producer groups. The full details of all studies can be found in the Appendix with abstracts, quotes, and other information for each article or paper.

Extension Services

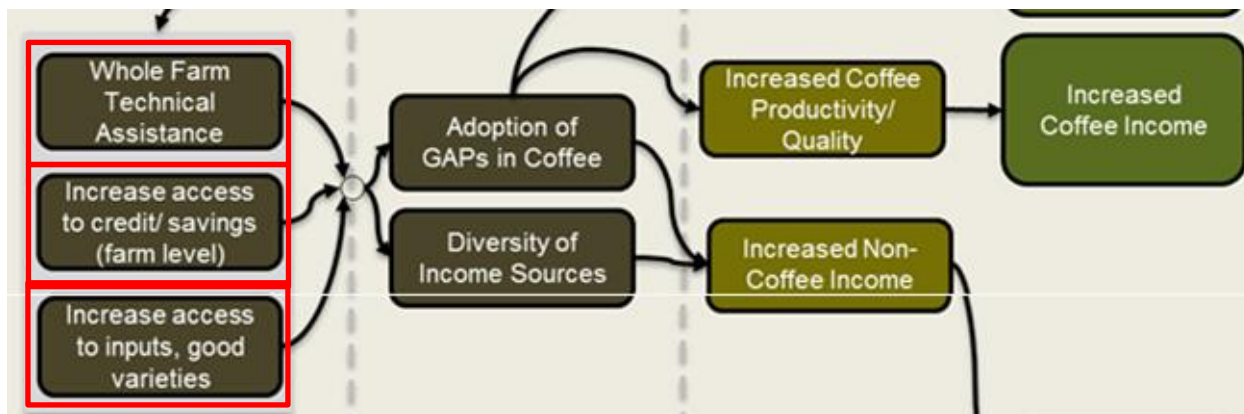


Figure 5. Extension Services

The first big area of research found tied to income security was extension services, or services given to farmers by government, NGO, or private organizations to help improve their farms. The various literature was broken down into four categories: Access to Inputs, Microfinance, Business Skills Training, and Technical Assistance. First, however, there were a number of studies on the effects of extension services on the whole.

In a detailed account of 80 years' worth of studies on extension services, Robert E. Evenson found that the overwhelming majority of the investments had strong internal rates of return (IRRs). The chapter in the *Handbook of Agricultural Economics, Volume 1* has multiple tables of study summaries, showing IRRs from 15%-200+% (Evenson, 2001). Also, in another holistic study by the IFC found that investments in agricultural projects lead to better farming income and better employment prospects (IFC, 2012). IFC's investment in extension services touched upon all the areas in the following subsections.

Access to Inputs

In this research a number of studies were found that backed up the KGM Theory of Change link between access to inputs and increases in productivity and quality. Since many of the studies were meant to show the benefit of things like a hybrid seed or a specific fertilizer regimen, KGM's intermediate step of Adoption of GAPs in Coffee **holds true**.

In a study from Uganda, Benson found that "...fertilizer use is judged to double or triple yields..." for both maize and Robusta coffee and that "...prices would have to drop by half..." before they would stop using fertilizer (Benson et al, Uganda, 2012). In a similar study by Benson, they found that maize yields in Tanzania "...were estimated to increase by a factor of four..." (Benson et al, Tanzania, 2012). In Kenya, it was determined that using a specific type and amount of fertilizer, as dictated by extension services to farmers, could increase a farmer's income by more than USD 1000 in a single season (Mutegi et al, 2012). A labor input was found to have a positive and significant correlation with crop yield and could be an interesting point of further study – that is, determining the degree to which a straightforward labor input helps more or less than other extension services (Evenson and Mwabu, 1998).

In addition to direct inputs of access to fertilizer and labor, this link can also mean giving access to credit.

Microfinance

There were many studies showing the benefits of access to credit, often to the point where authors would present a call to action for banks, governments, and other stakeholders to bridge the financing gap. A study from the Iramba District of Tanzania article showed approximately an 80% increase in production for those who had access to credit versus those who did not (Girabi et al, 2013). In a statistical study of 400 Kenyan smallholders, access to credit led to average annual increase of \$478.30 in productive income (George, 2009). In an MBA dissertation about Ugandan bank lending, the researcher found that there was a “significant positive relationship between credit accessibility and the performance of farmers. Credit accessibility was a major contributing factor toward the performance of farmers...” (Othieno, 2010).

The studies reviewed often blurred the line between access to credit and access to other inputs such as seed, fertilizer, equipment, and labor. For instance, in the aforementioned study from the Iramba District, the researchers found there was a “...significant difference in the levels of using improved seeds and fertilizer...” between those who received loans and those who did not. In turn, multiple regression analysis showed that fertilizers, improved seeds, and hired labor paid for by the loans had “positive and significant impacts on agricultural productivity” (Girabi et al, 2013).

In this chicken or egg scenario, many studies also looked at a smallholder’s access to credit as a result of extension services as opposed to microfinance giving access to smallholders otherwise ignored by financial markets. This connection point is almost as important if not more important than the series leading from access to credit to income security. If the farms can increase their quality, productivity, income, and other factors such as farm size and even contracts with buyers, then they are more likely to receive access to credit or more favorable credit. If KGM can focus on improving the farms in this manor, then they empower their smallholder farmers to gain access to credit on their own, without the help of microfinance extension services. Also, these studies on reinvesting credit into farms suggest that the link between income and increased investment in farms **holds true** (this will be covered more in the Long-Term Supply of Quality Coffee section).

In an article written about rice farmers of Ghana, the authors determined that the socio-economic factors that most significantly predicted loan size were “farm size, income, and years of farming experience” (Acquah and Addo, 2012). Another study of 105 smallholder farmers from Pakistan revealed that off-farm income and “value of non-fixed assets” were the “most important variables in determining access to formal credit” (Amjad and Hasnu, 2007). Research on cassava farmers in Nigeria found that crop yield, years of farming experience, and being a member of a farmers’ association all were significant variables in determining credit worthiness (Obisesan, 2013). The dissertation on Uganda mentioned above found that “income level...past credit participation, and assets owned were significant variables that explain the participation in credit markets.” These statistics point out that both income *and prior credit history* are crucial for future lending opportunities. Thus, if KGM is able to provide access to credit in the present, it may help farmers gain additional credit in the future.

Business Skills Training

KGM's Theory of Change includes building up co-op business and service capacity, while the Livelihoods Methodology document includes a focus on strong rural enterprise but neither currently considers direct training of smallholders. The few case studies available on this topic covered the training of individual farmers and farmer organizations. Cooperatives and other rural enterprises will be discussed later in this paper, but this extension service is highlighted here as another method to potentially increase income security.

The overall key findings for business skills training programs is that farmers were better able to both manage their farms and demand a better price for their product on the open marketplace. A case study on 1000 Zimbabwean banana farmers shows that the farmers "moved from price-takers to negotiators" and were able to get greater than 100% price increases while also reducing costs by 15% (Mudyazvivi and Maunze, 2010). The authors also point out that a good method of measuring the success of a training program is by the farmers' willingness to pay for it in the future. This evaluation tool may be helpful for future measurement of KGM's projects' long-term impact.

Finally, the IFC released a white paper on farmer business training and found that providing training in conjunction with providing access to credit provides the best option and that "...evaluations conducted over a long horizon (5 years and above) and those using panel data estimations show positive impacts on well-being of farmers" (Nankhuni and Panlagua, 2013). The white paper also provides a good longitudinal study on how a multi-faceted approach can lead to greater success rather than a singular approach such as increasing the use of fertilizer or just getting access to credit for farmers. This helps to validate KGM's Livelihood Methodology and shows that well-guided projects have the necessary staying power and adoption rates for it to actually improve farmers' livelihoods.

Technical Assistance

There were two studies found that were different enough from other extension services research to necessitate an additional subcategory.

The first investigated the effects of 3,661 Asian Farmer Field Schools' (FFS) on the almost 100,000 cotton farmers who went through their programs. While there were no specific numbers around income security except for drastic reductions in pesticide costs, it does point out "that a skills-oriented, knowledge-intensive and hands-on educational approach, as FFS, is an efficient system to diffuse the complex principles of [Integrated Pest Management] among farmers" (Mancini, 2006).

The second bit of research was conducted by the IFC and published in the form of a white paper on the World Bank-funded Agribusiness and Marketing Project in the Kyrgyz Republic. The program offered technical assistance in "food processing technology, quality management, accounting, marketing and sales..." and focused on giving advice accompanied by training in all of these areas. In the end, the IFC showed a 25-91% increase in profits with 68 new products brought to market (Broka and Koshmatov, 2011).

Overall, there were a lot of positives around extension services as it related to income security and improving farmer livelihoods. Key takeaways for KGM are to continue a multifaceted, holistic approach to their investments in livelihood, to monitor farmers' future creditworthiness, and to potentially track some of their own project success via things such as farmers' willingness to pay and

other variables tied to the probability of obtaining credit. The link between extension services and increased income security **holds true**.

Certification

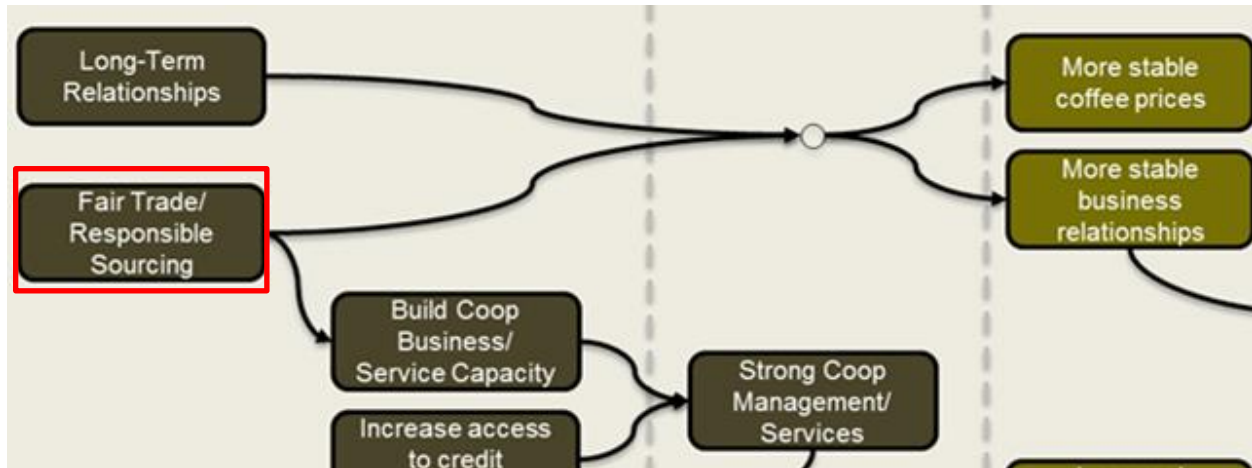


Figure 6. Certification

Since the KGM Supply Chain Outreach team invests in their coffee supply chains, one of the more obvious options for improving both quality and farmer livelihoods would be to use outside coffee certification programs such as Fairtrade International, Utz, Conservation International, or Rainforest Alliance. Though these organizations tout the benefit of their programs, KGM has mostly left such organizations out of their strategy. KGM actually has their own “responsible sourcing guidelines” which tend to mirror many of those certifications’ principles: fair wages, no forced or child labor, safe working conditions, worker equality, and environmental sustainable practices (Keurig, 2014). Also, as seen in their Theory of Change, the only mention of certification comes at a considerable distance from income security, as it links with building cooperative capacity and stabilizing coffee prices and business relationships. The way it was originally drawn, these benefits are ostensibly for KGM and are not tied to improved livelihoods. However, in their newer Livelihoods Methodology document, responsible sourcing guidelines are now tied to increased coffee incomes and “shared value across the supply chain” (Keurig, 2014). With this new connection, I wanted to investigate the extent to which these principles of responsible sourcing actually benefited the farmers.

This research found that while these certifications and guidelines have many of the right intentions, whether they actually improve income security or farmer livelihoods is decidedly undecided. This paper will first focus on the reports that attempt to prove certifications’ benefit to farmers and then detail studies from the detractors of certifications. The first couple studies found were performed on behalf of (or funded by) the certification entity itself.

Certification Group-Commissioned Reports

First, for Utz certification, a group of researchers conducted a statistical study that included a counterfactual—or what happened to those who did not have the intervention—of 300 Kenyan coffee farmers. The research found that the group that was certified “had lower cost of inputs in coffee (total amount and intensity) and had a lower proportion of rejected coffee” (Kamau et al, 2010). The certified group used less hired labor and received approximately 20% higher price for washed coffee which led to more money for food expenditure and time to develop other sources of income. Also, as detailed above under the Microfinance section, these more successful and accredited farmers had more access to credit, a critical tool for success (Kamau et al, 2010).

Fairtrade commissioned their own expansive literature and impact review of their certification farms from 1999 to 2009. Regardless of funding, this report turned out to be an honest assessment of the literature available on Fairtrade and didn’t always paint a great picture of the famous certification. For instance, the report pointed out “when specifically comparing income and wellbeing indicator differentials between Fairtrade and non-Fairtrade farmers the differences were not always found to be that significant” and that numerous studies found that “Fairtrade needs to be supplemented by changes in development policies and...funds and initiatives to raise rural livelihoods” (Nelson and Pound, 2009). However, beyond that, the research they did on the last 10 years was mostly positive. Fairtrade producers enjoy greater access to credit markets than those without the certification and this fact combined with Fairtrade’s guaranteed prices and long-term contracts “enables farmers to invest in their land, domestic facilities and children’s education”—all indicators of improved livelihoods (Nelson and Pound, 2009). Lastly, Fairtrade contracts also provided a buffer against environmental or financial shocks and prevented “outmigration” of farmers looking to find work off of the farms.

Positive to Mixed Results Studies

The next set of studies found mixed or positive results based on coffee certification programs but were not commissioned by the certification programs themselves. A discussion paper written by a group called Resources for the Future showed mixed results in their own literature review on all of the certifications. Their research turned up “just 6 [reports that] find some evidence that certification has positive socioeconomic or environmental impacts. Hence, at best, the...studies provide very weak evidence for the hypothesis that sustainable certification has positive socioeconomic or environmental impacts” (Blackman and Rivera, 2010).

On the flip side, a paper written for the Berlin Conference on the Human Dimensions of Global Environmental Change in 2010 on Nicaraguan coffee farmers found that certified farmers had higher gross margins than both non-certified and specifically organic farmers (Stellmacher et al, 2010). The “income effects of certification are positive” but it does not “eradicate severe poverty” (Stellmacher et al, 2010). A report on the overall methodology to catalyze smallholder finance found that a Peruvian farmer who was able to join a cooperative and get Fairtrade certified was able to “earn a 33 percent price premium” (Dalberg Global Development Advisors, 2012).

A key theme throughout each of these studies was that certification could provide opportunities for farm and livelihood betterment but true change came from a more wholesale approach to improving livelihoods.

Mixed to Negative Results Studies

V. Ernesto Méndez and Christopher Bacon have done extensive research on the interaction between agriculture, livelihoods, and social and environmental sustainability. They have actually worked with KGM in the past on projects with certain cooperatives. The majority of their work on certification shows that the programs do not do enough to support the farmers and improve their livelihoods or the environment. In an article they published together in 2010, they surveyed 469 households in Central America and Mexico about the effects of Fairtrade and similar certifications on the farmers' livelihoods. Overall, they found "certifications will not single-handedly bring significant poverty alleviation to most coffee-farming families" but that "developing more active partnerships between farmers, cooperatives, certifications and environmental and rural development organizations" can lead to better outcomes (Méndez, Bacon et al, 2010). The report also pointed out that only 15% of households had any savings and 63% struggled to meet basic food needs (Méndez, Bacon et al, 2010). Finally, Bacon's latest work from 2014 shows research on how coffee harvests, even with certification, fail to provide sufficient income for survival in Nicaragua (Bacon et al, 2014).

Overall, this research found mixed results on certification with some studies citing excellent examples of price premiums and long-term investment ability, while others showed that the certification alone could not secure income for smallholder farmers. Key takeaways for KGM are that certifications, or their own responsible sourcing guidelines, are not enough to guarantee any kind of income security or livelihood improvements, and that a diversified, multifaceted strategy on improving livelihoods is critical. The link between certification and income security or other benefits does **not necessarily hold true**.

Quality

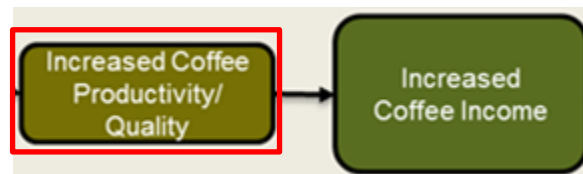


Figure 7. Quality

Though many of the certification programs have certain quality requirements in addition to sourcing guidelines, there was a considerable amount of independent research on the impact of quality on smallholder farmers' incomes. Looking at the Theory of Change, one can see that this is a large focus for KGM, with the increased quality metric sharing the same space with productivity. Quality also is a direct output of adopting Good Agricultural Practices and can lead to increased coffee income, all of which I have found evidence for in the literature. Thus, this part of the theory **holds true**. KGM maintains a strong emphasis on quality in their Livelihoods Methodology under the Whole-farm Planning and Production focus area. The best examples of quality-specific instances of increased farmer income came from two sources—the World Bank and the LICOS Centre for Institutions and Economic Performance & Department of Economics.

The World Bank compiled a series of case studies on improving quality in agriculture throughout Sub-Saharan Africa. If the projects were mature enough to measure, most of the results were positive—

except for occasions where there was no market for the higher-quality product (as in the case with Ugandan honey farmers in this report).

It was found that sunflower growers in Uganda who utilized improved seed varieties and instituted quality screening saw almost a three-fold improvement in yield and gross-profit per acre (Jaffee, Henson, and Rios, 2011). Higher standards for dairy quality in Kenya, Uganda, and Zambia led to a *50-fold* increase in total net profit for farmers (Jaffee, Henson, and Rios, 2011). In the sorghum market throughout Sub-Saharan Africa, changing to a higher quality strain called Epuripur sorghum led to significant financial benefits to farmers. Supplemental income of USD 250 over subsistence farming went to pay for “household needs (e.g., nutrition, education, health, clothing, entertainment, etc.) and to procure household assets (e.g., land, livestock, bicycle, radio, house, etc.)” (Jaffee, Henson, and Rios, 2011). Part of the reason for the farmers success was the “assured or reliable market” and the uptake of new technologies (Jaffee, Henson, and Rios, 2011).

In another study, coffee growers in Rwanda who improved their coffee quality were able to access a new specialty coffee market. This project was extremely large and very successful: 50,000 households saw their coffee production double. Exploiting coffee buyers’ desire for consistency and reliability, the farmers have seen a 100% increase in the price for their coffee cherries (Jaffee, Henson, and Rios, 2011).

When EU customers increased their standards for imported produce Senegalese fruit and vegetable farmers improved product quality to meet those higher demands. A subsequent study followed 300 households and showed that those who participated in the farming of the improved-quality produce had incomes 60-130% higher than the average income in the research area (Maertens and Swinnen, 2007). It should be noted that the increases to farmer incomes came from those farmers who farmed others’ land on consolidated farms, not their own. The authors went on to say:

These findings demonstrate that high-standards agricultural production and trade can directly reduce poverty and improve welfare even if it is realized through large-scale agro-industrial production. This challenges the general view in the literature of increasing food standards and agro-industrialization leading to a concentration of the gains from trade with large food companies and to the marginalization of the smallest farmers and the poorest households (Maertens and Swinnen, 2007).

Overall, these studies on quality showed that an increase of quality, separate from certification programs, can lead to great returns—so long as there is a market for it. KGM should take note that in order for farmers to capture the value of their increased quality good, there must be a market provided by KGM. The market can either demand higher quality, as in the case of the Senegalese produce farmers, or quality standards can be a barrier to entry to a more elite market, as with the Rwandan coffee farmers. Key takeaways for KGM are that installing practices to improve quality is a critical step for farmers to increase both their income as well as access to more profitable markets and that in order for these improvements to have lasting value for the farmer, KGM must ensure that the farmers have access to a market that will pay for the higher quality.

Environmental Sustainability



Figure 8. Environmental Sustainability

Another area of study found to be well documented was how environmental sustainability can lead to increased income security for farmers. The Theory of Change document separates improved environmental outcomes from improved landscapes as the result of any environmental change. The Livelihoods Methodology integrates the word “sustainability” into the focus on farm planning and has an additional section on climate resilience, but does not actually tie investment in environmental sustainability back to farmer incomes. However, the research below will demonstrate that a link between environmental sustainability and farmer income should be a part of KGM’s Theory of Change and strategy going forward.

The United Nations Environmental Programme [sic] (UNEP) in partnership with the International Fund for Agricultural Development (IFAD) published a white paper in 2013 relating smallholder farmers, food security, and the environment. The three main messages from the paper were: smallholders are vital to agriculture, productivity depends on healthy ecosystems, and a transformation is needed in agricultural systems to achieve the necessary production (UNEP and IFAD, 2013). The paper points out that productivity, food security, and poverty reduction all depend on ecosystem services (i.e. levels of soil fertility, freshwater delivery, pollination, and pest control) (UNEP and IFAD, 2013). Also, since the cost of adding artificial inputs to the environment may be too hard for smallholders without help from an NGO or other organization, it is especially important to maintain the “integrity and extent of natural supporting and regulating services, such as pest control, water retention and nutrient cycling” (UNEP and IFAD, 2013). The paper continued:

A ‘yield gap’ - the difference between potential and actual yield - widens as the provisioning of ecosystem services diminishes, e.g. lack of water, lack or imbalance of nutrients, pest damage, weed competition and lack of pollination (figure 4). The necessary investment to close this yield gap through inputs, such as (artificial) fertilizers and pesticides, increases as ecosystem services decline (UNEP and IFAD, 2013).

FIGURE 4
Contribution of regulating and supporting services to provisioning services (crop production)

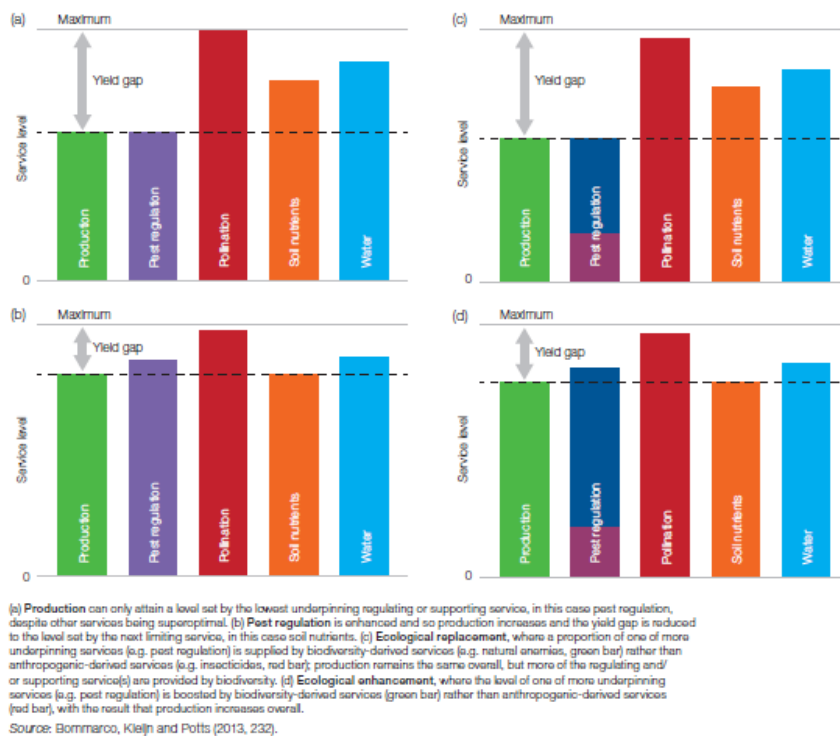


Figure 9. Figure 4 from UNEP and IFAD, 2013. Shows yield gap as a result of diminished ecosystem services

The paper also gave statistical data from other studies on the results of ecosystem decline. Soil degradation has lowered agricultural productivity by 13% since the 1990s. Erosion has led to a mean of 8.2% and up to 40% reduction in African agricultural yields. In the end, maintaining ecosystem services led directly to farmer income security (UNEP and IFAD, 2013).

The next two studies found related directly to the adoption of Good Agricultural Practices – specifically, Integrated Soil Fertility Management (ISFM) and Conservation Agriculture (CA) – and how they led to statistically significant improvements in the farmers’ income security.

In the first study from the International Association of Agricultural Economists Conference, a survey of 376 Malawian households found that maize farmers had 4.2% higher yield when they used ISFM over those who did not (Sauer and Tchale, 2006). With approximately the same costs as other methods, the profits were higher as well. Gross margins were more than 50% higher for those surveyed who used ISFM (Sauer and Tchale, 2006). In a cited study from 2004, a Zimbabwe maize farmer saw 64% higher yield with ISFM and a fivefold increase to return on labor invested. In another cited study from Kenya in 2002, there were higher yields and almost a 60% increase to return on labor invested. Finally, using ISFM was found to have a significantly lower cost than only using traditional inorganic fertilizer (Sauer and Tchale, 2006).

The second research paper brought to light that government extension services are often one-size-fits all and can actually cause more problems for both farm yield and ecosystem services. The

misuse of fertilizer can damage the ecosystem by ignoring differences between soils—and does so at the great expense of the smallholder farmer (Sommer et al, 2013). GAPs must be localized in order to benefit the farmers and prevent ecosystem degradation. Though the paper did not provide strong statistical backing, the paper’s salient points about third-parties’ attempts at intervention with fertilizer and other inputs are important to consider.

Overall, the research shows that sustainability and farmer income are intricately tied together and that any considerations for improving agricultural outcomes and farmers’ short- and long-term vulnerabilities must consider the environment. Key takeaways for KGM are to link their improved environmental outcomes with improved income security in their Theory of Change and Livelihood Methodology and the theory that adoption of GAPs leads to both better environmental outcomes and increased productivity/income security **holds true**.

Producer Groups/Rural Enterprises



Figure 10. Producer Groups

Producer groups, cooperatives, or rural enterprises can all have significant impacts on smallholder farmers’ income security. KGM recognizes their importance by creating a separate focus area within their Livelihood Methodology document and including their development separate from farmer development in their Theory of Change. The myriad of studies available on the benefits of producer groups often combined the specific benefits that producer groups provided to member farmers, but this paper breaks them out to four subcategories: GAPs and Technical Assistance; Business Skills, Marketing, and Bargaining Power; Co-op Financing and Access to Credit; and Certification. Some of the studies used here are previously referenced in other section and some of studies will be used in multiple subsections of this topic. It is safe to say that producer groups touch many points within KGM’s Theory of Change.

GAPs and Technical Assistance

KGM’s Theory of Change shows a direct set of links from investments in co-op business/service capacity, to whole farm technical assistance, to adoption of GAPs, to increased coffee revenue. This set of connections is one of the few that can be supported by single case or statistical studies.

The first study found was by the US Overseas Cooperative Development Council (OCDC) together with USAID on Armenian vegetable farmers. The mini case study explained that the producer group known as Armenian Greenhouse Association (AGA) was used as a vehicle to disseminate information on drip irrigation and other new technologies to solve yield issues. “As a result of new technologies and training, producers have achieved significant results, including 300 percent savings on fertilizer, reducing by fifteen-fold the amount of water used, and cutting crop diseases by half” (Mellor, 2009).

The second study came from another paper with a series of project summaries, this time from Kenya, Tanzania, and Uganda. For rice production in Uganda, adoption of technological best practices taught through the producer organization led to almost a doubling of yields (Roothaert and Muhanji, 2009).

A third study on the difference between cooperative members and non-cooperative members of agricultural communities in Ethiopia found that “involvement in cooperatives results in 5-15 per cent efficiency gains as compared to non-members” (Abate, Francesconi, and Getnet, 2013). In summary, the paper stated that there was a “positive and significant impact” on technical efficiency and that members were in a better position to gain more from their inputs than non-members (Abate, Francesconi, and Getnet, 2013).

Business Skills and Training

KGM focuses on developing co-op business and service capacity in both their Theory of Change and Livelihoods Methodology documents. By building a co-op’s business capacity, KGM theorizes that the co-op will be better run, leading to better-run farms. Increasing business acumen will not only result in more efficient operations and savvy investments with better capital outlay, it also allows the co-op to increase their marketing and bargaining skill sets.

The literature had quite a few examples of how cooperatives’ business skills training gave farmers (either collectively or individually) income security. In the aforementioned study from OCDC and USAID, Land O’Lakes helped dairy cooperatives streamline their transportation and operation procedures, and jointly market and price-bargain (Mellor, 2009). The project not only focused on the short-term strategy of operations improvements, but also the development of the farmers’ ability to lead and manage the finances, capacity, and unionized staff. Through their efforts, “union leadership implemented a business strategy that increased sales revenues by 70 percent and reduced operating costs by 46 percent” (Mellor, 2009). In the same paper, there was an example of a Paraguayan cooperative’s board of directors putting a growth plan in place that increased their exports by 1700% over 3 years. Additionally, the total value of savings deposits with the cooperative increased from USD 286,000 to USD 825,000 over the same span, significantly increasing members’ income security (Mellor, 2009).

In the previously noted study on rice farming in Uganda, the cooperative’s new marketing plan resulted in more than a 50% price premium over previous strategies (Roothaert and Muhanji, 2009). In the same paper, but for bulb onions in Kenya, the strengthening of “Commercial Villages” (the smallest municipality with a government—combining multiple villages) ties with the private sector led to price increases of “over 280 percent” (Roothaert and Muhanji, 2009). Finally, in a study on chicken farmers in

Tanzania, business training through farmer groups led to collective marketing and batched processes. The chicken farmers saw their profit margins increase from “10 to 17.5 percent” (Roothaert and Muhanji, 2009).

All of these case studies show that one of the best ways for farmers to improve their income security is to join a well-trained farmer organization. Furthermore, training groups of farmers in a cooperative setting allows them to improve both their collective and individual operations. Thus, the Theory of Change links that show increases to farmer income via increasing co-op business capacity **hold true**.

Co-op Finance

In a previous section on microfinance, many examples of statistical studies were given that proved that access to credit often leads to increased farmer income. Also, as acknowledged in that section, it was shown that income security and other factors lead to credit worthiness. Another significant determinant of access to credit is farmer organization membership. A collective unit can pool its risk and thus is a more attractive borrower. This research found three specific examples where collective membership led to access to credit.

The first example came from a statistical study of 10 smallholder farms in South Africa. The article finds that access to credit at the cooperative level is critical to the cooperatives’ success and may lead to access to credit for individual members in the future (Chibanda, Ortmann , and Lyne, 2009). The second report came from the Dalberg Global Development Advisors on catalyzing financial solutions for smallholders. As with the previous study, the report finds that smallholders who organize into collectives or cooperatives have more access to credit (Dalberg Global Development Advisors, 2012). Finally, as mentioned in the Microfinance section, the study on Nigerian cassava farmers found that farmers’ group membership increased the odds of received credit by a factor of 11.2 (Obisesan, 2013). Membership was second only to gender in explanatory variables for access to credit as can be seen in Figure 11:

TABLE 4: Results of Logit Analysis on Credit Accessibility

Explanatory variables	Coefficients	Odds ratio	Standard error
Gender	0.6471***	23.2452	0.1120
Age	-0.0244**	1.1017	0.0124
Marital Status	-0.4415	0.1397	0.1898
Household size	-0.0418	0.8558	0.0362
Years of education	0.0017	0.9819	0.0174
Main occupation	-0.0812**	0.7047	0.0506
Off-farm activities	0.0868**	1.4538	0.1345
Farmers’ group membership	0.5607***	11.1932	0.1266
Years of farming experience	0.0103*	0.9556	0.0107
Land area cultivated	0.0597	0.7353	0.1723
Crop yield	0.0689*	1.3184	0.0289
Constant	5.0793**		1.9754
Observation	150		
Pseudo R ²	0.4941		
Log likelihood	-47.18		

Source: Field Study, 2011

***, **, * represents 1%, 5% and 10% significant level respectively

Figure 11. Table 4 from Obisesan, 2013

Putting these studies together with other Theory of Change factors, it can be said with confidence that collective or cooperative membership leads to better access to credit, which in turn leads to better farmer income security. These links in the Theory of Change **hold true**.

Certification

The final connection between producer groups and farmer income is producer group certification. In the Dalberg Advisors report, the authors point out that if a Peruvian coffee farmer joined a cooperative, she could “get her coffee certified as Fair Trade [not necessarily Fairtrade International], and thereby earn a 33 percent price premium” (Dalberg Global Development Advisors, 2012). In addition, after some approximate math, the authors point out that the farmer can earn 15 times as much on their coffee outputs.

While this is not a statistical study and is only one case, it illuminates the fact that certain certification groups can certify an entire collective, relying on group management to consistently supply the necessary quality and monitor other requirements of their certification. This area could use much more research but still provides us with another reason for KGM to develop rural enterprises. In fact, it could be an area that they add to their livelihood strategy—if the cooperatives are developed to be advocates for the KGM sourcing policies, it will go a long way to developing the necessary changes down to the farm level and increase the all-important adoption rates.

Overall, there is tremendous literature around the benefits of farmer organizations to their members. A key takeaway for KGM is that initiatives done at the cooperative level have a higher number of successful case studies than farmer-level initiatives. Also, developing farmer organizations can lead to higher profits, more credit accessibility, and an even better chance to instill their own requirements at the farm level through cooperative “certification.”

Food Security, Health and Nutrition, and Water Security

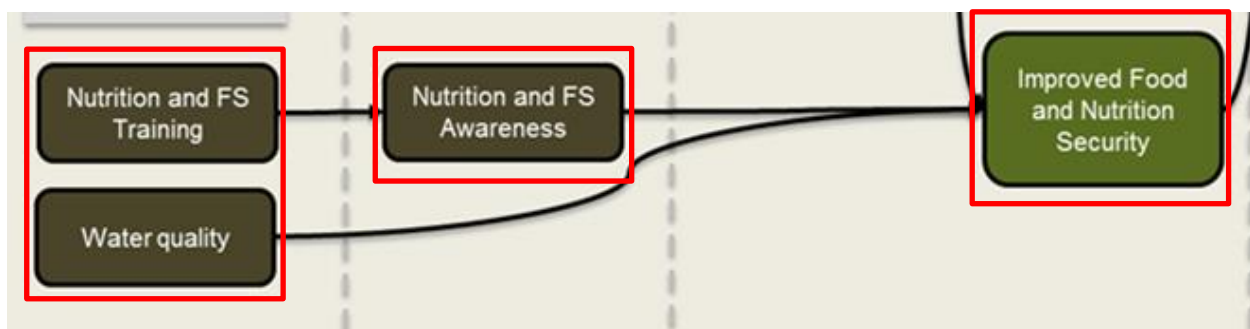


Figure 12. Food Security, Health and Nutrition, and Water

As this research advanced the interrelated nature, or so-called “nexus,” of food security, health, and water became clear. Most case or statistical studies found on the causes of health or nutrition problems were either water or food security related. Water security ran into food security issues and all three led to issues with farmer productivity, income security, and long-term betterment of livelihoods.

The Livelihoods Methodology document has water stewardship as a separate focal point and emphasizes the importance of water to not only farming practices but also to sustainable living conditions for their farmers. Since much of the literature found focused on the very measurable income security aspect of farmer livelihoods, combining the three of these topics together to avoid duplicate study references seemed most efficient. This paper will first look at studies that address nutrition and food security and their effects on income security—and then focus on water security.

Nutrition and Health Security

In the Livelihoods Methodology document, the second target area is to educate farmers on food security and nutrition. However, there were no statistical or longitudinal studies showing how nutrition or food security training led to higher food security for smallholders available. There was the aforementioned Farmer Field School study on improvements to workers health after a reduction in chemical use, but there were no firm statistics. This is a large **opportunity** for KGM for a future case or statistical study on how their programs affect the farmers.

Looking again at this focus point in the Livelihoods Methodology, it notes complementing agronomic (or technical, as we have deemed it for this paper) assistance with food security training. Referring to the Income Security section above, we can say with confidence that training through cooperatives is an effective way of disseminating information and seeing a desired result. While it is by no means proven that it will work for a less tangible outcome as health and nutrition, it is a start.

Though there was no evidence that training led to increased food security or nutrition awareness, there was available evidence that food security led to higher productivity/yields and higher yields associated with food security led to higher incomes and better farmer livelihoods. These studies prove that the link between food security and improved farmer livelihood **hold true**.

Food Security, Nutrition and Farmer Productivity

When researching ties between health and farmer livelihood, there were a number of studies on how farmer health problems led to decreases in farmer productivity. While this can obviously cause issues for farmers who cultivate their own land, this can also cause problems for buyers and the owners of the land that the farmers work. This paper will first look at the small-scale effect of poor nutrition and then give examples of companies that struggled with the balance between farmer health and company operations.

The first study on farmer health and food security investigated farmer iron-deficiency. Haas and Brownlie found “the evidence is clearly the strongest for IDA [iron-deficiency anemia] causing reductions in aerobic work capacity.” Their work stated that “the evidence clearly suggests that [severe iron-deficiency anemia] and [moderate iron-deficiency anemia] also impair endurance capacity” (Haas and Brownlie, 2001). In a World Health Organization Bulletin, both “clinical and field studies show that iron deficiency affects an individual’s aerobic capacity, endurance, energy efficiency, and work output” and that the deficiency also impacts economic success (Thomas and Frankenberg, 2002). The bulletin goes on to mention two separate studies giving good longitudinal evidence of these effects. First, declines in work capacity for male rubber workers in Indonesia greatly affected their economic prosperity. Second,

Kenyan construction workers who received caloric supplements had a significant increase in the amount of labor they were able to do per day (Thomas and Frankenberg, 2002).

In a third study on iron deficiency, its effect on productivity, and its ties to income security, 600 randomly sampled Indonesian males in construction and plantation farming were studied. The anemic tappers (on the plantations) were found to have 19% lower output than non-anemic tappers (Basta and Churchill, 1979). Also, there was a “linear correlation between hemoglobin levels and monthly latex payments paid to tappers for outputs beyond the daily quota” (Basta and Churchill, 1979). In an interesting counter-example, there was also an “improvement in diet attributable to the small income supplement paid.” The supplemental income often went to purchasing food including leafy greens and fruit—foods rich in iron and vitamin C (Basta and Churchill, 1979). Other examples of income security leading to food security are detailed in the next subsection. These reductions in farmer productivity were a detriment to both the farmers and the companies that employed them.

Some of the earliest studies on company investment in worker health surrounded the AIDS epidemic in Africa. With such a blight upon worker communities, companies tried many different strategies to combat the epidemic—and sometimes tracked their progress. One of the first books consulted here was written about companies’ battles against AIDS and their effectiveness. The study found “AIDS is a real threat to the productivity—and even the survival—of many companies and businesses” (Williams and Ray, 1993). The book details how companies, including Rio Tinto, David Whitehead Textiles, the Commercial Farmers’ Union, and Eastern Highlands Tea Estate went about promoting AIDS awareness as well as their success measures on number of STD cases reported and condom use increases over the 2 year study. While there were no defined metrics given, companies generally reported an improvement in worker health rates and ability to conduct business in Sub-Saharan Africa.

The book titled “The Hidden Cost of AIDS – the Challenge of HIV to Development” gave more specific numbers around the costs to companies when employees were no longer able to work. The report asserted that there would be a large decline in production in both manufacturing and farming in the affected regions, labor-intensive crops would be abandoned, and entire communities would be affected. If the young replaced the older workers in the fields that younger generation would struggle to finish school and development would slow. Companies faced issues with how much to directly pay their workers (sick pay, welfare, etc) and funerals stopped production (Panos Institute, 1992). The report even highlighted specific costs to certain companies, such as worker funerals (USD 600) and the cost of replacing and retraining skilled work (between USD 8,000-22,500). The cycle of poverty slowing disease prevention and disease leading to increased poverty is also seen in areas where malaria is prevalent.

Recent studies have focused on the economic and social burden of malaria around the world. In an article from *Nature*, Sachs and Melaney agree that causation runs in both directions, with the causal link from malaria to underdevelopment much more powerful than is generally accepted (Sachs and Melaney, 2002). “Those who live in regions where a specific strand of malaria is transmitted had 1.3% lower economic growth from 1965-1990” (Sachs and Melaney, 2002). These lower growth rates from diseased areas are surmised to directly affect farmer income security.

In the end, these case studies tie a company’s long-term supply of quality goods back to health and nutrition security. Reductions in farmer productivity from disease and nutritional deficiencies can have serious consequences up and down the value chain.

Creating Food Security through Income Security

Though it may be an obvious connection, the link between income security and food security was highlighted in a few case studies that were relevant. There is likely more evidence about the spending habits of those with income security versus those without it and their relative health/nutrition status, however KGM does not focus on the topic and so this study covers it only briefly. This is another excellent **opportunity** for KGM to investigate their investments in income security to examine their effects on the health of the farmers.

In a dissertation on the food vulnerability of farmers in rural Mali, the study used a specified measure of ‘vulnerability’ throughout where a reduction was a positive outcome and an increase was negative outcome. The study first found that food vulnerability would decrease if farmers were given “secondary employment opportunities during the hunger season” to increase their income security (Christiansen, 2000). Also, by diversifying income sources (thus boosting income security) and increasing the value of assets leading to income generation, each household can greatly reduce their food vulnerability (Christiansen, 2000).

In the same vein as reducing vulnerability, a dissertation on worker livelihoods in Oaxaca, Mexico investigated the link between food security and nutrition among coffee growers. Within that study, the author found that the unreliability of the coffee market motivated farmers to diversify crops. Since a bad season or a drop in coffee prices could have devastating effects on farmers’ income, their ability to procure food was also in flux. In one specific village, Analco, “it was local capability to assure food security through self-subsistence agriculture and other food procurement activities that prevented Analquefios from suffering hunger” (Sesia, 2002). Finally, in the graph seen in Figure 13, the undernutrition rates were measured from 1972 to 1997. The graph clearly depicts that the undernutrition rate falls drastically with increases in income for coffee farmers, but stays steady during less profitable years. The years 1980-1989 were known as the “coffee bonanza” in this area (Sesia, 2002).

GRAPH 4.14. Historical undernutrition rates (height-for-age), Analco 1972-1997

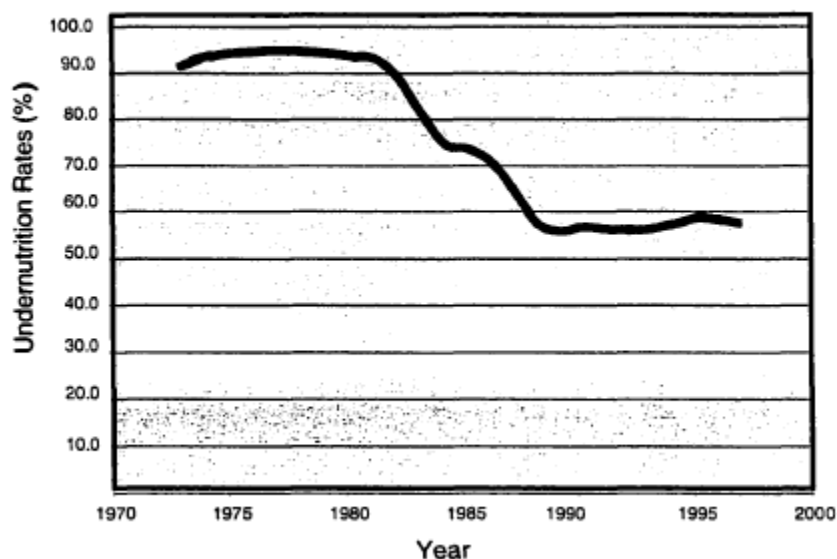


Figure 13. Graph 4.14 from Sesia, 2002 showing undernutrition rates in Analco

Other studies on productivity and poverty show a solid link between income security and food security. In a literature review on agricultural productivity and its ability to reduce poverty, the authors cited a study that found “that agricultural labor productivity (output per worker) has a significant effect on the average income of the [lowest] income quintile” (Schneider and Gugerty, 2011). Moreover, in other cited studies, there is a positive correlation between labor productivity and nutritional status. Plus, “a 1% increase in land productivity (output per unit of land) is associated with an increase in daily energy supply of 5.3%” (Schneider and Gugerty, 2011). A 1% increase in land productivity was also “associated with” a decrease in underweight children by 0.42% (Schneider and Gugerty, 2011). And finally, in a cited study on the development of Western Europe, “increased caloric intake raised productivity among the working poor” (Schneider and Gugerty, 2011). Though these are all correlations, there seems to be a two-way connection between food security and income security: more of one leads to more of the other in a positively reinforcing causal loop.

Overall, there was a strong connection between nutrition, food security, and farm productivity and farmer income. Key takeaways for KGM are that investments in farmer nutrition may lead to a more direct increase in productivity and may be the most important building block to implementing other farm-level and livelihood improvements. Without health, the farmer end of the value chain fails. Also, KGM should add causal links to their Theory of Change to show these relationships.

Water

As water has become a priority for those concerned about climate change, there has been significant research done on water security and its effects on livelihoods. There are a vast number of case studies on how water security effects the world’s population. This paper focuses on those studies that tie water security with food security, income security, and farmer livelihoods.

In an academic paper that used a sustainable livelihoods framework to measure relationships between access to water, livelihood assets, and livelihood strategies, the author found that access to potable and irrigation water sources had a significantly positive impact on farmers’ livelihoods in Northern Thailand. Financial assets were found to be “stronger” with those who had better access to water and “almost all component [sic] of the livelihood assets show a significant relationship to private or individual access to water” (Kitchaicharoen et al, 2008). Access to water in one region was also tied to better health as shown through the “human assets” indicator. The report continued:

...farm income as well as family income show that the households with good access to water had earned more income compared to the households with bad access to irrigation water. Having better access to irrigation water allows farmers to use their available land for crop production to increase their income. (Kitchaicharoen et al, 2008)

All of this added up to a strong correlation between water resources and improved farmer livelihood, health, and income security.

A second report on water had eight case studies from South Asia, all revealing the linkage between water and poverty. One case found “irrigation access allows poor people to increase their

production and incomes and enhances income diversification opportunities, reducing vulnerability” (Hussain, Giordano, and Hanjra, 2003). In Sri Lanka, farmers who lived in areas with irrigation had an average of 24% higher monthly household expenditure than those who lived in areas without irrigation (Hussain, Giordano, and Hanjra, 2003). Average wages were also USD 0.30 per day (or, >15%) higher in the irrigated regions. In a broader study of six countries throughout Asia, development of water resources led to improved food and income security, as well as a reduction in poverty (Hussain, Giordano, and Hanjra, 2003). In a case investigating Bangladesh, eastern India, and Nepal’s investment in irrigation infrastructure, researchers found that those who implemented a new pump system saw an increase in income of USD 100 per year (Hussain, Giordano, and Hanjra, 2003). Generally, the synthesis of the case studies found that water was directly related to employment, income increases, improved livelihoods, and food security (Hussain, Giordano, and Hanjra, 2003).

Water quality ties directly into improved food and health security and improved livelihoods. It also has many other connections throughout the Theory of Change, such as income security, coffee quality, and improved landscapes, all of which seem to be more of a focus in KGM’s Livelihoods Methodology document. Key takeaways for KGM are that water is interrelated with almost every link touching improved livelihoods and long-term supply of quality coffee. Water should continue to be a developing focus area for the company. Also, the hypothesized connection between water quality and all measurements of farmer security **holds true**.

Long-term Supply of Quality Coffee

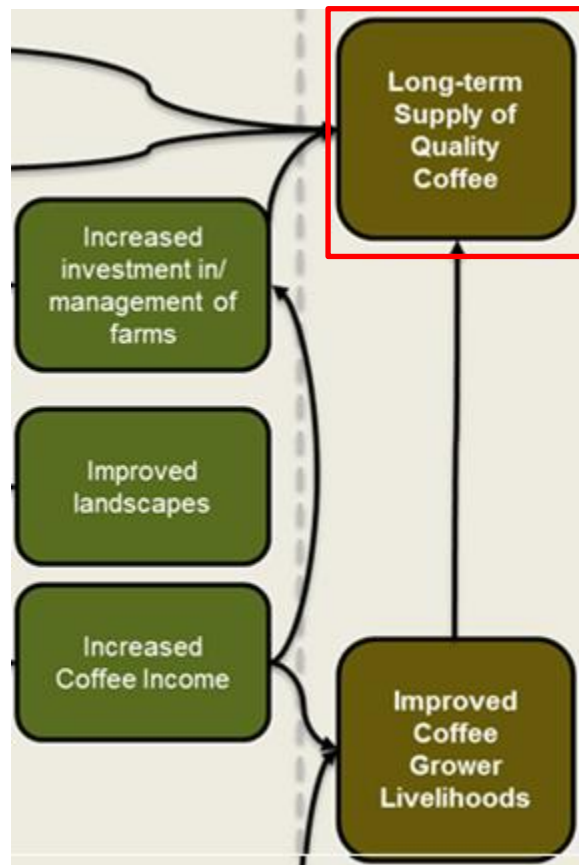


Figure 14. Long Term Supply of Quality Coffee

As described in the introduction and methodology of this report, there were no case or statistical studies done on investments in farming livelihoods that led to improved long-term outcomes for the company who invested, which is the last link in KGM's Theory of Change. This report attempts to prove as many of the Theory of Change links with evidence from available literature. This section will use the findings described in earlier sections of this paper to determine the ultimate benefits to KGM through the long-term supply of quality coffee. In addition, the Livelihoods Methodology document points out four "business value drivers" that form the basis for their methodology: "(1) supply continuity and quality, (2) cost efficiency, (3) reputational risk mitigation, and (4) enhanced traceability" (KGM, 2014). These four "drivers" serve to breakdown of the goal of long-term supply of quality coffee and are linked together in the following sections.

Again, there have been no studies to prove causality but here reasonable assumptions are made when connecting these pieces together.

Quality

'Quality' is a key piece of KGM's desired impact of their investments and is the number one business driver for their livelihood strategy. In the research that cited above, there are many examples different supply chain and farm-level investments increasing the quality of the product. From improved seed varieties for sunflowers in Uganda, to higher standards for dairy products throughout East Africa, to sorghum in Sub-Saharan Africa, and coffee in Rwanda, quality improvements have led to improved farmer livelihoods across the board (Jaffee, Henson, and Rios, 2011). Also, extension services, both at the farm and farmer collective level, have been shown to lead to improvements in quality and business practices.

If both KGM and smallholders benefit from quality enhancements and there are proven methods of increasing quality, it seems likely that KGM will have an increasing supply of quality coffee to purchase as a result of their efforts. Finally, if the "push system" of encouraging farmers and cooperatives to adopt quality-increasing practices is not enough, KGM is promoting quality through their own supplier guidelines as well as the purchase of higher-quality beans. Creating the market allows farmers to capture the value they create and should increase adoption rates of quality improvement techniques.

Productivity

Much of the research found and described above discussed how farmers have increased their productivity or yields at the farmer or cooperative level. These findings lend themselves to the second key term in KGM's desired impact: long-term. The Livelihoods Methodology document also cites both supply continuity and cost efficiency as business drivers.

Research has found a variety of means for increasing farm productivity, as evidenced above. Here there are many examples of increasing the farm plot yields via fertilizer, such as the examples from Kenya (Evenson and Mwabu, 1998) and Uganda (Benson et al, 2012). At the cooperative level, research shows business development training can increase the efficiency of operations, as in the Kyrgyz Republic

(Broka and Koshmatov, 2011) and Ethiopia (Abate, Francesconi, and Getnet, 2013). Good Agricultural Practices (GAPs) in Malawai (Sauer and Tchale, 2006) and throughout East and Southern Africa (Sommer et al, 2013) led to higher yield and sustainable farm management for long-term profitability.

Also, as evidenced in the studies on microfinance, many farmers will further invest in their farm once heightened levels of productivity allow them to go beyond subsistence. As mentioned above, this also shows that the link between increased coffee income and increased investment in / management of farms **holds true**. There is, however, no case studies currently showing how increased farmer investment in farms leads to long-term supplies of quality goods for the investing company.

The entire value chain benefits from increases in productivity: a more sustainable and less vulnerable life for the farmer, and higher quality and less expensive product for the buyer.

Rural Enterprises

KGM has focused much of their supply chain investments on developing rural enterprises and farmer cooperatives. By developing these organizations, the hope is that they will help to disseminate best practices for farm management, increase quality, and streamline practices to lower operating costs. This research has shown that farming cooperatives increase operational efficiency (Abate, Francesconi, and Getnet, 2013), lead to easier standardization of quality (Maertens and Swinnen, 2007), and make farms more attractive to produce buyers (Roothaert and Muhanji, 2009).

In addition to improving on-farm activities, since two of the business value drivers are reputational risk management and enhanced traceability, rural enterprises allow KGM to have more traceability at the farm level. Also, with reputation on the line, the cooperative can serve as a proxy for ensuring KGM's sustainable sourcing guidelines are being followed.

Migration

Migration and its effects on farm performance is one of the less discussed topics around long-term supply of quality coffee. In my early discussions with KGM on their Theory of Change, migration was mentioned as a key concern for their investment programs: if KGM invests in specific farms or cooperatives, how can they guarantee that those farmers won't migrate off the farms? How will KGM protect that collective knowledge?

Unfortunately, there is not much in the way of research on specifically stopping migration from farms, but studies previously mentioned showed farmer stability as a benefit to other metrics. For instance, Thirtle and Piesse cite Mellor for arguing that "agricultural productivity growth reduces poverty so effectively because it generates income for the poor" which in turn slows "migration to urban areas" (Thirtle and Piesse, 2007). An aforementioned study on malaria found that migration was one of the most prominent microeconomic effects of the disease, further degrading an area's resources for productive farming (Sachs and Malaney, 2002). Both of these examples can be reasonably extrapolated to show that any increase in vulnerability or decrease in the aforementioned securities (income, food, health) can lead to migration away from the farming area.

Overall, the studies here support the theory that KGM could improve quality, productivity, rural enterprise, and migration rate for their farmers. Each of these improvements can reasonably be assumed to lead to an increase in the long-term supply of quality coffee for KGM. Key takeaways are that KGM's theories, as set out in the Theory of Change, **hypothetically hold true**. However, there is a large gap in the literature in this area, which can be seen as an opportunity for KGM to develop case and statistical studies to more comprehensively prove their Theory of Change to both internal and external stakeholders.

Discussion Questions

After a discussion of these findings and how they support KGM's Theory of Change and Livelihoods Methodology documents, there were a number of discussion questions or points that still needed answers. This section serves to answer those questions.

Was there any selection bias on the studies chosen for this research?

The short answer is yes. This research was conducted searching key terms in the "positive," searching for causal links proven by statistical studies and not the opposite. Research with mixed results was often passed over for examples with only positive results—and particularly negative results may not have even come up within this search. Because this project centered on finding studies that specifically supported KGM's Theory of Change, research was inherently bias. However, in an investment setting, studies that find KGM's theories to be decidedly false could be equally helpful and this is an opportunity for further research.

Two examples of studies that found over the course of this research that did not back up KGM's original theories were Méndez and Bacon's work on certification and the International Food Policy Research Institute's work on Ethiopian producer groups.

Though KGM does not mention outside certification programs as part of their strategy, their own sourcing guidelines are deeply rooted in increasing farmers' food and income security. Méndez and Bacon show that even with certification for coffee farmers in Central America, 63% of all households "struggle[d] to meet their basic food needs" (Méndez, Bacon, et al, 2010). In Bacon and Méndez's work on the hungry farmer paradox (that is, how can a "successful" farmer be hungry?), they noted that farmers had an average of over three months of hunger per year and that coffee farming is notoriously bad for providing sufficient income (Bacon et al, 2014). Thus, even either with stronger sourcing guidelines, coffee may not be enough to give farmers food and income security through all 12 months of the year.

In an example of a study of mixed results, producer group research from Ethiopia showed a drastic increase in the price for cooperative members over non-cooperative members. However, the monograph goes on to explain "price incentives may not be sufficient to ensure greater market participation by the poorest farmers" (Bernard et al, 2010) and that the price increase may not actually increase the farmers' income security (Bernard et al, 2010). This paper rarely used a study with such mixed results and attempted to represent the researchers' overall findings as best as possible.

In order to offset a bit of this bias in proving the Theory of Change, the benefit of KGM's investment strategy is that they take a multi-faceted approach to improving farmers' livelihoods. In order to ensure the most "security" for farmers they should be sure that farmers receive the multi-faceted approach as comprehensively as possible, as opposed to different sets of farmers receiving help in one security area versus another.

Where were the gaps in information and what are the consequences of those gaps? Can and should KGM be focused on helping to fill those gaps with their own measurement?

There were a few large gaps in information for certain areas of the Theory of Change and there is always room for more research in most areas.

The most significant gap came from the connection of improved livelihoods to better business outcomes, or "long-term supply of quality coffee." I was unable to find any studies linking supply chain investments specifically with improvements to corporations' bottom lines—or even with the quality of their final product. Additionally, there were no studies that linked nutrition training to nutrition and health security for farmers. There were also limited studies showing reverse connections, leading from the desired outcomes of security back to things like adoption of GAPs, producer group development, or even to another security (e.g., income security leading to health security). Finally, my research did not uncover much evidence of the Theory of Change being explicitly false.

With their extremely large scope and size of investment, KGM has an opportunity to provide groundbreaking statistical studies on supply chain investments. They should certainly focus on gathering and maintaining statistics on all their investments, ideally providing a counter-factual to their investment with farmers not involved with their programs. The best method would be to have a third-party researcher perform the analysis and track farmers before and after the life of the investment program to understand metrics such as continued adoption of GAPs. KGM can also certainly track the efficacy of their nutritional trainings and perhaps even create case or statistical studies on the effects of their multi-faceted approach on multiple levels of farmer livelihood. Finally, KGM may well be served to try to disprove their theories in a more robust fashion to better hone their investment strategy.

By developing and furthering the research, KGM should be able to better justify their supply chain investments to their internal business stakeholders.

How can KGM use all of this to communicate to various stakeholders?

All of the research here supporting KGM's Theory of Change is more powerful if it is shared with other stakeholders. Besides proving the theory, the research can reassure internal stakeholders who question the benefit of livelihood investments, interest potential investors, or convince customers to purchase based on a sustainable product line. The following are specific recommendations for communicating to stakeholders.

First, associate studies from this research to the individual supply chain projects that KGM invests in or has invested in in the past. For instance, for a water stewardship project, KGM could give examples from Kitchaicharoen et al or Hussain, Giordano, and Hanjra connecting water stewardship to

improved farmer livelihoods. By citing these studies in a sustainability report or press release, KGM gives legitimacy to their projects, showing that KGM concentrates on projects with the best chance of achieving the desired outcome (improved livelihoods). Also, by using these statistics, stakeholders can better understand how KGM measures success and how livelihoods are being improved.

Next, since statistical and longitudinal studies from their own projects may be too far in the future to cite in reports, KGM should continue to use “Most Significant Change” stories to show their progress and results. “Most Significant Change” stories are self-reported examples of improvement as a result of KGM’s supply chain project investments and are a highlight of the sustainability reports. In contrast to the figures and numbers, the stories add a personal touch to KGM’s reporting.

To engage leadership, the investment team should summarize their Theory of Change hypotheses and give key, powerful examples of how each holds true. Each of the hypotheses should tie to the business value drivers explained in the Livelihoods Methodology document so as to connect the improvements to farmers’ livelihoods back to the business. An improvement in farmer livelihoods can and should be an improvement to the bottom line.

Conclusion

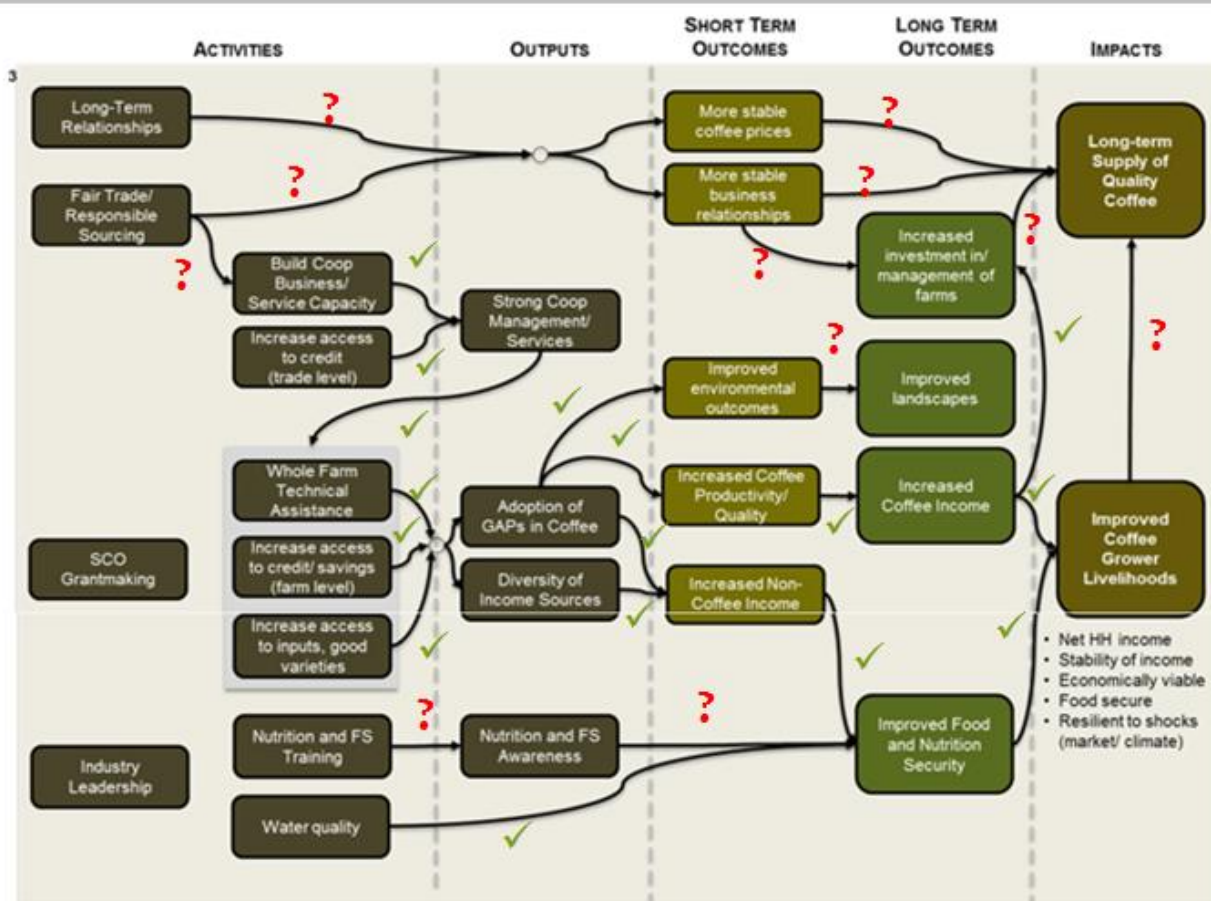


Figure 15. Theory of Change Document with Green Checks for Affirmed Links and Question Marks Where More Research is Needed

This paper has sought given an overview of the research conducted to support KGM’s supply chain livelihood investment strategy. It has been shown that there is significant evidence to support much of KGM’s Theory of Change and focal areas for the Livelihoods Methodology, giving support to their multi-faceted approach to improving farmer livelihoods and obtaining a long-term, quality supply of coffee. There was evidence of producer group development, access to credit, adoption of GAPs, extension services, improvements to quality, and environmental protection leading to income and food security for farmers. There was also evidence of investments in nutrition, health, and water leading to health security, increased productivity, income security, and overall improved livelihoods. Finally, many of the studies on increasing quality, and improving livelihoods and farm productivity can be reasonably extrapolated to show that investment projects can increase value to KGM. The Theory of Change holds true.

The research shown above elucidates specific recommendations for KGM. First, a multi-faceted approach is the strongest method of increasing farmers’ livelihoods and should continue to be KGM’s strategy. In order to have investment projects truly be successful, farmers must adopt changes and see

improvements to their livelihoods for the long term. KGM should monitor these metrics long after a project finishes to gauge whether the project was successful. Also, with all of these improvements to the quality and productivity, KGM should ensure that the farmers have enough access to markets to capture the value they are creating. Finally, the research shows that more research is necessary to truly hone KGM's investment strategy.

There are opportunities for KGM to do further research to gather additional evidence. First, there should be research conducted to determine if any studies have been done that reject the hypotheses KGM uses for its project investment strategy. There should also be more research to see whether there are causality links going in the reverse direction as the Theory of Change draws them. There are also gaps in the research here around nutrition and health training, and the effects of environmental outcomes on farmer livelihoods. In order to fill holes in the information currently available and to obtain additional research to support their investments, KGM should take care to perform longitudinal and statistical studies on their own project investments. By tracking their results, KGM can also hone their approach to supply chain investments and offer a resource to others who want to do the same.

In conclusion, KGM has a unique opportunity to create and publish case studies showing how investments in farmers' livelihoods can lead to business value. These studies can go beyond those that only show the benefit to sales for customers who prefer "sustainable" companies. By publishing results that show a significant return on investment for companies, KGM can truly be a global leader in sustainability.

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Appendix

Abstracts for KGM are subdivided by topic. Some studies are shown multiple times if they fit multiple categories.

Extension Services/Business Skills Training

Title: Economic Impacts of Agricultural Research and Extension

Author: Robert E. Evenson

Type: Chapter in Handbook of Agricultural Economics, Volume 1

Published: 2001

Abstract: Extremely detailed look at all of the studies (mostly economic) done on extension services from the 1920s through 2001 comparing them on methodology and calculation techniques. The author goes so far as to depict biases within the studies that are published (selection bias etc.) and analyzes them in temporal, geographic, and commodity groupings. In the end, it's a study of studies and shows that most extension services have moderate to great internal rates of returns (IRRs).

Use for KGM: As noted in the abstract, this paper summarizes 80 years' worth of studies on extension services and shows that most have great IRRs. The tables alone should be enough to support the links between service capacity, increasing access to inputs, and whole farm technical assistance with downstream nodes in KGM's theory of change.

Quotes and Tables:

Table 3
Extension economic impact studies: Statistical methods: Aggregate farms as unit of observation

Study	Country	Period of data	Production structure	Extension variable	IRR	
Evenson and Jha (1973)	India	1953-57	CS	PD	Maturity rating district	14
Mohsin and Evenson (1975)	India	1955-71	CS	PD	Presence of IADP	15
Huffman (1974)	USA	1959-74	CS	MPF	Extension staff/farm	16
Huffman (1976)	USA	1964	CS	MPF	Staff days/farm	110
Evenson (1979)	USA	1971	CSxTS	PD	Expenditures/region	100+
Huffman (1981)	USA	1979	CS	MPF	Extension days/country	110
Pray and Ahmed (1991)	Bangladesh	1951-61	CSxTS	MPF	Expenditure/district	nc
		1977-86	CSxTS	MPF		nc
Norton & Paczkowski (1993)	USA (Va)			MPF		52
Evenson (1992)	Indonesia	1971-89		PD	Expenditure/farm	92
Librero and Perez (1987)	Philippines	1956-83	CSxTS	MPF	Expenditure/province	nc
Setboonsarng and Evenson (1991)	Thailand	1953-71	CS-TS	PD(Y)	Expenditure/farm	nc
da Cruz et al. (1982)	Brazil	1970-75-80	CS-TS	PD	Expenditure/farm	nc
Evenson (1987)	Latin America	1960-82	CSxTS	PD(Y)	Ext.Ex/geo-climate region	0-80+
	Africa	1960-82	CSxTS	PD(Y)	Ext.Ex/geo-climate region	34-80+
	Asia	1960-82	CSxTS	PD(Y)	Ext.Ex/geo-climate region	80+
Evenson & McKinsey (1991)	India	1956-83	CSxTS	PD(Y)	Expenditure/farm	
	India	1956-83	CSxTS	PD(Y)	Wheat	82
	India	1956-83	CSxTS	PD(Y)	Rice	215
	India	1956-83	CSxTS	PD(Y)	Jowar	167
	India	1956-83	CSxTS	PD(Y)	Bajra	201
	India	1956-83	CSxTS	PD(Y)	Maize	56
	India	1956-83	CSxTS	PD(Y)	All	176
Evenson (1994)	USA	1950-72	CSxTS	PD	Expenditure/state	Crops 101
	USA	1950-72	CSxTS	PD	Expenditure/state	Livestock 89
	USA	1950-72	CSxTS	PD	Expenditure/state	All 82
Evenson and Avila (1996)	Brazil	1970-85	CSxTS	PD	Predicted extension contacts	Crops 33 Livestock 23 Aggregate 19
Evenson and Quizon (1991)	Philippines	1948-84		PD	Expenditure/farm	Positive (low)
Norton and Paczkowski (1993)	USA (Va)	1993		MPF		37

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"Most of the studies summarized in Table 3 reported rate of return calculations. **These, of course, are marginal rates of return since they are based on coefficients estimated for the extension variable** (sometimes interacted with other variables). The rate of return was **typically calculated by simulating a one dollar increase in extension expenditure in time t**, then calculating the change in the extension variable in subsequent periods from this investment utilizing the time weights. The estimated coefficient for the extension variable then enables one to

construct the "benefits stream" associated with the investment (multiplying by the units affected), and the IRR is calculated from this." Pg. 596

Table 4
Economic impact studies combining extension and public research

Study	Country	Period of analysis	Commodity	Production structure	IRR
Elias (1971)	Argentina	1943-63	Sugarcane	MPF	33-49
del Rey (1975)	Argentina	1943-63	Sugarcane	MPF	35-41
Pray (1978)	Punjab (India)	1906-56	Aggregate	MPF	34-64
	Punjab (Pakistan)	1948-63	Aggregate	MPF	23-37
Avila (1981)	Brazil	1959-78	Rice	MPF	83-119
White and Havlicek (1982)	USA	1943-77	Aggregate	MPF	7-36
Lu et al. (1979)	USA	1939-72	Aggregate	MPF	25
Zentner (1982)	Canada	1946-79	Wheat		30-39
Evenson (1979)	USA	1948-71	Aggregate	MPF	110
Nagy (1983)	Pakistan	1967-81	Maize	MPF	19
	Pakistan	1967-81	Wheat	MPF	58
Feijoo (1984)	Argentina	1950-80	Aggregate	MPT	41
da Silva (1984)	Brazil (Sao Paulo)	1970-80	Aggregate	MPF	60-102
Ayers (1985)	Brazil	1955-83	Soybeans	MPF	23-53
Nagy (1985)	Pakistan	1959-79	Aggregate	MPF	64
Khan and Akbari (1986)	Pakistan	1955-81	Aggregate	MPT	36
Norton et al. (1987)	Peru	1981-87	Aggregate		17-38
Scobie and Eveleens (1987)	New Zealand	1926-84	Aggregate	PD(Y)	30
Harvey (1988)	U.K.	1988	Aggregate		38-44
Seboonsamng and Evenson (1991)	Thailand	1991	Rice	MPF	40
Sterns and Bernstein (1994)	Cameroon	1979-91	Row pea	PD(Y)	3
	Cameroon	1979-91	Sorghum	PD(Y)	0
Howard et al. (1995)	Zambia	1978-91	Maize	PD(Y)	84-87
Kupfama (1994)	Zimbabwe	1932-40	Maize	PD(Y)	43.5
Mudhara et al. (1995)	Zimbabwe	1970-95	Cotton	PD(Y)	47

Pg. 594

"The 60-plus studies summarized in Table 5 covered a broad range of commodities in a broad range of countries. **Almost all report high to very high internal rates of return.** (Many studies reported a range of IRRs as noted in Table 5.)" Pg. 606

Table 9
Ex ante economic impact studies of agricultural research programs

Study	Country/region	Period of study	Commodity	<i>Ex ante</i> IRR
Monteiro (1975)	Brazil	1923-1985	Cocoa	19-20
Fonseca (1976)	Brazil	1933-1995	Coffee	23-27

Pg. 610

Title: Poverty Literature Review Brief: Primary Farming (Agriculture)

Author: International Finance Corporation

Type: IFC/World Bank Report

Published: 2012

Abstract: World Bank's report as a means of explaining their investments in agriculture and how it will lead to poverty alleviation. This paper specifically focuses on justifying their investments and explaining their own theory of change through years of study on agriculture and world's poor. It calls upon 37 case studies it has done in the past to show the improvements their funding has provided.

Use for KGM: The paper backs up the link between building capacity, increasing access to credit, and technical assistance all leading to better production and more income/food security for the farmers.

Quotes:

"First, irrespective of the setting, **agriculture is much more powerful [than non-agriculture] in reducing poverty among the poorest of the poor** (\$1-day) when inequality is not too high." Pg. 8

"...in resource-rich countries, agriculture is usually more powerful in reducing poverty, especially when it comes to \$1-day poverty." Pg. 8

"**Agriculture** remains a powerful instrument of poverty alleviation across the globe **and its growth through productivity improvements...will continue to have a direct and lasting impact on incomes and poverty alleviation**. This **legitimizes in particular the emphasis on** supply chains to break the vicious circles of low productivity and household incomes by **improving access to inputs, technology and financial services** while improving producer capacity and overcoming infrastructure gaps." Pg. 9

Title: Developing Viable Business with Smallholders through Local Service Providers – the Case of Banana (Musa spp.) Value Chain Development in Zimbabwe

Authors: E. Mudyazvivi and S. Maunze, Netherlands Development Organization (SNV)

Type: Article in Acta Horticulturae

Published: 2010

Abstract: A case study that examines capacity development as a result of training Zimbabwean banana farmers in business skills. The business skills include keeping business records, contract negotiations, profit determination and farmer-group management. The organization then tracked the success of their program via demand for their services and the overall market management.

Use for KGM: This case study follows over 1000 banana farmers and shows successful results for training farmers in business skills, a key piece of KGM's livelihood strategy. Secondly, it shows a method of measuring success with an extension program that is less typical but very effective that KGM may want to adopt in the future.

Quotes:

"The most common approach to **measure the impact of BDS [business development services] is through indicators such as outreach, number of repeat customers and willingness to pay.** The SNV case reflects an attempt to use outcomes in the business of the smallholders. The argument is that **if BDS makes smallholder business more successful, these same small businesses will demand more paid-for services** from providers." Pg. 776

"...**farmer associations and groups' membership increased from 600 to more than 1000...** improved negotiation skills and reduced risk profile of smallholders secured them market supply agreements of 640 t from leading companies in the country. In addition, **the smallholders moved from price-takers to negotiators.**" Pg. 776

"They negotiated **price increases** from an average of \$**0.07 to 0.15**; (d) **forty out of 50 farmer groups opened and started using bank accounts...** a bulking model dependent on efficient routing and collection centre capacity is estimated to have **reduced costs by 15%...** " Pg. 776

On CARE sorgham case: "In 2003, the organization **linked some 1,500 sorghum...farmers to the beer company** Ingwebu Breweries (Bulawayo, Zimbabwe). The linkage started successfully, with CARE organizing farmer s and directing field operations, while the company provided seed and the market outlet. However, as soon as **CARE pulled out** in 2005, the market linkage began to decelerate and by early 2007, **more than 50% of the farmers had stopped participating.** CARE concluded that this was because **when it pulled out at the end of the project period, no capacity-building mechanisms were in place to support the linkage.**" Pg. 774

Title: Finding Out What Worked in IFC's Access to Finance and Farmer/Business Training

Author: Gloria Panlagua and Flora Nankhuni, IFC

Type: IFC White Paper

Published: 2013

Abstract: This white paper synthesizes 66 studies done between 2000 and 2012 of private sector interventions in financial access and farmer/business training. It summarizes the results of those studies and makes commentary on what needs to be studied further. Finally, it notes both the strengths and shortcomings of those studies.

Use for KGM: The overall finding of this synthesized report is that increasing access to credit and training go hand in hand and are both positive for farm outputs and farmer livelihood over the long-term. Also, this report summarizes both the positives and negatives of the current study of the effects of extension services in farming.

Quotes:

"**Successful projects address farmer constraints along the whole value chain.** This can include providing training on good farming practices and management skills; informing about post-harvest techniques and marketing; offering access to grants or credit; and facilitating the organization of farmers to help them

secure better prices with suppliers while ensuring that their produce meets required standards. For example, most of the successful training **programs provide training alongside other interventions (such as provision of credit or grants in the form of in-kind inputs and equipment/infrastructure) to enable farmers adopt the technology being taught.**" Pg. 1

"**[Access to Finance] interventions generally produce positive impact on agricultural outcomes** such as adoption of technologies being promoted and resulting **increases in production, productivity, and/or farm income and profits**, especially when combined with training." Pg. 1

"...**the evaluations conducted over a long horizon (5 years and above) and those using panel data estimations show positive impacts on well-being of farmers.**" Pg. 1

Title: Overcoming Skepticism about Technical Assistance Projects: The Story of the Agribusiness Competitiveness Center in the Kyrgyz Republic

Author: Sandra Broka and Talaibek Koshmatov, IFC

Type: IFC White Paper

Published: November 2011

Abstract: This is a small white paper on the "lessons learned" on the World Bank-financed Agribusiness and Marketing Project (ABMP) in the Kyrgyz Republic. The ABMP was setup to aid the agro-processing sector via market development and access to credit. The market development offered technical assistance in "food processing technology, quality management, accounting, marketing and sales...". The paper summarizes their findings on how to build a successful technical assistance project but also highlights their results.

Use for KGM: This will bolster the reasoning behind KGM's focus on strong rural enterprises by giving strong results from a project investing in agribusiness. The results from ABMP's work with 44 enterprises are significantly positive.

Quotes:

"Some 68 new products have been introduced in the client enterprises, with **their profits increasing by 25–91 percent and sales increasing by 15–169 percent...**" Pg. 2

"In addition to the 44 client enterprises with which it had a long-term engagement, ABCC facilitated 109 trade deals for other agribusinesses, resulting in sales of 41,770 tons of agricultural products with **total value of \$14.7 million, of which 92 percent went to export markets.**" Pg. 2

"Assistance packages are most effective when they take in the entire context and incorporate complementary components. For example, consultancy **advice should be accompanied by training**; sales support should go along with linking the processors back to the farmers; and **development of business plans for clients should go along with financing options.**" Pg. 3

"Greater **reliance on local consultants has allowed for cost savings and extension of the engagements for longer periods**, and it has helped build client trust and confidence in ABCC's ability to tackle problems that take time to solve." Pg.3

Title: Bank Lending, Information Asymmetry, Credit Accessibility and Performance of Farmers: The Case of the Tororo District

Author: Emmanuel Akika Othieno

Type: MBA Dissertation

Published: November, 2010

Abstract: This dissertation studied the relationships between "bank lending and credit accessibility...information asymmetry and credit accessibility and...credit accessibility and performance of farmers" (Othieno, xi) . The author surveyed 108 farmers and 40 bank employees in Uganda and ran statistics on the results to show correlations between all of the factors associated with bank lending.

Use for KGM: Further backs up the theory that access to credit leads to higher profitability for farmers but also shows that productivity actually will lead to banks being more likely to lend to the farmer. The reverse theory is almost as important.

Quotes:

"Results show that there was a significant positive relationship between bank lending and credit accessibility, a significant negative relationship between information asymmetry and credit accessibility, and a **significant positive relationship between credit accessibility and the performance of farmers.**" Pg. xi

"A study by Atieno (2001) **indicated that income level, distance to credit sources, past credit participation and assets owned were significant variables that explain the participation in formal credit markets.**" Pg. 14

"The results...revealed that there was a **significant positive correlation between credit accessibility and the performance of farmers ($r = 0.580^{**}$, $P < 0.01$).** This implied that the performance of farmers was to a large extent affected by credit accessibility." Pg. 49

"There was a **significant positive relationship between credit accessibility and the performance of farmers. Credit accessibility was a major contributing factor toward the performance of farmers and yet many farmers are not accessing credit.** Access to affordable credit provides working capital and the investment capacity by enabling farmers to afford improved farming techniques thereby increasing on their productivity and profitability." Pg. 56

Title: Impacts of Farmer Field Schools on Cotton Growers in Asia

Author: Francesca Mancini

Type: Paper from Presentation to International Cotton Advisory Committee in September 2006

Published: September 2006

Abstract: This paper shows the impact of "integrated pest management farmer field schools" in cotton-growing regions of Asia. There were 3,661 schools and almost 100,000 farmers trained all with tracked results on things such as the reduction in pesticide use, gross margin, yield, costs, and health effects.

Use for KGM: This paper provides statistically significant example of how training can lead to significant improvements in farmer livelihood.

Quotes:

"These findings support the idea that a skills-oriented, knowledge-intensive and hands-on educational approach, as FFS, is an efficient system to diffuse the complex principles of IPM among farmers." Pg. 3

"The initiative aimed to measure the health effects of pesticide exposures in real time through direct documentation by farmers. The study documented that a **strikingly large majority (84%) of the monitored spray events led to mild to severe poisoning.**" Pg. 4

"In 2004, FFS alumni **eliminated their exposure to pesticide** [of the] most hazardous WHO toxicity class (1a)...**products by a third.** Exposure to moderately hazardous pesticides (WHO II) **was also significantly lower (-60%)** than in 2003." Pg. 4

"[Integrated Pest Management] had a comparatively lower environmental impact than conventional systems on the basis of the reduced pesticide use (<75%)." Pg. 4

Certification

Title: The Evidence Base for Environmental and Socioeconomic Impacts of "Sustainable" Certification

Authors: Allen Blackman, Jorge Rivera

Type: Resources for the Future, Environment for Development Discussion Paper

Published: March 2010

Abstract: This paper reviews the studies done on the claim that certifications has environmental and socioeconomic benefits. The paper only selects studies that focused on socioeconomic and environmental impacts and did an *ex post* analysis of the certification (as opposed to simulation) and ended up with 14 studies that had a "credible counterfactual", or causal link. In the end, the results were mixed and not promising for the certifications' claims.

Use for KGM: Since KGM is using many of its own sustainable sourcing standards and also investing separately in farmer livelihoods, this is extra fodder to show that KGM's work will do more than simple Fair Trade, Utz, or other certification.

Quotes:

"Of these...studies, just 6 find some evidence that certification has positive socioeconomic or environmental impacts. Hence, at best, the...studies provide very weak evidence for the hypothesis that sustainable certification has positive socioeconomic or environmental impacts." Pg. 6

"Overall, **farm-level studies of coffee certification do not provide compelling evidence that certification has positive socioeconomic or environmental impacts.**" Pg. 15

"As discussed in Sections 4 and 5, **the evidence base** on the environmental and socioeconomic impacts of sustainable certification **is relatively thin, comprising 37 studies, of which only 14 attempt to construct a credible counterfactual** and can, therefore, be considered tests of causal impacts." Pg. 23

Title: The Impact of Certification on Smallholder Coffee Farmers in Kenya: The case of 'UTZ' certification program

Authors: Kamau, Mercy W.; Mose, Lawrence; Fort, Ricardo; and Ruben, Ruerd

Type: Research paper presented at African Agricultural Economists conference

Published: September 2010

Abstract: Study on the effect of the Utz certification on the Kenyan coffee farming community with a statistical study of 300 farming households with the counterfactual being those that did not participate in the certification program. Overall, the study found that the farmers in the target group saw many benefits such as higher prices for their coffee and thus incomes, larger savings and bigger investments in land.

Use for KGM: This article provides a statistically significant example of when stringent certification standards (KGM will create their own 'responsible sourcing guidelines') can lead to better farmer livelihoods through better profits and access to credit.

Quotes:

"...the [Utz-certified] group ... **had lower cost of inputs in coffee (total amount and intensity) and had a lower proportion of rejected coffee.** This group **received a higher price for their coffee** (KSh. 5.00 to 6.00 per kg of washed coffee & KSh. 46.00 to 48.00 for mbuni)." Pg. 15

"In addition, the [Utz-certified] group **received greater amounts of credit, used less hired labour in other crops, had greater income from off-farm sources and had a higher expenditure for food.** Farmers in treatment group expressed greater satisfaction with the technical services offered by their cooperative but their perception of the commercial services is not different." Pg. 15

Title: The Last Ten Years: A Comprehensive Review of the Literature of the Impact of Fairtrade

Authors: Valerie Nelson and Barry Pound

Type: Fairtrade commissioned study by Natural Resources Institute

Published: September 2009

Abstract: Over 80 studies were culled down to 23 on the impact of the Fair Trade certification on farmers' lives. The authors pick through all of the selected studies to get an overall sense of many different impact areas and give honest opinions about areas that are both studied and not studied by the current literature. In the end, the results show both positive impacts and a large gap in information for still needs to be studied.

Use for KGM: Though this is specific to Fair Trade and case studies done about Fair Trade this shows that a concentrated effort to improve the livelihoods of farmers through stringent sourcing policies can lead to better farmer livelihoods, especially in incomes. However, it should be noted that Fair Trade is a 3rd Party and thus may have different success compared to KGM's sustainable sourcing policies

Quotes:

"...we are defining **impact** as the 'systematic analysis of the **lasting or significant changes - positive or negative, intended or not - in people's lives** brought about by a given action or series of actions(Roche, 1999).'" Pg. 3

"A number of authors provide evidence that **Fairtrade producers enjoy greater access to credit than their non-Fairtrade counterparts** to cover harvest expenses & other costs." Pg 12

"Most of the impact studies [on activities funded by Fair Trade premium]...provide impressive figures but these figures are not wholly contextualised (in terms of scale of activity and reach of the population), nor do they give much idea of what changes the investment in activities and equipment led to." Pg. 12

"The majority of the studies demonstrate positive benefits from Fairtrade participation...particularly in intangible factors such as **providing extra stability/buffering against shocks, enhancing family social cohesion by reducing the need for outmigration to find work and by building farmers organisations with an ethos of solidarity...**" Pg. 30

"At the same time, **when specifically comparing income and wellbeing indicator differentials between Fairtrade and non-Fairtrade farmers the differences were not always found to be that significant.**" Pg. 30

"This extensive review of the literature finds **strong evidence that Fairtrade provides a favourable economic opportunity for smallholder farming families** who are able to form producer organizations and provide products of the right specifications for the market. A high proportion of the studies reviewed found **higher returns and more stable incomes** as clear benefits enjoyed by Fairtrade producers from sales to Fairtrade markets compared to sale into conventional ones." Pg. 35

"Several studies indicate that **Fairtrade needs to be supplemented by changes in development policies** and coordination with other development actors, **funds and initiatives to raise rural livelihoods** to a more sustainable level." Pg. 35

"For those able to participate in Fairtrade **increased stability provided by guaranteed prices, longterm contracts and the availability of credit enables farmers to invest in their land, domestic facilities and children's education.**" Pg. 36

Tables:

Table 1: Summary of the economic benefits of Fairtrade

Benefit	Number of papers demonstrating benefit
Guaranteed minimum price leading to improved income	29
Improved economic stability	27
Improved access to credit, prefinancing and greater creditworthiness	11
Enables transition to organic	9
Enables diversification of income sources	7
Access to lower interest rates	3
Improvements to facilities and equipment (including being able to position themselves further up the value chain)	5
Income enables quality improvement	4
Access to export markets	9
Influence over conventional markets	6

Pg. 7

Title: The local payoffs of coffee certification. Evidences from smallholder cooperative farmers in Jinotega, Nicaragua.

Authors: Stellmacher, Till; Jena, Pradyot; Nayak, Bibhu; Grote, Ulrike

Type: Paper from Berlin Conference on the Human Dimensions of Global Environmental Change

Published: October 2010

Abstract: A study of Northern Nicaragua's coffee market and how certification affects 1) income and 2) sustainable livelihood. The authors use a randomly-sampled comprehensive survey of 238 farmers to give statistically significant results on their two points of interest. In the end, the results are not conclusive for certified farmers' sustainable livelihood.

Use for KGM: This study helps to show that certification is helpful but that a wholesale approach to farmer welfare and livelihood is necessary to insure that they come out of poverty.

Quotes:

"The **gross margins earned are also higher in certified markets compared to those in non-certified markets. The gross margins of fairtrade certified farmers are higher than those of organic certified ones.** This is mainly reasoned by the **much lower yields of organic coffee cultivation. The higher prices that organic certified farmers obtain from their cooperatives do not adequately compensate for the lower yields.**" Pg. 14

"The answer to the first research question is **that the income effects of certification are positive.** The second part of our analysis shows that the concerned certification program does not eradicate severe poverty among the certified coffee farmers." Pg. 15

Table:

Pg. 14 Poverty Regression

Table 6: Poverty regression (Dependent variable = income gap)

Exp. Variables	Spec. 1	Spec. 2	Spec. 3	Spec. 4
Intercept	7.29 (1.93)*	7.14 (2.17)*	7.74 (2.17)*	6.38 (2.15)*
Age	-0.05 (0.02)	-0.05 (0.03)***	-0.07 (0.02)*	-0.05 (0.02)***
Education	0.20 (0.10)***	0.24 (0.12)**	0.20 (0.11)***	0.20 (0.10)***
Total Land	0.24 (0.11)**	0.30 (0.13)*	0.25 (0.12)**	0.16 (0.12)
Household size	-0.79 (0.13)*	-0.70 (0.15)*	-0.77 (0.14)*	-0.83 (0.16)*
Fairtrade	-0.16 (0.82)		-0.20 (0.84)	
Organic	0.23 (1.24)	0.02 (1.35)		1.06 (1.15)
Organic-fairtrade	0.34 (1.34)	-0.07 (1.48)	0.23 (1.40)	1.67 (0.97)***
Experience in coffee cultivation	0.03 (0.03)	-0.00 (0.03)	0.02 (0.04)	0.07 (0.04)***
Livestock	0.00 (0.00)	0.00 (0.00)	0.000 (0.000)**	0.000 (0.000)
Observation	191	141	160	118
R ²	0.33	0.35	0.35	0.41

Source: Own calculations.

Title: Catalyzing Smallholder Agricultural Finance

Authors: Dalberg Global Development Advisors

Type: Strategic Advisory Report

Published: September 2012

Abstract: A detailed report on the size of the potential smallholder finance market, the potential paths for successfully meeting the demand for financing, and recommendations on which paths to take. The details were worked out through market studies and interviews with both multinational organizations and social lenders.

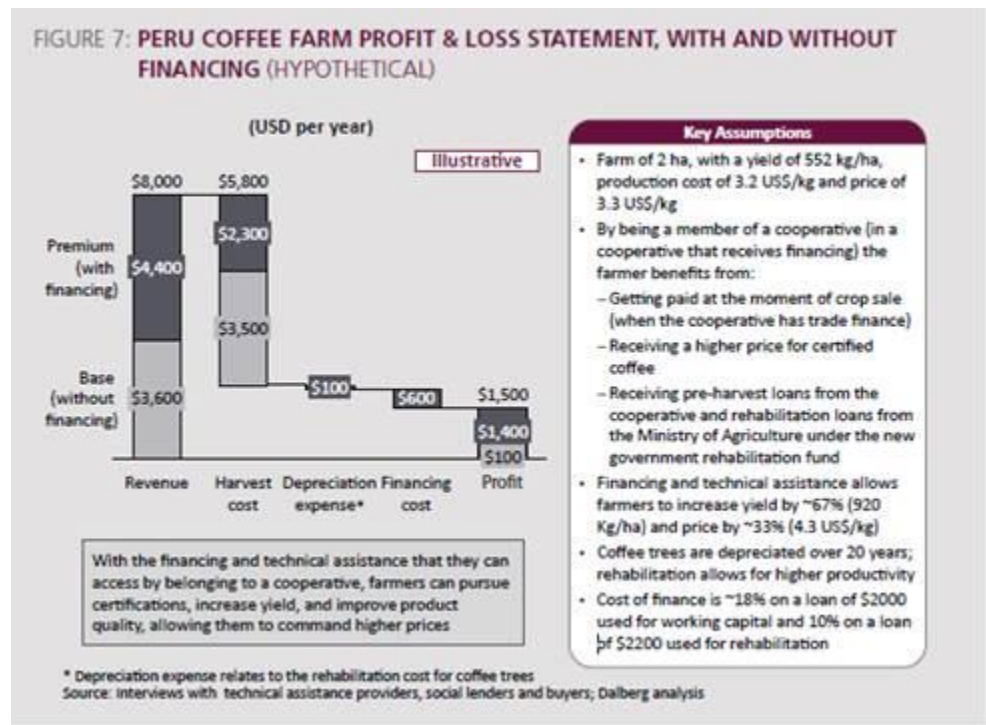
Use for KGM: This study backs up the theory that certification leads to higher yields and incomes for farmers (quote #3)

Quotes:

“Where deployed, the **social lender model** has proven successful in meeting smallholder financing needs, **improving production, building local markets, and encouraging sustainable management of natural resources.**” Pg. 1

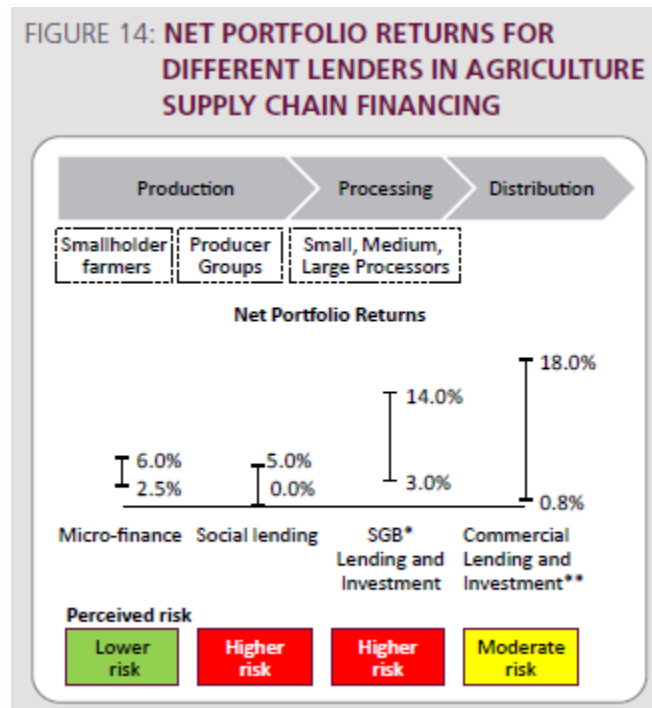
"Furthermore, there is evidence that the **model can catalyze lending from other sources, such as commercial lenders. The social lender model works through cooperatives or producer organizations,** making it an efficient channel for supplying finance to smallholder farmer.” Pg. 1

"**By joining a cooperative,** a Peruvian coffee farmer can get her coffee certified as Fair Trade, and thereby earn a **33 percent price premium.** She can access pre-harvest loans from the cooperative, and is also eligible for loans to rehabilitate coffee plants under a new government program. Her input costs (for plant depreciation and interest) increase, but her yields increase by 67 percent. The end result is a **\$1500 profit** on revenues of \$8000, **compared with a non-aggregated farmer, who profits \$100** on revenues of \$3600." Pg. 7



"The 225 million smallholders who sell and trade each require approximately **\$1000 short-term financing** and **\$1000 in long-term financing** amortized over multiple years. Therefore, a directional estimate suggests smallholder demand for short-term financing amounts to **\$225 billion**, and smallholder demand for long-term financing amounts to **\$225 billion.**" Pg. 8

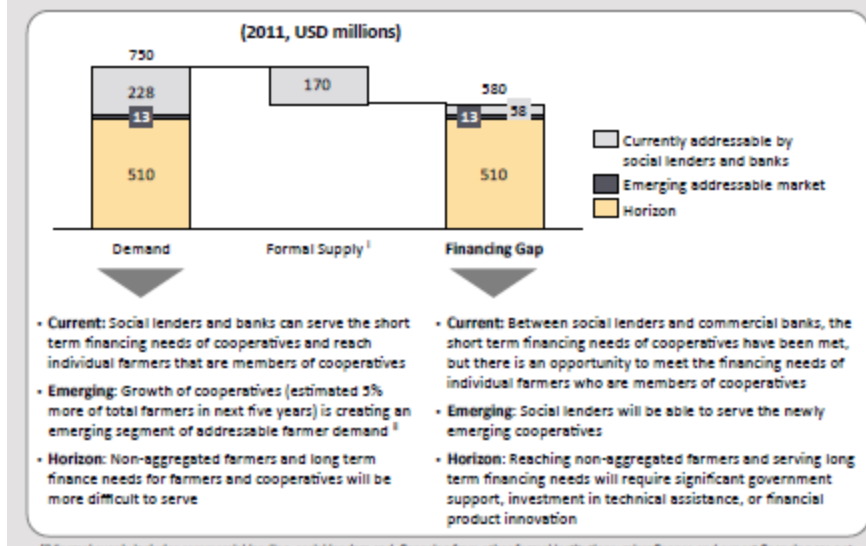
"As **smallholder productivity and profits increase, livelihoods improve, and smallholders can escape the cycle of poverty.** Because smallholders constitute a large proportion of the world's poor, focusing on smallholder livelihoods could have a great impact on reducing global poverty. Furthermore, because smallholders are stewards of the land, supporting them can have positive benefits for preservation of ecosystems." Pg. 15



Pg. 16

Large financing gap = need for more financing

FIGURE 19: FINANCING GAP IN PERUVIAN COFFEE (APPROXIMATE)



Pg. 18

"Multinational buyers provide the contracts with smallholder organizations that social lenders can use for collateral." Pg. 21

Quality

Title: Making the Grade: Smallholder farmers, emerging standards and development assistance programs in Africa.

Authors: Steven Jaffee, Spencer Henson, and Luz Diaz Rios

Type: World Bank White Paper

Published: 2011

Abstract: This paper provides a variety of case studies on Sub-Saharan Africa's agricultural sector's improvement in quality and the effects it had on the smallholders involved. Though many of the results are positive, the paper also provides examples where certain initiatives failed because there wasn't a market for the improved-quality item.

Use for KGM: This provides a strong backing to the link between production quality and farmer income.

Quotes:

Sunflowers in Uganda:

"Upwards of 85,000 smallholder farmers have been incorporated into one or more coordinated supply chains...The simple upgrades involved here—**centered primarily upon the use of improved seed varieties and some modest tasks of quality screening**—represent relatively easy steps that can be taken by most smallholder farmers... Overall, **the costs of achieving quality upgrades by these farmers have been very modest on a per beneficiary basis...**" Pg. 79

"For farmers there have been evident benefits... A survey by Elepu and Nalukenge (2007) found participating farmers to have much better access to advisory services and reliable market outlets than did nonparticipants in similar locations. **The incremental incomes from sunflower haven't been exceptionally high, but yields have been relatively reliable** and prices are determined prior to plantings. Elepu and Nalukenge (2007) found **reported gross profit per acre to be significantly higher among the farmers participating in the contract scheme than the noncontracted farmers growing sunflower (US\$ 20,456/acre vs. negative 7,775/acre).**" Pg. 82

"APEP reported increased yields from adoption of hybrid seed (and low input technologies) from **250–350 kg/acre with the traditional variety to 575–600 kg/acre** with the improved system during the 2006/07 season, and **net incomes considerably higher among farmers adopting the hybrid.**" Pg. 82

East African Dairy:

Higher standards on quality lead to higher profits for farmers:

TABLE 6.2: Costs and Returns of Smallholder Dairy Upgrades in Selected Countries

	TOTAL MILK AVAILABLE FOR SALE (LITERS/YR)	PRODUCTION COSTS (USD)			FARMER REVENUE (USD)		
		TOTAL COST PER HERD	COST PER COW	COST PER LITER SOLD	TOTAL NET PROFIT (CASH & IMPUTED)	NET PROFIT FROM MILK SALES (CASH ONLY)	TOTAL PROFIT PER COW (CASH & IMPUTED)
Kenya (3-cow)							
Typical	5,448	1,944	648	0.36	39	(148)	13
Basic	6,229	2,085	695	0.33	152	(56)	51
* Improved	9,060	2,945	982	0.33	944	441	315
* Advanced	14,269	4,026	1,342	0.28	1,564	874	521
Kenya (6-cow)							
Typical	7,533	2,385	398	0.32	463	255	77
Basic	9,015	2,545	424	0.28	734	505	122
* Improved	11,785	3,430	572	0.29	1,595	1,187	266
* Advanced	17,193	4,941	824	0.29	2,193	1,742	366
Uganda (3-cow)							
* Basic	4,177	1,131	377	0.27	321	(122)	107
* Improved	7,843	1,623	541	0.21	638	100	213
* Advanced	11,754	2,007	669	0.17	931	360	310
Zambia (1-cow)							
* Basic	617	394	394	0.64	586	(209)	586
* Recommended	1,932	649	649	0.34	926	(97)	926
* Advanced	3,037	902	902	0.30	1,099	52	1,099
Zambia (2-cow)							
Basic	1,564	657	328	0.42	1,214	(188)	607
Recommended	4,269	1,193	596	0.28	1,843	27	922
Advanced	6,509	1,678	839	0.26	2,213	368	1,106

Management assumptions

Kenya, zero-graze: breed improves at each level, switch from plastic to metal.

Uganda, zero-graze: breed improves from typical to improved (same for improved and advanced).

Zambia, semi-zero graze: high-quality breed throughout.

* Indicates metal dairy equipment

Source: Keyser, 2003 (Uganda), Keyser, 2008 (Zambia), Parsons and Matiru, 2008 (Kenya).

Pg. 85

Increasing quality of sorghum with Epuripur sorghum in Sub-Saharan Africa:

"Clearly the farmers that have been able to participate in the scheme **have benefited from an assured or reliable market, an additional source of cash income, and increased adoption of improved sorghum technologies.**" Pg. 92

"Farmers have evidently **used this money to meet their household needs (e.g., nutrition, education, health, clothing, entertainment, etc.) and to procure household assets (e.g., land, livestock, bicycle, radio, house, etc.).**" Pg. 92

"The company estimates that farmers have received over US\$3.8 million through the program over the past four years, providing a **supplemental income of around \$250 per farmer over and above their subsistence farming**, with each farmer supplying an average of 1.4 tons of sorghum each year." Pg. 93

Improving coffee quality in Rwanda to gain access to Specialty Coffee Market

"**Approximately 50,000 households have seen their incomes from coffee production double**" Table 6.3, Pg. 102

"**Quality ratings for Rwandan coffee have improved considerably since 2002 (from 3.5 to 4.5)**" Table 6.3, Pg. 102

"The experience has demonstrated that although under specialty coffee markets, importers, and roasters buy and sell a "story," the **most powerful marketing tool to the specialty coffee industry is the promise of consistent quality and a reliable supply.**"

"According to a survey among coffee international buyers undertaken **in 2002 and 2007, reliability, consistency, and strength of relationships are the most important supply attributes for buyers** (MAAR, 2008–12)." Footnote, Pg. 102

"Thousands of Rwanda smallholders are benefiting from higher coffee prices for fully washed specialty coffee. The price that cooperatives and noncooperative (private sector) [coffee washing stations] are paying to farmers for cherries has risen from **60 to 80 Rwandan francs in 2004 to between 160 and 180 Rwandan francs in 2008...**" Pg. 104

"Coffee growers have **improved the overall household expenditure by 13 percent in 2007 compared to the period before the reforms.**" Footnote, Pg. 104

Title: Trade , Standards and Poverty : Evidence from Senegal

Authors: Miet Maertens and Johan F. M. Swinnen

Type: Discussion Paper from LICOS Centre for Institutions and Economic Performance & Department of Economics, University of Leuven, Belgium

Published: April 2007

Abstract: As a result of increased standards from EU buyers, Senegalese farmers and sellers integrated and improved their product. This study looks at the benefits to farmers and others in the value chain as it relates to those changes. The study was performed in Senegal via a survey of 300 farm-households over 23 villages. They find that though this change takes the farming away from smallholders, the farmers still benefit more in a work setting rather than in an individual farm production setting.

Use for KGM: This discussion paper highlights the benefits of higher quality leading to higher income though it also showcases alternate means of increasing farmer livelihoods. Namely, through aggregation of farms, skilled farmers can work there and increase their income instead of producing their own.

"So, participants in [fresh fruit and vegetable] export production have incomes that are 60% to 130% higher than the average income in the research area – indicating very strong positive effects." Pg. 16

"...our estimations indicate that the impact on household income from FFV contract farming is about two times higher than the impact from FFV estate employment." Pg. 16

"These findings demonstrate that **high-standards agricultural production and trade can directly reduce poverty and improve welfare** even if it is realized through large-scale agro-industrial production. **This challenges the general view in the literature of increasing food standards and agro-industrialization leading to a concentration of the gains from trade with large food companies and to the marginalization of the smallest farmers and the poorest households.**" Pg. 20

"We find that more and poorer households participate in and share in the gains from high-standards FFV export production. **Supply chain restructuring has altered the mechanism through which local households benefit – increasingly through labor markets rather than through product markets – and thereby improved the distribution of gains within rural communities.**" Pg. 20

Environmental Sustainability

Title: International Fund for Agricultural Development and the United Nations Environment Programme. (2013). Smallholders, food security, and the environment.

Author: "Asad Naqvi (Acting Head of Green Economy Advisory Services), under the overall guidance of Steven Stone, led the preparation of this paper from UNEP's side"

Type: UNEP and IFAD White Paper/"Programme"

Published: 2013

Abstract: UNEP and IFAD prepared this program to highlight three key messages about smallholder farmers and the environment: smallholders are vital to agriculture, productivity depends on healthy ecosystems, and a transformation is needed in agricultural systems to achieve the necessary production.

The paper highlights where the ecosystem has broken down and its effect on smallholders' yield and costs.

Use for KGM: This paper gives strong evidence from other statistical studies that adopting GAPs in production will lead to both better environmental outcomes and higher income for farmers. Also, it ties together sustainability and farmer incomes.

Quotes:

"The **productivity of smallholder agriculture** and its contribution to the economy, **food security and poverty reduction depend on the services provided by well-functioning ecosystems**, including soil fertility, freshwater delivery, pollination and pest control." Pg. 6

"The **'yield gap' – the difference between potential and actual yield – widens as the provisioning of ecosystem services diminishes, e.g. lack of water, lack or imbalance of nutrients, pest damage, weed competition and lack of pollination** (figure 4). The necessary **investment to close this yield gap through inputs**, such as (artificial) fertilizers and pesticides, **increases as ecosystem services decline.**" Pg. 18

"Applying or **increasing the levels of artificial inputs** applied is generally **non-economic for resource-constrained smallholder** households (Heisey and Mwangi 1996; Odhiambo and Magandini 2008). Thus their **ability to close the yield gap depends more on improving the integrity and extent of natural supporting and regulating services**, such as pest control, water retention and nutrient cycling." Pg. 18

"**Soil degradation was estimated to have reduced global agricultural productivity by 13 per cent** since the mid-1990s (Wood, Sebastian and Scherr 2000)." Pg. 23

"**Yield reduction in Africa due to past soil erosion may range from 2 to 40 per cent, with a mean loss of 8.2 per cent for the continent** (Nellemann et al. 2009)." Pg. 23

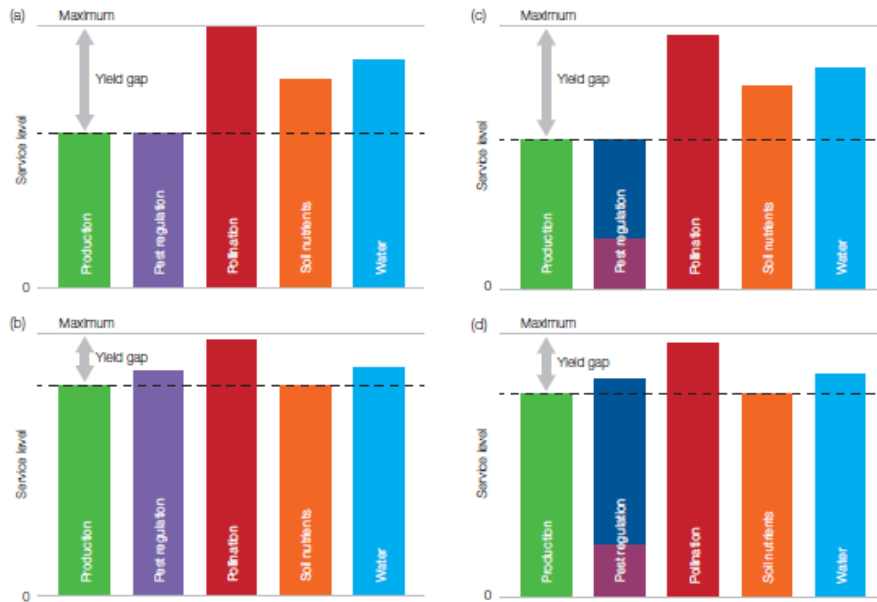
"Overall, this evidence suggests that **land degradation – through erosion, biological soil degradation, physical degradation, chemical degradation (acidification, toxicity) and salinization** – probably affects smallholder activity and reduces benefits derived from ecosystem services, **limiting their agricultural production** (IAASTD 2009b; Neely and Fynn 2011)." Pg. 24

Tables:

The yield gap (between maximum yield and actual yield) as ecosystem services go down:

FIGURE 4

Contribution of regulating and supporting services to provisioning services (crop production)



(a) Production can only attain a level set by the lowest underpinning regulating or supporting service, in this case pest regulation, despite other services being superoptimal. (b) Pest regulation is enhanced and so production increases and the yield gap is reduced to the level set by the next limiting service, in this case soil nutrients. (c) Ecological replacement, where a proportion of one of more underpinning services (e.g. pest regulation) is supplied by biodiversity-derived services (e.g. natural enemies, green bar) rather than anthropogenic-derived services (e.g. insecticides, red bar); production remains the same overall, but more of the regulating and/or supporting service(s) are provided by biodiversity. (d) Ecological enhancement, where the level of one of more underpinning services (e.g. pest regulation) is boosted by biodiversity-derived services (green bar) rather than anthropogenic-derived services (red bar), with the result that production increases overall.

Source: Bommarco, Kleijn and Potts (2013, 232).

Pg. 18

Title: Alternative Soil Fertility Management Options in Malawi - An Economic Analysis

Authors: Johannes Sauer and Hardwick Tchale

Type: Paper from International Association of Agricultural Economists Conference 2006

Published: August 2006

Abstract: Using a household survey of 376 farmers in addition to validation trials on the farm, this paper attempts to show the benefits of Integrated Soil Fertility Management (ISFM) versus chemically-based soil fertility management practices. The study shows higher yield rates and lower cost of input for ISFM versus inorganic fertilizer use.

Use for KGM: This paper shows the benefits of using ISFM, which is better for the environment and ultimately more profitable for the farmers. This again links the adoption of GAPs with higher income and better environmental outcomes while also tying the latter two together.

Quotes:

"The use of integrated soil fertility management improves the yield of maize by 4.2% on average, compared to the use of inorganic fertilizer only." Pg. 21

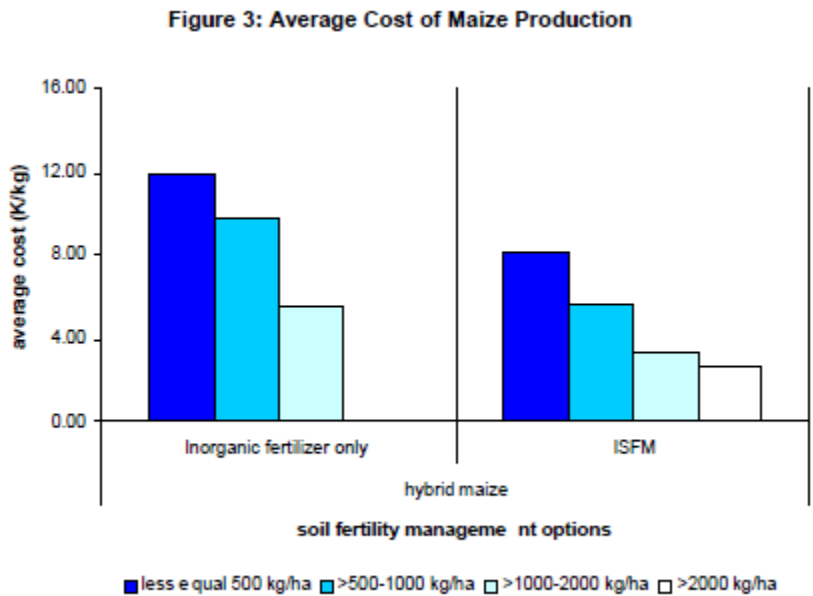
"However, **returns to scale for farmers using integrated soil fertility management practices are significantly higher (P<0.000) than for farmers using only inorganic fertilizer.** The relatively higher returns to scale for integrated soil fertility management options imply that there is still scope for smallholder farmers to improve maize productivity by an increase of their production: **ISFM options improve the soil fertility and hence enhance the efficiency of inputs.**" Pg. 23

"Thus, with farmers facing more or less the same maize price and input cost, the profitability of smallholder maize production is likely to be higher when farmers integrate inorganic fertilizers with grain legumes." Pg. 23

"In Zimbabwe, Whitebread et al. (2004) reported a **64% higher yield when maize is planted following green manure rotation compared to continuous fertilized maize.** Mekuria and Waddington (2002) also reported that **ISFM options gave a return to labour of \$1.35 per day compared to \$0.25 per day when either mineral fertilizers or organic soil fertility management options are used alone in Zimbabwe.** In Kenya, Place et al. (2002) reported that the returns to labour from **ISFM options ranged from \$2.14-\$2.68 per day compared to \$1.68 per day when only one of the options is used.** Economic analysis in central Zambia also indicates that **velvet bean and sunhemp green manure followed by maize gives higher rate of returns compared to fertilized maize crop alone (Mwale et al. 2003).**" Pg. 25

"Gross margin per unit of inputs is also higher, assuming farmers face the same maize prices and input costs." Pg. 27

Figure:



Pg. 25

Table:

Table 5: Descriptive Statistics - The Economics of Maize Production

	Hybrid maize	
	Inorganic fertilizer only (N= 110)	Integrated SFM (N=143)
Gross revenue (Kwacha per ha)	9488.80	13124.09
Labour cost (Kwacha per ha)	1816.02	1478.91
Fertilizer cost (Kwacha per ha)	1520.34	1994.42
Gross margin (Kwacha per ha)	6107.44	9650.76
Gross margin per Kg of fertilizer	368.41	530.26
Gross margin per manday	99.91	191.03
Average variable cost per kg of maize	4.80	3.60
Value/Cost ratio (VCR)	2.81	3.78
Marginal Rate of Return (%)	181	278

Note: Hybrid maize includes MH17 and MH18, Kwacha is the local currency, Fertilizers include a combination of 23:21:0+4s and CAN, Integrated soil fertility management (ISFM) involves the application of inorganic fertilizers and incorporation of grain legumes i.e. groundnuts (*Arachis hypogaea*) or pigeon peas (*Cajanus cajan*) in an intercrop system.

Pg. 26

Title: Profitable and Sustainable Nutrient Management Systems for East and Southern African Smallholder Farming Systems – Challenges and Opportunities

Authors: R. Sommer, D. Bossio, L. Desta, J. Dimes, J. Kihara, S. Koala, N. Mango, D. Rodriguez, C. Thierfelder and L. Winowiecki

Type: Research Paper

Published: May 2013

Abstract: This research paper calls out that there are many different ways to sustainably increase the yield of Sub-Saharan Africa's agriculture but that Integrated Soil Fertility Management (ISFM) and Conservation Agriculture are likely the best ways to handle the soil degradation issue. The common recommendation of extension services (government or otherwise) to replace the missing nutrients has been to add fertilizer. However, dosage amounts are extremely site-specific and thus often fail to have the necessary return on investment for smallholder farmers. With this gap in information and the need for farmers to be confident that they will have income security, the authors believe ISFM and CA are the best methods forward.

Use for KGM: This paper shows the benefits of using ISFM and CA, which are better for the environment and ultimately more profitable for the farmers. This again links the adoption of GAPs with higher income and better environmental outcomes while also tying the latter two together.

Quotes:

"...fertilizer recommendations developed in the past often **ignore differences between soils** and are **highly incompatible with smallholders' resources**." Pg. 2

"Even though proven profitable in the long-run, the attractiveness of ISFM and CA is often impaired by smallholders' limited resources (money, labour) as well as the delayed responsiveness in terms of improved yields." Pg. 3

"One of the **primary bottlenecks of adaptation of profitable and sustainable nutrient management systems is the lack of knowledge of site-/region-specific soil fertility constraints**." Pg. 79

Producer Groups

Title: Cooperatives for Stable Crop Marketing: Evidence from Ethiopia

Authors: Tanguy Bernard, David J. Spielman, Alemayehu Seyoum Taffesse, Eleni Z. Gabre-Madhin

Type: International Food Policy Research Institute Monograph (164)

Published: 2010

Abstract: This study provides results from 2 surveys completed in Ethiopia about the development and growth benefits that rural producer organizations provide to smallholder farmers. The studies survey 293 kebeles ["clusters of villages"]and use advanced techniques on matching treatment and non-treatment farms and avoiding selection and regional biases.

Use for KGM: This report both shows the benefits of farmer organizations and potential opportunities to help build "strong rural enterprises," as per KGM's Livelihoods Methodology document.

Quotes:

"...on average, cooperative members **receive between 7.2 and 8.9 percent higher prices** for their cereal products than did their nonmember counterparts. **This effect is statistically significant and robust across both matching techniques**; it is consistent with the idea that cooperatives may increase the returns to commercialization for smallholder farmers." Pg. 41

"Although cooperatives can effectively secure higher prices for their members' output, **this ability does not necessarily lead to an increase in the quantity of output commercialized** by their members, suggesting (as indicated elsewhere in the literature) that **price incentives may not be sufficient to ensure greater market participation by the poorest farmers**." Pg. 47

"Furthermore, a **1 percent increase in the level of overall potential volume traded aggregation leads to a 16 percent greater chance that the organization has performed marketing activities** during the past 12 months." Pg. 63

Title: Measuring Cooperative Success: New Challenges and Opportunities In Low- and Middle-Income Countries Measurements for Tracking Indicators of Cooperative Success (METRICS)

Authors: Dr. John W. Mellor, US Overseas Cooperative Development Council (OCDC), US Agency for International Development

Type: OCDC and USAID Study

Published: 2009

Abstract: This study focused on the characteristics of successful cooperatives in developing economies. Using a series of surveys and interviews, the researchers correlated information and statistics on cooperatives with their activity and success rate. Throughout the paper, the authors highlight specific case study success stories from around the world.

Use for KGM: The breadth of case studies with statistical analysis is perfect for showing the benefit of producer organizations. In addition, there are certain case studies that highlight a multinational buyer promoting the development of producer organization and the success related to it.

Quotes:

"...**Land O'Lakes** helped four primary dairy cooperatives in the Kilimanjaro region of Tanzania **form a cooperative union to jointly market their milk, increase farmers' bargaining power in the marketplace and rationalize transportation and operational costs.** Land O'Lakes worked with the union to: formalize its management structure, build leadership and management capacity, and introduce improved business planning, consolidated financial management systems and best practices to the union and its primary cooperative members. **Within 18 months, union leadership implemented a business strategy that increased sales revenues by 70 percent and reduced operating costs by 46 percent.**" Pg. 31

"New product lines at Cooperativa Manduvira [Paraguay] caused a growth surge, which spurred the board of directors to develop a sustainable and sensible plan for managing growth...

- Sugar exports rose from **324 tons in 2005 to 5,500 tons in 2008. Early estimates for 2009 expect 6,200 tons** to be exported to 15 countries in Europe, Asia and the Americas.
- To reduce member transportation costs and move the product to markets faster, the cooperative has built 13 sugar cane collection facilities around the region.
- New product lines now are considered, including organic cotton and stevia." Pg. 38

"As a result of better management and stronger membership, **the total value of savings deposits with the cooperative rose from nearly \$286,000 to almost \$825,000**" Pg. 38

"**Land O'Lakes mobilized and raised the awareness of these farmers about forming dairy cooperatives** as a means of solving their milk collection and marketing problems... dairy farmers had formed 88 primary cooperatives (82 have their own chilling facilities) grouped into seven district cooperative unions, **with a total membership of 15,000... through price negotiation,** the cooperatives now receive an average of 24 cents per liter, **an increase of 18 cents or an amazing 320 percent.** Also through [Uganda Crane Creameries Cooperative Union], farmers now are planning to venture into value-added products by financing and building a dairy plant, which they will own and operate." Pg. 44

"As a result of **new technologies and training**, producers have achieved significant results, including **300 percent savings on fertilizer, reducing by fifteen-fold the amount of water used, and cutting crop diseases by half... owners have seen a 15 percent increase in sales...**" Pg. 46

"Cooperatives in housing, insurance, savings/credit and communications **have proved effective in reducing costs and risks**, and being highly responsive to participants' needs." Pg. 48

"The **solution to poverty in these countries requires accelerated growth of agriculture, which cooperatives can facilitate.**" Pg. 48

Title: Profit Making for Smallholder Farmers: Proceedings of the 5th MATF Experience Sharing Workshop

Editors: Dr. Ralph Roothaert and Gilbert Muhanji

Type: Workshop Summary Report

Published: May 2009

Abstract: This is a report from the proceedings of 5th Maendeleo Agricultural Technology Fund (MATF) Workshop and summarizes the highlights from each of the nine funded projects in Kenya, Tanzania and Uganda. All of the projects "had a common objective: to add value to an agricultural product and link smallholder farmers to profitable markets in a lasting way." (Pg. 3).

Use for KGM: Many of the projects display the benefits of producer organizations and give quantitative results for farming cooperatives. This also highlights the benefits of adoption of best practices and technologies.

Quotes:

Rice Production in Uganda:

" The market driven approach and organisational strengthening of farmer institution will sustain the intervention beyond the project life...**Productivity increased from 960 kilograms of paddy rice per acre to 1700 kilograms due to the adoption of technologies and best practices.**" Pg. 11

"**Production increased from 850 to 1500 kilograms per hectare for both high and low inputs respectively.**" Pg. 12

"**Linkage to buyers through collective marketing gives premium price of US\$1.000 per kilogram as opposed to US\$0.650 per kilogram**" Pg. 13

Bulb Onions in Nairobi, Kenya:

"Objectives

The main objectives were to develop sustainable and gender sensitive access to markets and increase onion market share by 50 percent as well as increase household incomes by 30 percent. To attain these, FCI was to:

1. Assess current onion management practices,
2. **Establish Commercial Villages (CVs) and governance structures in Kieni District, Kenya, and Keratu District, Tanzania,**
3. **Enhance the capacity of CVs and Community Based Technical Experts (COTEs),**
4. **Establish and strengthen partnerships between CVs and private business sector,"** Pg. 17

"Achievements...Market intermediation – **prices increase by an average of over 280 percent...**" Pg. 18

Chicken in Tanzania:

"Objectives

- To strengthen the supply chain at household level through introduction of programmed hatching and improved husbandry practices,
- **To organise collective marketing through establishment of collection points and strategic marketing,**
- **To increase producers profit margin for indigenous chicken from 10 to 17.5 percent."** Pg. 23

"**The assembling, bulking and selling in batches increases profit margins by 17.5 percent. After transportation to the city the profit margin went down to 15 percent**" Pg. 24

Title: Impact of Agricultural Cooperatives on Smallholders ' Technical Efficiency : Evidence from Ethiopia

Authors: Gashaw Tadesse Abate, Gian Nicola Francesconi and Kindie Getnet

Type: Euricise Working Paper n. 50 | 13

Published: 2013

Abstract: This paper statistically investigates the question of whether cooperative members are more technically efficient, or able to get more output from the same inputs, than non-members. From a total sample size of more than 1600 farmers and using very specific statistical studies of the 'Ethiopia Agricultural Marketing Household Survey', the authors provide a good case for the benefits of being in a cooperative.

Use for KGM: This paper provides backing to KGM's goal of developing and supporting strong rural enterprises in addition to the assertions that technical assistance and adoption of good agricultural practices lead to higher productivity.

Quotes:

"**For productivity gains to be achieved, smallholder farmers need to have better access to technology and improve their technical efficiency.** It is important for smallholders to have easy access to extension services in order to optimize on-farm technical efficiency and productivity, given the limited resources available...A third option for **providing services to smallholder farmers is agricultural cooperatives,**

which serve the dual purpose of aggregating smallholder farmers and linking them to input and output markets." Pg. 3

"Whether cooperative members are technically more efficient than non-members is an open question...This paper aims to answer this question by comparing cooperative members and similar independent farmers within the same kebeles [groups of villages with administration]. "

"For large proportion of members, **involvement in cooperatives results in about 5-15 per cent efficiency gains as compared to non-members.**" Pg. 22

"Our results consistently indicate a **positive and significant impact of agricultural cooperatives on members' levels of technical efficiency. On average members are better situated to get maximum possible output from a given set of inputs used, by at least five percent.**" Pg. 23

Title: Catalyzing Smallholder Agricultural Finance

Authors: Dalberg Global Development Advisors

Type: Strategic Advisory Report

Published: September 2012

Abstract: A detailed report on the size of the potential smallholder finance market, the potential paths for successfully meeting the demand for financing, and recommendations on which paths to take. The details were worked out through market studies and interviews with both multinational organizations and social lenders.

Use for KGM: Study finds that the smallholders who are the most accessible for credit are those who organize into collectives or, in this case, coffee cooperatives. The study provides specific success cases and backup to the theory that providing access to credit for cooperatives will lead to strong co-op management and services.

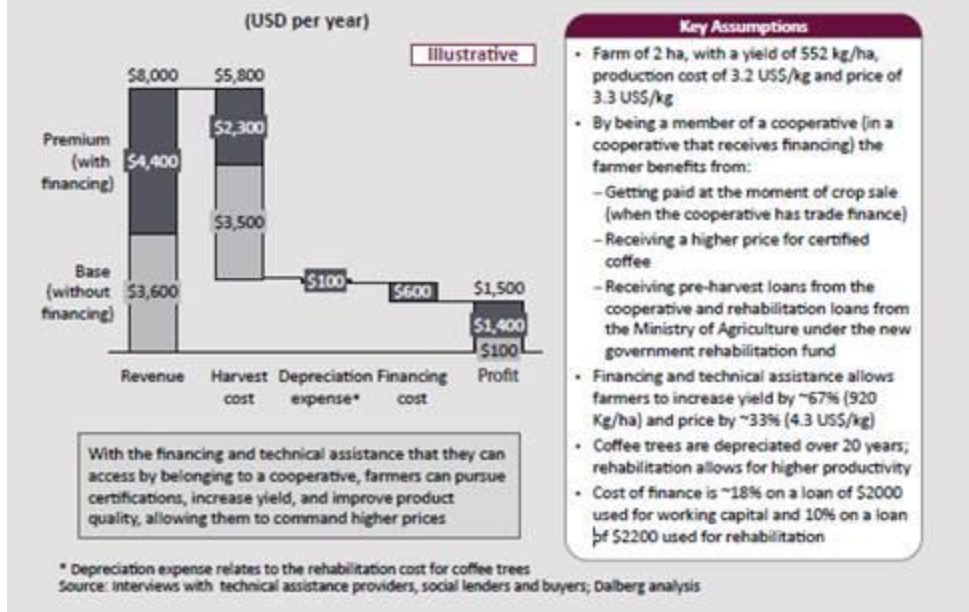
Quotes:

"Where deployed, the **social lender model** has proven successful in meeting smallholder financing needs, **improving production, building local markets, and encouraging sustainable management of natural resources.**" Pg. 1

"Furthermore, there is evidence that the **model can catalyze lending from** other sources, such as **commercial lenders. The social lender model works through cooperatives or producer organizations,** making it an efficient channel for supplying finance to smallholder farmer." Pg. 1

"By joining a cooperative, a Peruvian coffee farmer can get her coffee certified as Fair Trade, and thereby earn a **33 percent price premium.** She can access pre-harvest loans from the cooperative, and is also eligible for loans to rehabilitate coffee plants under a new government program. Her input costs (for plant depreciation and interest) increase, but her yields increase by 67 percent. The end result is a **\$1500 profit** on revenues of \$8000, **compared with a non-aggregated farmer, who profits \$100** on revenues of \$3600." Pg. 7

FIGURE 7: PERU COFFEE FARM PROFIT & LOSS STATEMENT, WITH AND WITHOUT FINANCING (HYPOTHETICAL)

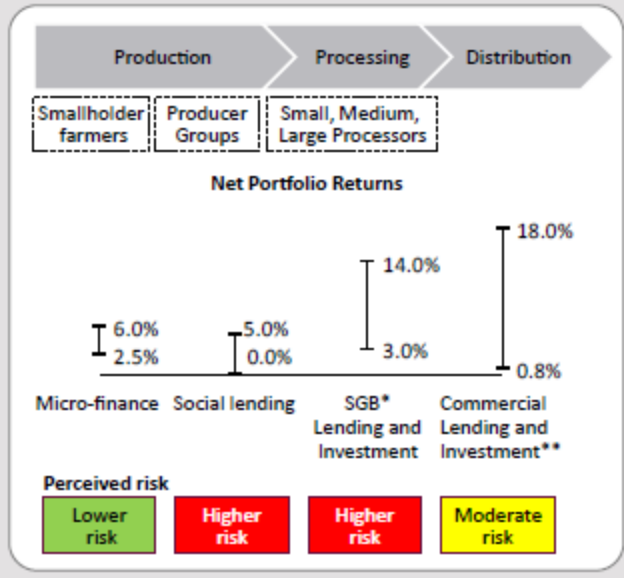


Pg. 8

"The 225 million smallholders who sell and trade each require approximately **\$1000 short-term financing** and **\$1000 in long-term financing** amortized over multiple years. Therefore, a directional estimate suggests smallholder demand for short-term financing amounts to **\$225 billion**, and smallholder demand for long-term financing amounts to **\$225 billion**." Pg. 8

"As smallholder productivity and profits increase, livelihoods improve, and smallholders can escape the cycle of poverty. Because smallholders constitute a large proportion of the world's poor, focusing on smallholder livelihoods could have a great impact on reducing global poverty. Furthermore, because smallholders are stewards of the land, supporting them can have positive benefits for preservation of ecosystems." Pg. 15

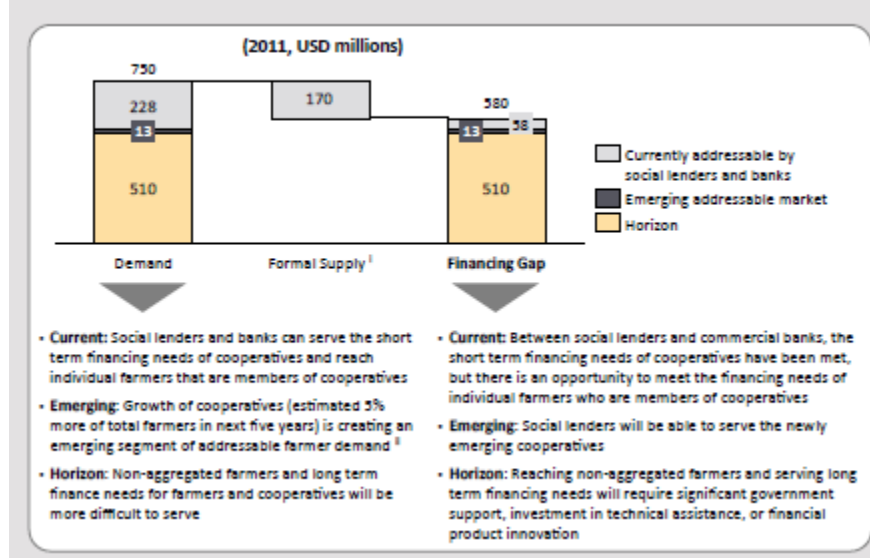
FIGURE 14: NET PORTFOLIO RETURNS FOR DIFFERENT LENDERS IN AGRICULTURE SUPPLY CHAIN FINANCING



Pg. 16

Large financing gap = need for more financing

FIGURE 19: FINANCING GAP IN PERUVIAN COFFEE (APPROXIMATE)



Pg. 18

"Multinational buyers provide the contracts with smallholder organizations that social lenders can use for collateral." Pg. 21

Co-op Finance

Title: Institutional and governance factors influencing the performance of selected smallholder agricultural cooperatives in KwaZulu-Natal

Authors: M Chibanda, GF Ortmann and MC Lyne

Type: Article in *Agrekon* Journal

Published: September 2009

Abstract: Statistical study of 10 smallholder farms in South Africa that reviews the effects of institutional and governmental factors on a number of variables of farmers wellbeing and farm output.

Use for KGM: No firm numbers to cite but explains that access to credit at the cooperative level is necessary to make cooperatives successful and may lead to further access to credit for farmers.

Quote:

“The conclusion is that **appropriate institutional arrangements** and good governance are **important to the performance of enterprises initiated by groups of smallholders.**” Pg. 293

Title: Catalyzing Smallholder Agricultural Finance

Authors: Dalberg Global Development Advisors

Type: Strategic Advisory Report

Published: September 2012

Abstract: A detailed report on the size of the potential smallholder finance market, the potential paths for successfully meeting the demand for financing, and recommendations on which paths to take. The details were worked out through market studies and interviews with both multinational organizations and social lenders.

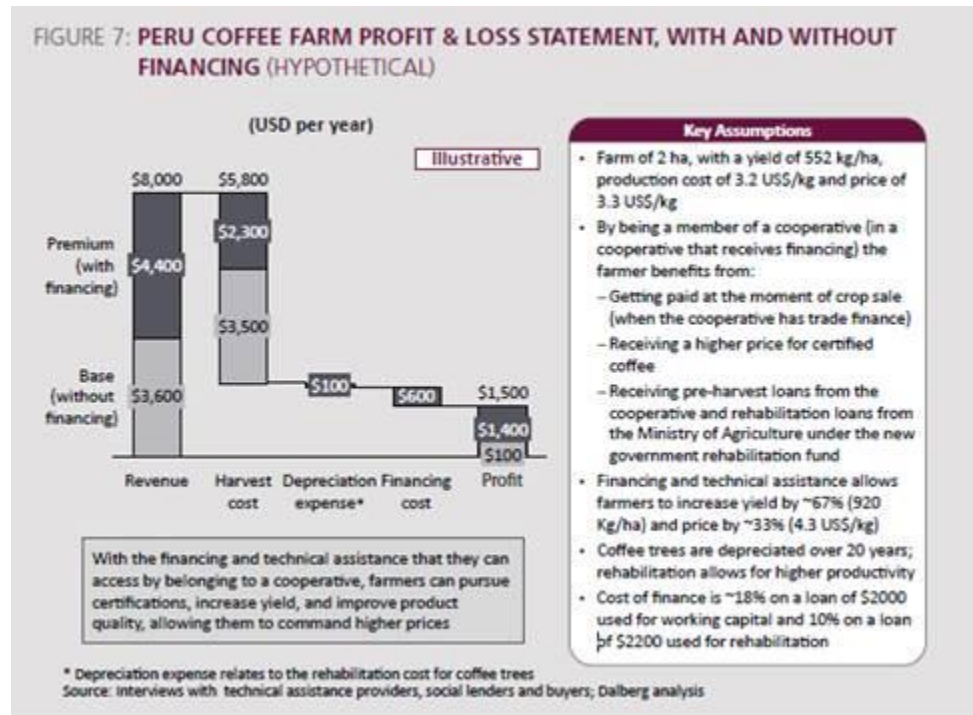
Use for KGM: Study finds that the smallholders who are the most accessible for credit are those who organize into collectives or, in this case, coffee cooperatives. The study provides specific success cases and backup to the theory that providing access to credit for cooperatives will lead to strong co-op management and services.

Quotes:

“Where deployed, the **social lender model** has proven successful in meeting smallholder financing needs, **improving production, building local markets, and encouraging sustainable management of natural resources.**” Pg. 1

“Furthermore, there is evidence that the **model can catalyze lending from** other sources, such as **commercial lenders.** The **social lender model works through cooperatives or producer organizations,** making it an efficient channel for supplying finance to smallholder farmer.” Pg. 1

"By joining a cooperative, a Peruvian coffee farmer can get her coffee certified as Fair Trade, and thereby earn a **33 percent price premium**. She can access pre-harvest loans from the cooperative, and is also eligible for loans to rehabilitate coffee plants under a new government program. Her input costs (for plant depreciation and interest) increase, but her yields increase by 67 percent. The end result is a **\$1500 profit** on revenues of \$8000, compared with a non-aggregated farmer, who profits **\$100** on revenues of \$3600." Pg. 7

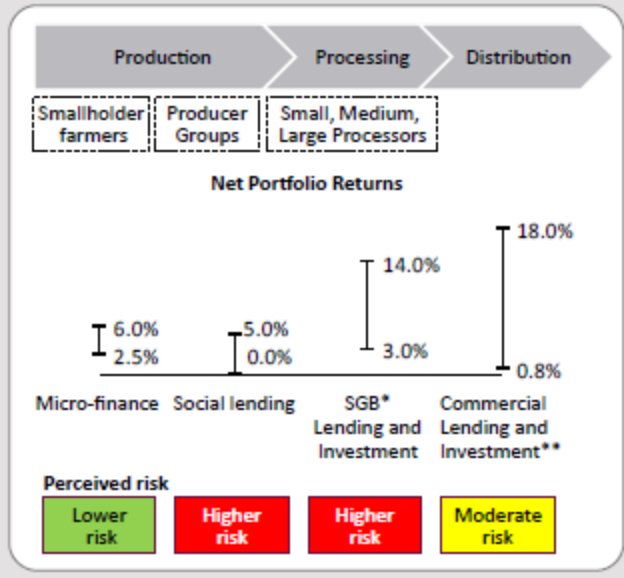


Pg. 8

"The 225 million smallholders who sell and trade each require approximately **\$1000 short-term financing** and **\$1000 in long-term financing** amortized over multiple years. Therefore, a directional estimate suggests smallholder demand for short-term financing amounts to **\$225 billion**, and smallholder demand for long-term financing amounts to **\$225 billion**." Pg. 8

"As smallholder productivity and profits increase, livelihoods improve, and smallholders can escape the cycle of poverty. Because smallholders constitute a large proportion of the world's poor, **focusing on smallholder livelihoods could have a great impact on reducing global poverty**. Furthermore, because smallholders are stewards of the land, supporting them can have positive benefits for preservation of ecosystems." Pg. 15

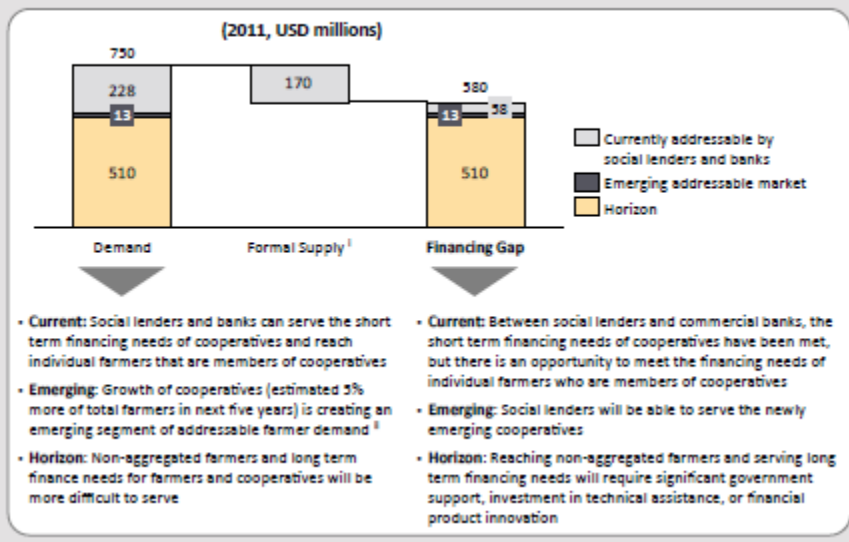
FIGURE 14: NET PORTFOLIO RETURNS FOR DIFFERENT LENDERS IN AGRICULTURE SUPPLY CHAIN FINANCING



Pg. 16

Large financing gap = need for more financing

FIGURE 19: FINANCING GAP IN PERUVIAN COFFEE (APPROXIMATE)



Pg. 18

"Multinational buyers provide the contracts with smallholder organizations that social lenders can use for collateral." Pg. 21

Title: Credit Accessibility and Poverty among Smallholder Cassava Farming Households in South West, Nigeria

Author: A.A. Obisesan

Type: Research Article in the Greener Journal of Agricultural Sciences

Published: February 2013

Abstract: This is a study of 150 cassava farmers in Nigeria that determines the factors influencing the farmers' access to credit for the purpose of suggesting government action to better support the farmers.

Use for KGM: This article shows statistical evidence of yield and cooperative membership giving farmers access to credit. Thus, by increasing their yield or by joining a producer group, they can gain more access to credit and obtain the benefits of credit.

Quotes:

"The results of the logistic model showed the **significant determinants of credit accessibility** as gender, age, main occupation, participation in off-farm activities, **membership of farmers' association and crop yield.**" Pg. 120

"Participation in off-farm activities and **crop yield were significant at 5% and both increase the odds in favour of credit access by a factor of 1.4538 and 1.3184** respectively. **The odds of access to credit increased with years of experience in farming and crop yield significantly at 10% by a factor of 0.9556 and 1.3184** respectively." Pg. 124

"However, households with no access to credit had highest poverty incidence with 74.5% described poor." Pg. 126

Tables:

TABLE 4: Results of Logit Analysis on Credit Accessibility

Explanatory variables	Coefficients	Odds ratio	Standard error
Gender	0.6471***	23.2452	0.1120
Age	-0.0244**	1.1017	0.0124
Marital Status	-0.4415	0.1397	0.1898
Household size	-0.0418	0.8558	0.0362
Years of education	0.0017	0.9819	0.0174
Main occupation	-0.0812**	0.7047	0.0506
Off-farm activities	0.0868**	1.4538	0.1345
Farmers' group membership	0.5607***	11.1932	0.1266
Years of farming experience	0.0103*	0.9556	0.0107
Land area cultivated	0.0597	0.7353	0.1723
Crop yield	0.0689*	1.3184	0.0289
Constant	5.0793**		1.9754
Observation	150		
Pseudo R ²	0.4941		
Log likelihood	-47.18		

Source: Field Study, 2011

***,**, * represents 1%, 5% and 10% significant level respectively

Pg. 125

Microfinance

Title: Impact of Microfinance on Smallholder Farm Productivity in Tanzania: The Case of Iramba District

Authors: Frank Girabi, Agnes Elishadai, and Godfrey Mwakaje

Type: Article in *Asian Economic and Financial Review*

Published: 2013

Abstract: A study of 98 smallholder farmers (49 had received credit from microfinance institution, 49 had not) to try to show the impact of microfinance on an extremely poor, agricultural area in Tanzania. The study generally finds that access to credit greatly increases agricultural productivity as it relates to farm efficiency and output (not individual farmer output).

Use for KGM: Backs up the direct link between farmer access to credit and better farm productivity, a key outcome for KGM's long-term business model *and* theory of change.

Quotes:

"The main objective of this study was to test a **hypothesis on whether there has been any significant impact of microfinance on agricultural productivity in Tanzania** with the case study of Iramba district..."
Pg. 228

"An investigation on how the money was used in agricultural production show that as high as **80.6%** of the respondents from the CB **used the loan for buying farm inputs** while **19.4 %** reported to **use the loan for hiring farm labourers**" Pg. 236

"Generally, **results show that there was significant difference in the levels of using improved seeds and fertilizer**...between [credit beneficiaries] and [non-credit beneficiaries]...there was **no significant different in using tractors, hand hoe and ox-plough**. Generally faming technology was dominated by hand hoe." Pg. 236

“Results obtained from multiple regression analysis for smallholder farmers **show positive and significant impacts on agricultural productivity for variables of fertilizers, improved seeds and hired labour**” Pg. 237

Table:

Shows that credit beneficiaries had an increase of ~80% of total production:

Table-3. Farm productivity for sample farmers

Category	Mean	Std. Dev	t-value	2-Tail Sig (P-value)
Total production				
Credit beneficiaries (n=49)	31.8	25		
Non beneficiaries (n=49)	17.7	18.6	3.1	0.002***
Sun-flower				
Credit beneficiaries (n=49)	15.3	14.9		
Non beneficiaries (n=49)	7.6	11.8	2.8	0.005***
Maize				
Credit beneficiaries (n=49)	16.5	17.4		
Non beneficiaries (n=49)	10	11.4	2.1	0.029*

Note: *** - 1% level of significance, ** - 5% level of significance, * - 10% level of significance
Source: Data analysis, 2011

Pg. 237

Title: Is Micro-Finance Achieving Its Goal Among Smallholder Farmers in Africa? Empirical Evidence from Kenya Using Propensity Score Matching

Authors: Owuor George

Type: Article submitted to XXVII International Conference of Agricultural Economists

Published: 2009

Abstract: A statistical survey done on 400 smallholder farmers in rural Kenya to find out the effect of microfinance credit on household and farmer productivity and income.

Use for KGM: Backs up the direct link between farmer access to credit and better farmer income.

Quotes:

“Our findings reveal that participation in **[micro-finance] credit improves household productive incomes by a range of between US\$ 200 and US\$ 260 in a single production period.**” Pg. 2

“Kernel matching and stratified matching results show that all 180 participants matched all the 221 controls, with **an average effect on [annual] productive income of US \$ 478.30.**” Pg. 12

Title: Socio-Economic Determinants of Rice Farmers' Loan Size in Shama, Ghana

Authors: Henry De-Graft Acquah and Joyce Addo

Type: American-Eurasian Journal of Agricultural & Environmental Sciences article

Published: 2012

Abstract: This article investigates the socio-economic determinants of the size of the loan that farmers receive when they apply for credit. The data comes from a series of interviews from a sample of 91 rice farmers in Ghana. The article concludes that farm size, farmer income, and farmer experience are significant predictors for the size of the loan.

Use for KGM: KGM can use this to show that productivity and business skills are important for obtaining credit to enhance the capabilities of their farm.

Quotes:

"Empirical work by Arene [Arene, C.J., 1993. An analysis of loan repayment potentials of smallholder soyabean group farmers in Nigeria. Quarterly J. Int. Agric., 32: 160-169] showed that **income, farm size, age of farmers, farming experience and level of formal education of farmers contributed positively to the credit worthiness of farmers.**" Pg. 516

"**The regression analysis finds the farm size, income and years of farming experience as significant predictors of farm loan size.** The covariates in the model explained 78% of the variation in the farm loan size." Pg. 520

"The increase in individual loan size of the farmers will lead to increase farm output, productivity and income." Pg. 520

Tables:

Table 1: Parameter estimates of the Multiple Regression Model

Variables	Estimates	Std. Error	t value	Pr (> t)
AGE	2.892	1.933	1.496	0.1384
EDU	8.138	8.057	1.010	0.3153
INC	0.068	0.031	2.182	0.0318*
EXP	13.498	6.895	1.958	0.0535.
FS	90.860	22.969	3.956	0.0001***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 374.5 on 86 degrees of freedom

Multiple R-squared: 0.7984, Adjusted R-squared: 0.7867

F-statistic: 68.12 on 5 and 86 DF, p-value: < 2.2e-16

Note: AGE= Age of respondents, EDU= Years of education, INC= Annual

Income of respondent, EXP= Experience (measured by years of farming),

FS= Size of farmland

Pg. 519

Title: Bank Lending, Information Asymmetry, Credit Accessibility and Performance of Farmers: The Case of the Tororo District

Author: Emmanuel Akika Othieno

Type: MBA Dissertation

Published: November, 2010

Abstract: This dissertation studied the relationships between "bank lending and credit accessibility... information asymmetry and credit accessibility...credit accessibility and performance of farmers" (Othieno, xi). The author surveyed 108 farmers and 40 bank employees in Uganda and ran statistics on the results to show correlations between all of the factors associated with bank lending.

Use for KGM: Further backs up the theory that access to credit leads to higher profitability for farmers but also shows that productivity actually will lead to banks being more likely to lend to the farmer. The reverse of KGM's original hypothesis is almost as important.

Quotes:

"Results show that there was a significant positive relationship between bank lending and credit accessibility, a significant negative relationship between information asymmetry and credit accessibility, and a **significant positive relationship between credit accessibility and the performance of farmers.**"
Pg. xi

"A study by Atieno (2001) **indicated that income level, distance to credit sources, past credit participation and assets owned were significant variables that explain the participation in formal credit markets.**" Pg. 14

"The results...revealed that there was a **significant positive correlation between credit accessibility and the performance of farmers ($r = 0.580^{**}$, $P < 0.01$).** This implied that the performance of farmers was to a large extent affected by credit accessibility." Pg. 49

"There was a **significant positive relationship between credit accessibility and the performance of farmers. Credit accessibility was a major contributing factor toward the performance of farmers and yet many farmers are not accessing credit.** Access to affordable credit provides working capital and the investment capacity by enabling farmers to afford improved farming techniques thereby increasing on their productivity and profitability." Pg. 56

Title: Smallholders' Access to Rural Credit: Evidence from Pakistan

Authors: Shehla Amjad and SAF Hasnu

Type: Article in The Lahore Journal of Economics

Published: 2007

Abstract: This article investigates Pakistani farmers' access to credit via surveys of 105 smallholder farmers. The authors perform a statistical analysis on the limiting factors and conclude that many

variables such as ownership, literacy, off-farm income, and value of non-fixed assets are determinants in access to credit.

Use for KGM: This article shows that off-farm income and other productivity measures are crucial for gaining access to credit, though farmers may never actually borrow.

Quotes:

"The tenure status, family labor, literacy status, **off-farm income, value of non-fixed assets** and infrastructure quality are found to be the **most important variables in determining access to formal credit.**" Pg. 1

"On the other hand, the **total operated area, family labor, literacy status and off-farm income are found to be the most important factors in determining the credit status of the smallholders from informal sources.**" Pg. 1

"It is very difficult to completely separate the variables affecting demand or access because at both stages, decision making is based on almost similar considerations." Pg. 11

"Family labor, age head of the household, **off-farm income and value of non-fixed assets have almost one to one effect on the probability of being a borrower.**" Pg. 12

Title: Credit Accessibility and Poverty among Smallholder Cassava Farming Households in South West, Nigeria

Author: A.A. Obisesan

Type: Research Article in the Greener Journal of Agricultural Sciences

Published: February 2013

Abstract: This is a study of 150 cassava farmers in Nigeria that determines the factors influencing the farmers' access to credit for the purpose of suggesting government action to better support the farmers.

Use for KGM: This article shows statistical evidence of yield and cooperative membership giving farmers access to credit. Thus, by increasing their yield or by joining a producer group, they can gain more access to credit and obtain the benefits of credit.

Quotes:

"The results of the logistic model showed the **significant determinants of credit accessibility** as gender, age, main occupation, participation in off-farm activities, **membership of farmers' association and crop yield.**" Pg. 120

"Participation in off-farm activities and **crop yield were significant at 5% and both increase the odds in favour of credit access by a factor of 1.4538 and 1.3184** respectively. **The odds of access to credit**

increased with years of experience in farming and crop yield significantly at 10% by a factor of 0.9556 and 1.3184 respectively." Pg. 124

"However, households with no access to credit had highest poverty incidence with 74.5% described poor." Pg. 126

Tables:

TABLE 4: Results of Logit Analysis on Credit Accessibility

Explanatory variables	Coefficients	Odds ratio	Standard error
Gender	0.6471***	23.2452	0.1120
Age	-0.0244**	1.1017	0.0124
Marital Status	-0.4415	0.1397	0.1898
Household size	-0.0418	0.8558	0.0362
Years of education	0.0017	0.9819	0.0174
Main occupation	-0.0812**	0.7047	0.0506
Off-farm activities	0.0868**	1.4538	0.1345
Farmers' group membership	0.5607***	11.1932	0.1266
Years of farming experience	0.0103*	0.9556	0.0107
Land area cultivated	0.0597	0.7353	0.1723
Crop yield	0.0689*	1.3184	0.0289
Constant	5.0793**		1.9754
Observation	150		
Pseudo R ²	0.4941		
Log likelihood	-47.18		

Source: Field Study, 2011

***, **, * represents 1%, 5% and 10% significant level respectively

Pg. 125

Agroeconomy

Title: Effects of Fair Trade and organic certifications on smallscale coffee farmer households in Central America and Mexico

Authors: V. Ernesto Méndez, Christopher M. Bacon, Meryl Olson, Seth Petchers, Doribel Herrador, Cecilia Carranza, Laura Trujillo, Carlos GuadarramaZugasti, Antonio Córdón and Angel Mendoza

Type: Article in *Renewable Agriculture and Food Systems*

Published: September, 2010

Abstract: 18 cooperatives made up of 469 households were surveyed for this study on organic certifications and their effect on the coffee market. The study looks at differences in yields, sales, income, farm biodiversity, livelihood and many other factors. While the focus of the article is to articulate the difference for farmers for organic versus conventional farming, this study still provides good data for KGM.

Use for KGM: This article contains some good data tidbits for two large coffee growing regions along with a heavily-cited article claiming it is important to partner with development organizations to obtain sustainable livelihoods.

Quotes:

“...certifications will not single-handedly bring significant poverty alleviation to most coffee-farming families. Although certified coffee markets alone will not resolve the livelihood challenges faced by smallholder households, they could still **contribute to broad-based sustainable livelihoods**, rural development and conservation processes in coffee regions. This can be done **by developing more active partnerships between farmers, cooperatives, certifications and environmental and rural development organizations** and researchers in coffee regions.” Pg. 236

“Only 15% of all households interviewed reported having monetary savings, these being most frequent in Nicaragua, and least frequent in El Salvador. In Guatemala and Mexico, 15 and 16% of households reported having some savings. **Forty percent of all households reported having access to some form of credit**, with a marked difference between countries. **Approximately 34% of households in the four countries reported at least one member migrating**, either within their countries, or internationally. Mexico (in 30.6% of the sample) and Nicaragua (28.8%) had the highest emigration rates of the sample.” Pg. 242.

“Sixty-three percent of the households interviewed reported that they did **struggle to meet their basic food needs.**” Pg. 245.

“On average, households purchased 61% of their food.” Pg. 245.

Title: Agrobiodiversity and Shade Coffee Smallholder Livelihoods: A Review and Synthesis of Ten Years of Research in Central America

Authors: V. Ernesto Méndez, Christopher M. Bacon, Meryl Olson, Katlyn S. Morris & Annie Shattuck

Type: Article in *The Professional Geographer*

Published: 2010

Abstract: This article summarizes Méndez and others' work in Central America around the interactions between shade tree biodiversity, coffee farming outputs, and farmer livelihoods. In the end it summarizes their results on biodiversity and makes recommendations on land management and conservation techniques.

Use for KGM: While the article focuses on maintaining agrobiodiversity (as with many of Méndez articles and papers), there are key facts obtained through his research about farmer livelihood and how it is affected by various inputs.

Quotes:

“The agrobiodiversity managed by coffee households, in both countries, **produced food, firewood, and timber for consumption.** These products also **generated income** through sales. Taken as a whole, this **accounts for at least 50 percent of household income** (roughly half of which comes from coffee) and **at least 40 percent of the household's staple food supply.** Farmers also appreciated plants for their ornamental and medicinal value.” Pg. 371.

“Fully addressing food security for the farmers who participated in this study requires a shift in policy, rural development initiatives, and household management so that it integrates food and coffee production as equally important livelihood strategies. To date, policy and rural development efforts have concentrated on improving coffee production and sales, leaving food production mostly unattended. **A promising initiative led by progressive coffee importers and buyers in North America (e.g., Green Mountain Coffee Roasters and Cooperative Coffees) has recently addressed food security issues by funding research and food security projects in collaboration with several of the cooperatives mentioned in this article, and the first and second authors.**” Pg. 372.

Title: Explaining the ‘hungry farmer paradox’: Smallholders and fair trade cooperatives navigate seasonality and change in Nicaragua's corn and coffee markets

Authors: Christopher M. Bacon, William A. Sundstrom, María Eugenia Flores Gómez, V. Ernesto Méndez, Rica Santos, Barbara Goldoftas, Ian Dougherty

Type: Article in *Global Environmental Change*

Published: 2014

Abstract: This article documents the well-known paradox of farmers facing “lean months” and not having enough food to last between harvests. Through research of 244 cooperative members in Nicaragua, Bacon et al describe the background for the problem, the various causes of this farmer hunger, and how to potentially fix the issue.

Use for KGM: Gives a good background for the causes of food insecurity and some great data on food insecurity for coffee farmers along with a case for using 3rd parties to help alleviate the issue.

Quotes:

“... seasonal hunger is influenced by multiple factors, including: (1) annual cycles of precipitation and rising maize prices during the lean months; (2) inter annual droughts and periodic storms; and (3) **the long-term inability of coffee harvests and prices to provide sufficient income.**” Pg. 1

“The length of seasonal hunger was 3.15 months (SD = 1.06), or three months and 4.5 days.” Pg. 7

“Coffee smallholders must navigate unfavorable exchange entitlements often related to commodity prices that limit their ability to access corn and beans during the critical lean months. This can be addressed through **production-oriented strategies that diversify and intensify farms** as well as **exchange oriented strategies that include storage, better prices, redistribution, and credit.**” Pg. 14

Charts:

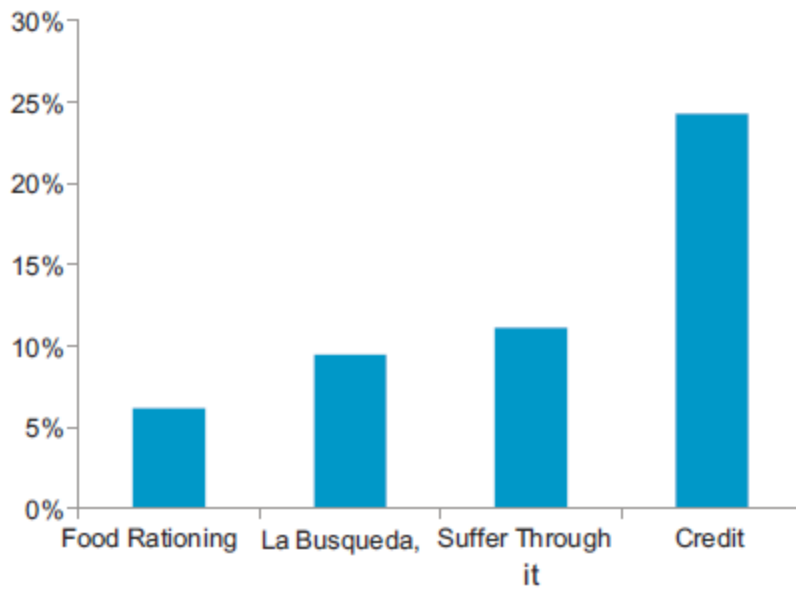


Fig. 3. Household coping mechanisms showing seasonal hunger severity (n = 244).

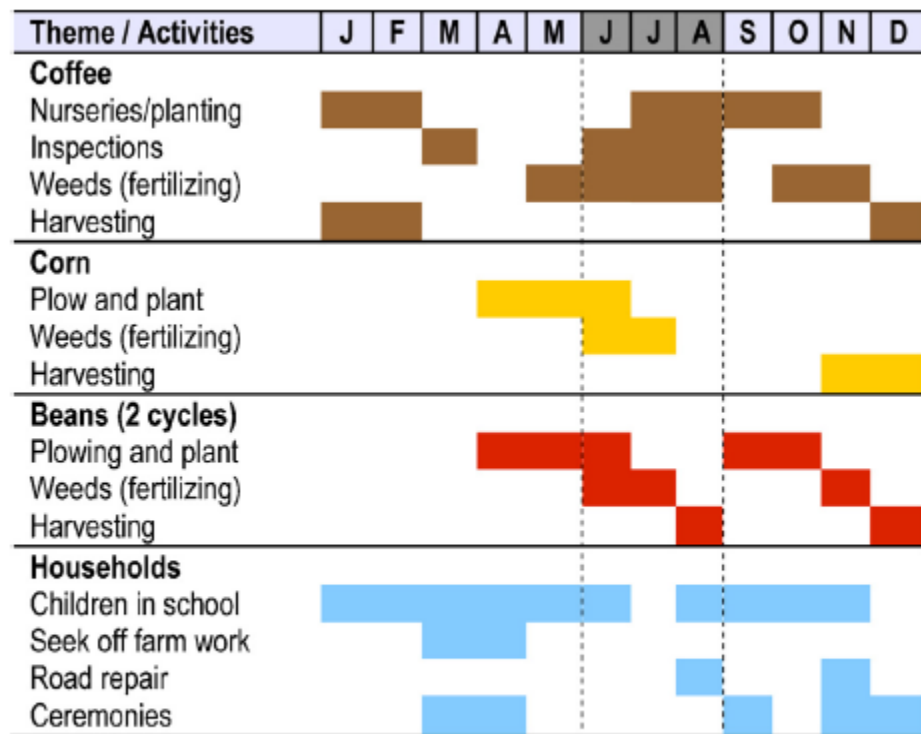


Fig. 4. Summary of Nicaraguan coffee smallholder seasonal calendar.

Access to Inputs

Title: Impact of Microfinance on Smallholder Farm Productivity in Tanzania: The Case of Iramba District

Authors: Frank Girabi, Agnes Elishadai, and Godfrey Mwakaje

Type: Article in Asian Economic and Financial Review

Published: 2013

Abstract: A study of 98 smallholder farmers (49 had received credit from microfinance institution, 49 had not) to try to show the impact of microfinance on an extremely poor, agricultural area in Tanzania. The study generally finds that access to credit greatly increases agricultural productivity as it relates to farm efficiency and output (not individual farmer output).

Use for KGM: Backs up the direct link between farmer access to credit and better farm productivity, a key outcome for KGM's long-term business model and theory of change.

Quotes:

"The main objective of this study was to test a **hypothesis on whether there has been any significant impact of microfinance on agricultural productivity in Tanzania** with the case study of Iramba district..."
Pg. 228

"An investigation on how the money was used in agricultural production show that as high as **80.6%** of the respondents from the CB **used the loan for buying farm inputs** while **19.4 %** reported to **use the loan for hiring farm labourers**" Pg. 236

"Generally, **results show that there was significant difference in the levels of using improved seeds and fertilizer**...between [credit beneficiaries] and [non-credit beneficiaries]...there was **no significant different in using tractors, hand hoe and ox-plough**. Generally farming technology was dominated by hand hoe." Pg. 236

"Results obtained from multiple regression analysis for smallholder farmers **show positive and significant impacts on agricultural productivity for variables of fertilizers, improved seeds and hired labour**" Pg. 237

Table:

Shows that credit beneficiaries had an increase of ~80% of total production:

Table-3. Farm productivity for sample farmers

Category	Mean	Std. Dev	t-value	2-Tail Sig (P-value)
Total production				
Credit beneficiaries (n=49)	31.8	25		
Non beneficiaries (n=49)	17.7	18.6	3.1	0.002***
Sun-flower				
Credit beneficiaries (n=49)	15.3	14.9		
Non beneficiaries (n=49)	7.6	11.8	2.8	0.005***
Maize				
Credit beneficiaries (n=49)	16.5	17.4		
Non beneficiaries (n=49)	10	11.4	2.1	0.029*

Note: *** - 1% level of significance, ** - 5% level of significance, * - 10% level of significance

Source: Data analysis, 2011

Pg. 237

Title: The Supply of Inorganic Fertilizers to Smallholder Farmers in Uganda Evidence for Fertilizer Policy Development

Authors: Todd Benson, Patrick Lubega, Stephen Bayite-Kasule, Tewodaj Mogues, Julian Nyachwo

Type: Discussion Paper by International Food Policy Research Institute

Published: December 2012

Abstract: This paper presents results from a study on Ugandan smallholder farmers' use of fertilizer and whether taxes or public services reduce fertilizer access. Based on this study, the authors make recommendations on how the Ugandan government can improve farmer fertilization uptake. The research included surveying 70 traders and 275 farmers.

Use for KGM: Study shows higher yields for coffee growers and general correlation with better livelihoods for those who use fertilizer. Providing direct access to fertilizer should help increase yields and free up time for diversified income due to less field work.

Quotes:

"The economics of fertilizer use by Ugandan smallholder farmers is clearly problematic...**well below 5 percent of farmers in Uganda regularly use the input...**" Pg. 1

"Uganda is a price taker for fertilizer from international markets, so it can do little about that element of the landed cost of fertilizer in the country." Pg. 7

"In terms of educational attainment of the household head, significant differences are present between fertilizer users and nonusers in the full sample for all three levels considered—**any formal education, completion of primary school, and completion of secondary school [were significantly higher with those who use fertilizer]**. With regard to household asset ownership, the general trend is that fertilizer users tend to be better endowed." Pg. 27

"Users [of fertilizer] **are significantly more likely to engage in off-farm employment than are nonusers.** Of those who do work off-farm, the type of work that fertilizer users engage in is more likely to be more highly paid skilled work than unskilled work or trading activities...the average monthly income obtained when working off-farm is, in consequence, significantly higher for fertilizer users than for nonusers." Pg. 29

"Positive determinants of fertilizer use among farmer survey sample households are ownership of a motorcycle, involvement in off-farm work of a skilled nature, and a subjective assessment that quality of the soil farmed is poor." Pg. 30

"For maize and **Robusta**, the only crops for which yield increases could be computed, **fertilizer use is judged to double or triple yields**, based on farmer estimates of the yield they would have obtained had they not used fertilizer." Pg. 33

"At the median, **farmers felt that prices would have to drop by half for maize and the coffee varieties before they would call into question the economic wisdom of using fertilizer.**" Pg. 33

Title: The Supply of Inorganic Fertilizers to Smallholder Farmers in Tanzania, Evidence for Fertilizer Policy Development

Authors: Todd Benson, Stephen L. Kirama, Onesmo Selejio

Type: Discussion Paper by International Food Policy Research Institute

Published: December 2012

Abstract: This paper presents results from a study on Tanzanian smallholder farmers' use of fertilizer and the factors inhibiting its uptake. Based on this study, the authors make recommendations on how the Tanzanian government can improve farmer fertilization uptake. The research included surveying 193 farmers.

Use for KGM: More statistical evidence for the increase in yields as a result of fertilizers.

Quotes:

"In 2008, only 9 percent of farmers in Tanzania regularly used the input on their crops (National Bureau of Statistics [NBS] et al. 2010), although this level can be expected to have gone up in recent years with the agricultural input subsidy program in place since then." Pg. 1

"Sample farmers who used fertilizer were asked to estimate what their yields would have been had they not used fertilizer in 2010. **Maize yields were estimated to increase by a factor of four and rice by two.**" Pg. 31

Title: The effects of Agricultural Extension on Farm Yields in Kenya (add to ag extension)

Authors: Robert E. Evenson and Germano Mwabu

Type: Discussion Paper for Yale Economic Growth Center

Published: September 1998

Abstract: Paper uses data collected from the Kenyan government in 1982 on crop yields as they were related to government extension services and training given to smallholder farmers. The study focuses on the many different correlations with crop use and concludes that the extension services are more helpful (in terms of increasing yield) for both the poorest and most well-to-do farmers and less so for the average farmer.

Use for KGM: This report gives statistical evidence of high correlations of extension services and other inputs such as labour, training, and fertilizer with increases in yield.

Quotes:

"The analysis presented in this paper suggests that a national system of agricultural extension can play an important role in increasing farm yields but its effect on yields is not uniform across farmers." Pg. 2

"As can be seen from Table 2, **crop yield is positively and significantly correlated with labour, crop area and with the expenditure on fertilizers & sprays. The correlation is strongest with respect to the labour input.** Farm productivity is also positively correlated with the extension staff and with farmer's education, but its association with the latter covariate is statistically significant only at about 8 percent level." Pg. 22

"Thus, as the results show, it is conceivable for productivity or economic effects of extension to be lower for average ability farmers at the median residual than for farmers above or below it, thereby generating a U-shaped yield response across quantiles." Pg. 24

Title: Complimentary Effects of organic and mineral fertilizers on maize production in the smallholder farms of Meru South District, Kenya

Authors: Edwin Mwiti Mutegi, James Biu Kung'u, Mucheru-Muna, Pypers Pieter, Daniel Njiru Mugendi

Type: Article in Agricultural Sciences Vol. 3, No. 2

Published: 2012

Abstract: Paper compares the effects of using various organic mineral fertilizers on maize production in Kenya. The research is done using a statistical "randomized complete block design" experiment with neighboring plots and control plots. In addition to yield there's a cost benefit analysis performed.

Use for KGM: This study gives hard, statistically significant numbers to the argument that fertilizer has a strong return on investment.

Quotes:

"Cost-benefit analysis (CBA) during the 2005 SR sea- son indicated sole calliandra treatment gave the **highest net benefit of USD 1089 and was followed by tithonia + 30 kg·N·ha⁻¹ (USD 844)** which was not significantly different ($p < 0.05$) from sole manure and sole tithonia treatment (**USD 800 and USD 621 respectively**)." Pg. 226

Table:

Table 6. Cost-benefit ratios for different soil fertility amendments on maize yields during the 2005 SR and 2006 LR at Mucwa, Kenya.

Trt	Total sales (USD))		Total cost (USD)		Net benefit (USD)		Benefit-Cost ratio	
	SR 05	LR 06	SR 05	LR 06	SR 05	LR 06	SR 05	LR 06
1	1176 ^a	3342 ^a	88 ^{cd}	83 ^{cd}	1089 ^a	991 ^a	12.4 ^a	11.9 ^a
2	864 ^{bc}	2751 ^b	78 ^{da}	80 ^{cd}	786 ^{bcd}	834 ^{ab}	10.1 ^b	10.4 ^a
3	884 ^{bc}	1993 ^d	85 ^{cd}	76 ^d	799 ^{bc}	621 ^{cd}	9.4 ^{bc}	8.1 ^{bc}
4	949 ^b	2609 ^{bc}	105 ^{bc}	102 ^{bc}	844 ^b	779 ^{bc}	8.0 ^{cd}	7.6 ^c
5	764 ^c	2046 ^{cd}	95 ^{cd}	92 ^{bcd}	670 ^{cd}	605 ^d	7.1 ^{def}	6.6 ^{cd}
6	765 ^c	1195 ^e	98 ^{cd}	86 ^{cd}	667 ^d	407 ^e	6.8 ^{def}	4.7 ^{def}
7	922 ^b	1943 ^d	189 ^a	179 ^a	733 ^{bcd}	522 ^d	3.9 ^e	2.9 ^f
8	824 ^{bc}	1734 ^d	117 ^b	109 ^b	707 ^{cd}	544 ^d	6.0 ^f	5.0 ^{de}
9	573 ^d	551 ^f	84 ^{cd}	74 ^d	488 ^e	261 ^f	5.8 ^f	3.5 ^{ef}
10	436 ^e	448 ^f	60 ^e	50 ^e	377 ^e	182 ^f	6.3 ^{ef}	3.6 ^{ef}

Treatment (1 = Calliandra; 2 = Tithonia; 3 = Manure; 4 = Tithonia + 30 kg·N·ha⁻¹; 5 = Calliandra + 30 kg·N·ha⁻¹; 6 = Manure + 30 kg·N·ha⁻¹; 7 = 90 kg·N·ha⁻¹; 8 = 60 kg·N·ha⁻¹; 9 = 30 kg·N·ha⁻¹; 10 = Control.

Pg. 226

Title: The Last Ten Years: A Comprehensive Review of the Literature of the Impact of Fairtrade

Authors: Valerie Nelson and Barry Pound

Type: Fairtrade commissioned study by Natural Resources Institute

Published: September 2009

Abstract: Over 80 studies were culled down to 23 on the impact of the Fairtrade certification on farmers' lives. The authors pick through all of the selected studies to get an overall sense of many different impact areas and give honest opinions about areas that are both studied and not studied by the current literature. In the end, the results show both positive impacts and a large gap in information that still needs to be studied.

Use for KGM: Though this is specific to Fairtrade and case studies done about Fairtrade this shows that a concentrated effort to improve the livelihoods of farmers through stringent sourcing policies can lead to better farmer livelihoods, especially in incomes. However, it should be noted that Fairtrade is a third

party certification and thus may have different success compared to KGM with their sustainable sourcing policies.

Quotes:

"...we are defining **impact** as the 'systematic analysis of the **lasting or significant changes - positive or negative, intended or not - in people's lives** brought about by a given action or series of actions (Roche, 1999).'" Pg. 3

"A number of authors provide evidence that **Fairtrade producers enjoy greater access to credit than their non-Fairtrade counterparts** to cover harvest expenses & other costs." Pg 12

"Most of the impact studies [on activities funded by Fair Trade premium]...provide impressive figures but these figures are not wholly contextualised (in terms of scale of activity and reach of the population), nor do they give much idea of what changes the investment in activities and equipment led to." Pg. 12

"The majority of the studies demonstrate positive benefits from Fairtrade participation...particularly in intangible factors such as **providing extra stability/buffering against shocks, enhancing family social cohesion by reducing the need for outmigration to find work and by building farmers organisations with an ethos of solidarity...**" Pg. 30

"At the same time, **when specifically comparing income and wellbeing indicator differentials between Fairtrade and non-Fairtrade farmers the differences were not always found to be that significant.**" Pg. 30

"This extensive review of the literature finds **strong evidence that Fairtrade provides a favourable economic opportunity for smallholder farming families** who are able to form producer organizations and provide products of the right specifications for the market. A high proportion of the studies reviewed found **higher returns and more stable incomes** as clear benefits enjoyed by Fairtrade producers from sales to Fairtrade markets compared to sale into conventional ones." Pg. 35

"Several studies indicate that **Fairtrade needs to be supplemented by changes in development policies** and coordination with other development actors, **funds and initiatives to raise rural livelihoods** to a more sustainable level." Pg. 35

"For those able to participate in Fairtrade **increased stability provided by guaranteed prices, longterm contracts and the availability of credit enables farmers to invest in their land, domestic facilities and children's education.**" Pg. 36

Farmer Income

Title: Agricultural Productivity and Poverty Reduction: Linkages and Pathways

Authors: Kate Schneider and Professor Mary Kay Gugerty

Type: Literature Review for Agricultural Development Team of Bill & Melinda Gates Foundation

Published: 2011

Abstract: This literature review investigates the many studies on the links between increases in agricultural productivity and a decline in poverty.

Use for KGM: While the individual studies will provide more background on the statistics used, this paper serves as a tremendous summary of how productivity can lead to income security and generally improved livelihoods. The quotes below, though extensive, are just a taste of the great wealth of information found in this literature review.

Quotes:

"The **evidence suggests that there are multiple pathways through which increases in agricultural productivity can reduce poverty, including real income changes, employment generation**, rural non-farm multiplier effects, and food prices effects." Pg. 56

"Fan, Hazell and Thorat (1999) measure the relationship between total factor productivity and poverty outcomes by investigating returns on different productivity increasing investments. They find that investments in roads, agricultural research, development, and **extension had the greatest impact on both productivity and poverty reduction.**" Pg. 57

"Similarly, in a cross-country sample, Gallup et al. (1997) **find a 1% increase in agricultural GDP leads to a 1.61% increase in the incomes of the poorest quintile...**" Pg. 58

"Bravo-Ortega and Lederman (2005) **find that agricultural labor productivity (output per worker) has a significant effect on the average income of the first income quintile (the poorest)** and this relationship is consistent across regions" Pg. 58

" [Thirtle et al, 2001] calculate that a **1% increase in productivity is associated with a decrease of 0.62% to 1.3% in the percent of the population below the US\$1 per day poverty line.** Additionally, the authors regress the productivity measures against the human development index and find that **raising yields by 1% is associated with a 0.12% increase in the HDI** (Thirtle et al. 2001)." Pg. 61-62

"Otsuka (2000) and Binswanger and Quizon (1989) found that **output expansion and the resulting decline in food prices was the primary mechanism through which the green revolution decreased inequality and poverty.**" Pg. 62

"Dasgupta (1998) **similarly emphasizes the positive correlation between labor productivity and nutritional status of the poor.**" Pg. 63-64

"[Thirtle et al] find that a **1% increase in land productivity (output per unit of land) is associated with an increase in daily energy supply of 5.3% and that a 1% increase in land productivity is associated with a decrease in the count of under-weight children under five of 0.42%** (Thirtle et al. 2001). This is consistent with Fogel's (1991) finding that **increased caloric intake raised productivity among the working poor** in the early stages of Western Europe's development (Fogel 1991)." Pg. 64

"[Datt and Ravallion's] analysis of Indian survey data from 1958–1994 found that **higher real wages and higher farm yields reduced absolute poverty, and that even the poorest benefitted from productivity gains** (Datt and Ravallion 1998)." Pg. 64-65

Tables:

Table 1. Poverty Reduction Pathways through Increased Agricultural Production

Farm Economy
Higher incomes from farm output
On-farm employment
Rural Economy
More jobs upstream and downstream in agriculture & food value chains
Employment in expanding rural non-farm sectors
Increased incomes and employment allow better nutrition, health & increased investment in education leading indirectly to higher labor productivity
Generates more local tax revenue & demand for better infrastructure, contributing to second round effects promoting the rural economy
Linkages in production chain generate trust & information, build social capital and facilitate non-farm investment
National Economy
Reduced prices of food & raw materials raises real wages of the urban poor, reduces wage costs of non-farm sectors
Generation of savings & taxes from farming allows investment in non-farm sector, creating jobs and incomes in other sectors
Earning of foreign exchange allows import of capital goods & essential inputs for non-farm production
Release of farm labor allows production in other sectors

Source: Irz et al. (2001), p. 450–451

Title: Is Micro-Finance Achieving Its Goal Among Smallholder Farmers in Africa? Empirical Evidence from Kenya Using Propensity Score Matching

Author: Owuor George

Type: Article submitted to XXVII International Conference of Agricultural Economists

Published: 2009

Abstract: A statistical survey done on 400 smallholder farmers in rural Kenya to find out the effect of microfinance credit on household and farmer productivity and income.

Use for KGM: Backs up the direct link between farmer access to credit and better farmer income.

Quotes:

"Our findings reveal that participation in MFC credit improves household productive incomes by a range of between US\$ 200 and US\$ 260 in a single production period." Pg. 2

"Kernel matching and stratified matching results show that all 180 participants matched all the 221 controls, with an average effect on [annual] productive income of US \$ 478.30." Pg. 12

Title: How High are Rates of Return to Fertilizer? Evidence from Field Experiments in Kenya

Authors: Esther Duflo (MIT), Michael Kremer (Harvard), and Jonathan Robinson (UCSC)

Type: Paper submitted in relation to American Economic Association Meetings

Published: January 2008

Abstract: This study used a series of 6 field trials over a three year period to understand the profitability of fertilizer on farms in Kenya.

Use for KGM: This study finds a direct link between using fertilizer, or a key input, and increasing the farmers' net income or income security.

Quotes:

"The Kenyan Ministry of Agriculture recommends the use of hybrid seed and fertilizer for maize...based on evidence from experimental farms that **fertilizer and hybrid seeds increase yield from 40% to 100%** (see, for instance, Kenyan Agricultural Research Institute, 1993; and Daniel Karanja, 1996)." Pg. 2

"We find that the **mean rate of return to using the most profitable quantity of fertilizer we examined was 36% over a season, or 69.5% on an annualized basis.** However, other levels of fertilizer use, including the combination of fertilizer plus hybrid seed recommended by the Ministry of Agriculture, are not profitable for farmers in our sample." Pg. 3

"...it seems reasonable to assume that costs other than fertilizer were similar between treatment and control plots." Pg. 5

"Thus, while fertilizer can be very profitable when used correctly, one reason why farmers may not use fertilizer and hybrid seeds is that the official recommendations are not adapted to many farmers in the region." Pg. 7

"The absolute income gains to fertilizer are reasonably substantial, however. The average acreage under maize cultivation for all farmers in our area is 0.93 acres. Without fertilizer or hybrid seed, this would produce about Ksh 8,000 (or \$242 PPP) worth of maize on average. Using ½ teaspoon of top dressing fertilizer per hole would increase agricultural income (net of fertilizer cost) by about Ksh 1,100 (\$33 PPP). **This represents a 15% increase in net income and more than a month's agricultural wages.**" Pg. 10

Table:

Table 1: Returns to Fertilizer

	Mean (1)	Median (2)	Std. Error (3)	Obs. (4)
Panel A. 1/4 Teaspoon Top Dressing Fertilizer				
Percentage Increase in Yield	28.1	8.9	6.8	112
Rate of Return Over the Season	4.8	-27.7	38.8	112
Annualized Rate of Return (at the Mean and Median)	8.4	-42.6		112
Panel B. 1/2 Teaspoon Top Dressing Fertilizer				
Percentage Increase in Yield	47.6	24.3	6.1	200
Rate of Return Over the Season	36.0	23.9	16.9	202
Annualized Rate of Return (at the Mean and Median)	69.5	44.4		202
Panel C. 1 Teaspoon Top Dressing Fertilizer				
Percentage Increase in Yield	63.1	30.6	8.2	273
Rate of Return Over the Season	-10.8	-16.9	8.4	274
Annualized Rate of Return (at the Mean and Median)	-17.8	-27.3		274
Panel D. Full Package Recommended by Ministry of Agriculture				
Percentage Increase in Yield	90.6	48.7	15.4	82
Rate of Return Over the Season	-38.9	-49.4	10.4	85
Annualized Rate of Return (at the Mean and Median)	-48.2	-59.7		85

Notes: See text for description of rate of return calculation. The annualized rates of return are annualized at the mean and median raw return. The official package that is recommended by the Ministry of Agriculture includes planting fertilizer, fertilizer at top dressing, and hybrid seeds.

Health

Title: Economic and Social Burden of Malaria

Authors: Jeffrey Sachs & Pia Malaney

Type: Article in *Nature*

Published: 2002

Abstract: Malaria and poverty are tightly interwoven and are a reinforcing causal loop. Malaria leads to poverty and poverty leads to malaria. The article has both quantitative and qualitative studies cited about malaria's effect on the workforce along with potential solutions to the problems.

Use for KGM: This article shows that investments in health services can have a large effect on farmer livelihood and productivity increases via drops in absenteeism and more women able to be educated and in the workforce.

Quotes:

“Poverty may promote malaria transmission; malaria may cause poverty by impeding economic growth; or causality may run in both directions. It is also possible that the correlation is at least partly spurious, with the tropical climate causing poverty for reasons unrelated to malaria. We tend to favour the explanation that **causation runs in both directions, with the causal link from malaria to underdevelopment much more powerful than is generally appreciated.**”

“...analysis finds that countries in which a high proportion of the **population lived in regions of P. falciparum malaria transmission in 1965 had annual economic growth rates that were 1.3% lower than other countries over the period 1965–1990**, even after controlling for the other standard growth determinants used in macroeconomic analyses.”

There are microeconomic effects on “schooling, demography, migration and saving.”
Macroeconomic effects “trade, tourism and foreign direct investment.”

“Along with other factors such as household income, female education and the availability of birth control, **infant and child mortality are important factors in the fertility decisions of households.**”

“This theory predicts that a **high burden of malaria will lead to a disproportionately high fertility rate and an overall high population growth rate** in regions of intense malaria transmission.”

“These predictions are supported by cross-country evidence, although the direct causal linkages from malaria deaths to increased fertility to rapid population growth is circumstantial, and yet to be proved.”

“When women have very **high fertility rates**, parents may choose to **invest less in the education of their daughters**, knowing that they are likely to spend a considerable portion of their working years **involved in child-rearing activities rather than in the labour force** where they would reap the economic returns to education.”

“Although there have been some estimations of the loss of educational investment expenditures as a result of lost school days, **the overall impact of malaria on human capital development in children remains largely unexplored and unquantified.**”

“**Investments in all sorts of production — in mining, agriculture and manufacturing — may similarly be crippled if the labour force faces a heavy disease burden**, or if the burden raises the costs of attracting the needed labour to a malarious region.”

“**Suppressing malaria in poor, highly malarious regions, especially in sub-Saharan Africa, offers the potential to initiate a virtuous cycle in which improved health spurs economic growth, and rising income further benefits human health.** The economic evidence also suggests that **high priority targets should include port cities, potential tourist destinations, mining operations and high-value-added agricultural settings.**”

Title: Policy Brief #2: The Returns to Investing in Health

Authors: The Lancet Commission on Investing in Health

Type: Article in *The Lancet*

Published: 2013

Abstract: The article overviews The Lancet commission’s investigation into the return on health and disease prevention investments. It finds significant increases to GDP, productivity, education, and livelihood.

Use for KGM: The article shows that investments in health services can have a large effect on farmer livelihood and productivity.

Quotes:

“A full income approach combines growth in national income with the value people place on increased life expectancy—that is, the value of their additional life years (VLYs). This approach accounts for people’s willingness to trade off income, pleasure or convenience for an increase in life expectancy.”

Global Health 2035 estimates that **24% of the growth in full income in low- and middle-income countries between 2000 and 2011 resulted from health improvements.** Figure 3 summarizes estimates of the contribution of health to growth in full income in 1990–2000 and in 2000–2011 or different regions of the world.

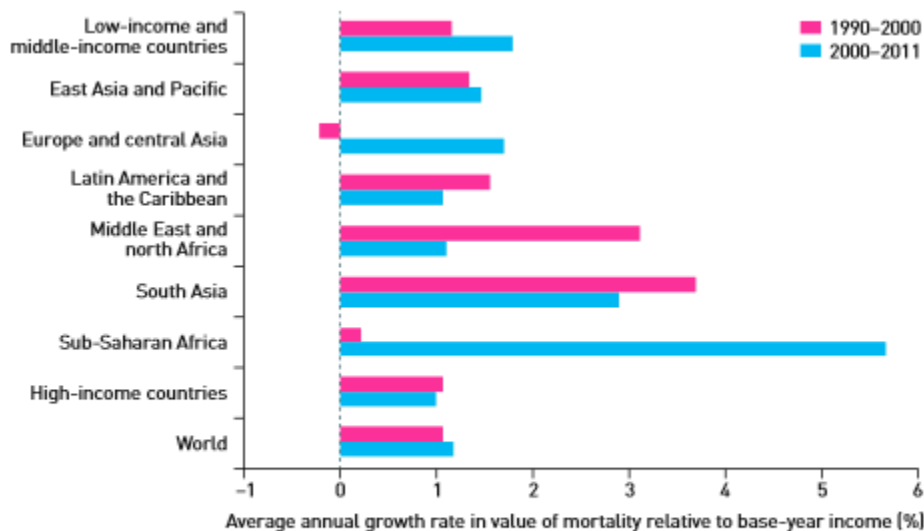


Figure 3: Contribution of change in life expectancy to growth in full income, 1990-2000 and 2000-2011

“Since the launch of the 1993 World Development Report, the body of evidence pointing to the economic payoff from investing in health has steadily grown. Many microeconomic (individual level) and macroeconomic (national level) studies have shown that better health is linked with higher income. How do health improvements result in increased GDPper capita? Mechanisms include...

- the impact of better health and nutrition on adult worker productivity;

- **childhood educational attainment, which is a powerful mechanism of income growth; and**
- **the increased access to natural resources and to foreign direct investment that come about from controlling diseases like malaria and river blindness. “**

Title: The Hidden Costs of AIDS – the Challenge of HIV to Development

Author: Panos Institute

Type: Book

Published: 1992

Abstract: Overall, this book brings to life some case studies and points about sub-Saharan Africa's bout with AIDS and how they relate to development. It points out that since the incubation period is so long, the problems multiply. The report claims that there will be a large decline in production in both manufacturing and farming in the affected regions, labor-intensive crops will be abandoned, and entire communities will be affected. If the young replace the older in the fields they will struggle to finish school and development will slow. Companies face issue with how much to directly pay their workers (sick pay, welfare, etc) and funerals stop production.

Use for KGM: This article gives real costs to disease and health issues and shows that health security is essential for improved farmer livelihoods and long-term supply of coffee.

Quotes:

“Poverty both creates the conditions which facilitate the spread of HIV/AIDS and prevents an effective response to the epidemic.” Pg. 11

“To qualify for [IMF loans], governments often had to cut back on social services.” Pg. 12

“Economic recession and SAPs [structural adjustment policies] further aggravate the transmission, spread and control of HIV infection in Africa in two major ways: directly by increasing the population at risk through migration, poverty, women's powerlessness and prostitution, and indirectly through a decrease in health care provision.” Pg. 12

“Thus, although HIV/AIDS is likely to slow the growth rate of the labour force, it is unlikely to reduce its overall size. It does, however, alter its profile, **yielding a younger workforce** dominated by strength and vitality but with **little experience and few skills.**” Pg. 69

“...**finding and retraining workers** to replace those who have died will be difficult and costly.” Pg. 78

“Thus HIV/AIDS has meant for this family that **land has returned to bush and a child has been withdrawn from school. Lack of cash means that the cultivated area has effectively been reduced...**” Pg. 96

Swaziland sugar industry case study (specific funeral costs- \$600) Pg. 74-75

Uganda case study on many costs to companies (specific costs) Pg. 76
Uganda case study on three specific house holds (effect on food, income security) Pg. 96-97
Cost of lost lives (in 1980s dollars b/w 8,000-22,500) Pg. 112-113

Title: Work Against AIDS: Workplace-based AIDS initiatives in Zimbabwe

Authors: Glen Williams and Sunandra Ray

Type: Book

Published: 1993

Abstract: This book highlights the efforts by individual companies and groups to decrease AIDS and other STDs in their workforce. In particular, the book highlights Rio Tinto (mining), David Whitehead Textiles, the Commercial Farmers' Union, and Eastern Highlands Tea Estate. The book provides details on how the companies or groups went about promoting AIDS awareness and its success measures on number of cases of STDs reported and condom use increases over the 2 years in the study. It does not specifically provide productivity dollars or hours lost/gained through the disease/prevention, but it can be extrapolated for other uses.

Use for KGM: This book shows the real costs of disease on companies hiring or employing workers in areas affected with AIDS. If the workforce is sick the company's supply line gets shut off.

Quotes:

"Equally serious will be the loss of...skilled...workers. Recruiting and training staff to replace all those lost to AIDS will be both time-consuming and costly...**AIDS is therefore a real threat to the productivity – and even the survival – of many companies and businesses...**" Pg. 5

Title: Agricultural Productivity and Poverty Reduction: Linkages and Pathways

Authors: Kate Schneider and Professor Mary Kay Gugerty

Type: Literature Review for Agricultural Development Team of Bill & Melinda Gates Foundation

Published: 2011

Abstract: This literature review investigates the many studies on the links between increases in agricultural productivity and decline in poverty.

Use for KGM: While the individual studies will provide more background on the statistics used this serves as a tremendous summary of how productivity can lead to income security and general improved livelihoods. The quotes below, though extensive, are just a taste of the great wealth of information found in this literature review.

Quotes:

"The **evidence suggests that there are multiple pathways through which increases in agricultural productivity can reduce poverty, including real income changes, employment generation, rural non-farm multiplier effects, and food prices effects.**" Pg. 56

"Fan, Hazell and Thorat (1999) measure the relationship between total factor productivity and poverty outcomes by investigating returns on different productivity increasing investments. They find that investments in roads, agricultural research, development, and **extension had the greatest impact on both productivity and poverty reduction.**" Pg. 57

"Similarly, in a cross-country sample, Gallup et al. (1997) **find a 1% increase in agricultural GDP leads to a 1.61% increase in the incomes of the poorest quintile...**" Pg. 58

"Bravo-Ortega and Lederman (2005) **find that agricultural labor productivity (output per worker) has a significant effect on the average income of the first income quintile (the poorest) and this relationship is consistent across regions**" Pg. 58

" [Thirtle et al, 2001] calculate that a **1% increase in productivity is associated with a decrease of 0.62% to 1.3% in the percent of the population below the US\$1 per day poverty line.** Additionally, the authors regress the productivity measures against the human development index and find that **raising yields by 1% is associated with a 0.12% increase in the HDI** (Thirtle et al. 2001)." Pg. 61-62

"Otsuka (2000) and Binswanger and Quizon (1989) found that **output expansion and the resulting decline in food prices was the primary mechanism through which the green revolution decreased inequality and poverty.**" Pg. 62

"Dasgupta (1998) **similarly emphasizes the positive correlation between labor productivity and nutritional status of the poor.**" Pg. 63-64

"[Thirtle et al] find that a **1% increase in land productivity (output per unit of land) is associated with an increase in daily energy supply of 5.3% and that a 1% increase in land productivity is associated with a decrease in the count of under-weight children under five of 0.42%** (Thirtle et al. 2001). This is consistent with Fogel's (1991) finding that **increased caloric intake raised productivity among the working poor** in the early stages of Western Europe's development (Fogel 1991)." Pg. 64

"[Datt and Ravallion's] analysis of Indian survey data from 1958–1994 found that **higher real wages and higher farm yields reduced absolute poverty, and that even the poorest benefitted from productivity gains** (Datt and Ravallion 1998)." Pg. 64-65

Title: Impacts of Farmer Field Schools on Cotton Growers in Asia

Author: Francesca Mancini

Type: Paper from Presentation to International Cotton Advisory Committee in September 2006

Published: September 2006

Abstract: This paper shows the impact of "integrated pest management farmer field schools" in cotton-growing regions of Asia. There were 3,661 schools and almost 100,000 farmers trained all with tracked results on things such as the reduction in pesticide use, gross margin, yield, costs, and health effects.

Use for KGM: This paper provides a statistically significant example of how training can lead to significant improvements in farmer livelihood.

Quotes:

"These findings support the idea that a skills-oriented, knowledge-intensive and hands-on educational approach, as FFS, is an efficient system to diffuse the complex principles of [Integrated Pest Management] among farmers." Pg. 3

"The initiative aimed to measure the health effects of pesticide exposures in real time through direct documentation by farmers. The study documented that a **strikingly large majority (84%) of the monitored spray events led to mild to severe poisoning.**" Pg. 4

"In 2004, FFS alumni **eliminated their exposure to pesticide** [of the] most hazardous WHO toxicity class (1a)...**products by a third.** Exposure to moderately hazardous pesticides (WHO II) **was also significantly lower (-60%)** than in 2003." Pg. 4

"[Integrated Pest Management] had a comparatively lower environmental impact than conventional systems on the basis of the reduced pesticide use (<75%)." Pg. 4

Food Security

Title: "Iron Deficiency and Reduced Work Capacity: A Critical Review of the Research to Determine a Causal Relationship"

Author: Jere D. Haas and Thomas Brownlie IV

Type: Article in *Journal of Nutrition*

Published: 2001

Abstract: This article is an attempt to define a causal relationship between varying types of iron deficiencies and a reduction in worker productivity (defined here as mainly associated with aerobic capacity, endurance, and voluntary activity). The authors use research literature on both human and animal studies to help shape their argument.

Use for KGM: A firm study that codifies the literature around iron deficiency and drops in productivity. Without a good diet, farmers will be less efficient and effective hurting their livelihood and a company's supply.

Quotes:

“The **evidence is clearly the strongest for IDA [iron-deficiency anemia] causing reductions in aerobic work capacity**. The animal and human studies consistently find that aerobic capacity is significantly reduced with SIDA [severe iron-deficiency anemia] and MIDA [moderate iron-deficiency anemia].”

“The evidence clearly suggests that SIDA and MIDA also impair endurance capacity, but this is based almost exclusively on studies of experimental animals.”

Title: Health, nutrition, and prosperity: a microeconomic perspective.

Authors: Duncan Thomas and Elizabeth Frankenberg

Type: World Health Organization Bulletin

Published: 2002

Abstract: The article cites many different studies that link health and nutrition to worker prosperity along with total economic prosperity for an area (e.g. GDP). However, it clearly states that the causality of these theories is difficult to scientifically test. There are many links from this article to specific case studies around productivity, some of which I cite below.

Use for KGM: Another synthesis of studies showing the importance of food security as it relates to worker health and their productivity.

Quotes:

“In sum, clinical and field studies show that iron deficiency affects an individual’s **aerobic capacity, endurance, energy efficiency, and work output**...a sizeable impact on economic success although there is controversy about the magnitude of the effect...”

“A longitudinal study of male rubber workers in Indonesia provides the strongest evidence that iron status causally affects economic prosperity. [in *American Journal of Clinical Nutrition* 1979, 32: 916-25]”

“...calorie supplementation had a small but **significant positive impact on the amount of digging** by road construction workers in Kenya... [in *American Journal of Clinical Nutrition* 1982, 36: 68-78]”

Title: Iron Deficiency Anemia and Productivity of Adult Males in Indonesia (Working Paper 175)

Author: S.S. Basta and A. Churchill

Type: Working paper from International Bank for Reconstruction and Development

Published: April 1974

Abstract: This working paper gives detail on the studies done in Indonesia first on construction workers and then on plantation workers to help determine the effect of iron-deficiency on their work and

lifestyle. The report details out the methodology, population tested, and various findings before and after.

Use for KGM: This article helps to connect the dots to food security and its impact on both worker/farm productivity and farmer livelihoods. More sustenance is better for the farmer and disposable income is often put toward more/better food in poorer communities.

Quotes:

“...there is the **improvement in diet attributable to the small income supplement paid**. A large part of this supplement went for the purchase of food, particularly leaves and fruit which are both rich in iron and vitamin C...”

“Thirty to forty days after placebo administration and the **financial incentives were stopped, hemoglobin levels were re-measured and were found to have fallen** to pre-treatment levels in the placebo groups but were maintained in the iron treated anemic group.”

“[Before the experiment i]t was found that the output of **anemic tappers [plantation job] was on the average 19% below that of non-anemic tappers. After iron treatment, the output of the anemic tappers reached the level of the non-anemic tappers.**”

“The study also found a **linear correlation between hemoglobin levels and** the monthly latex payments paid to tappers for **outputs** beyond the daily quota.”

Title: Measuring vulnerability and food security: Case evidence from Mali

Author: Luc Jozef Christiaensen

Type: Dissertation

Published: 2000

Abstract: This is a statistical analysis of the vulnerability of certain farmers and residents of rural Mali. The author looks at statistically predicting whether families will be vulnerable to future food security based on a number of different factors. Much of the writing goes into detail about how to create a proper indicator around food security and vulnerability. In the end of the report, they highlight findings to help lower vulnerability to food security and what policies work better than others.

Use for KGM: This dissertation has a few good statistical measures of what leads to food security for rural farmers as shown in the quotes below. In addition, this work could help to define KGM indicators for food security in the future.

Quotes:

“The first major conclusion from our simulation indicates that there **are larger benefits** to be derived in terms of food vulnerability reduction **from directly providing** the population with **secured employment**

opportunities during the hunger season in the area itself (either through irrigation agriculture or off-farm activities) **than from promoting (temporary) out migration.**” Pg. 111

“There is certainly more promise in public activities to enhance the diversity of income sources in the immediate area. We find that the **possession of agricultural, transport and especially fishing equipment plays a crucial role in the reduction of a household’s vulnerability.** Possession of this equipment provides the households with access to off farm income sources during the hunger season. It increases the mean and decreases the variance of hunger season consumption. Simulation results indicate that by **increasing the value of current household equipment by twice the current population’s average equipment value, the proportion of vulnerable households can be decreased by about 10 percentage points.** However, strategies directed at creating off-farm employment opportunities have so far been largely neglected by the development community in our study area. Over the past decade, all development efforts have focused on the expansion of irrigated agriculture, an intervention, which is also much desired by the population.” Pg. 149

“Finally, our results with respect to migration, off-farm employment and irrigation, lend empirical support to the proposition by Lipton and Ravallion (1995) that **policies to encourage migration away from high risk areas to low risk environments are less preferred than policies focused on the provision of risk reducing inputs such as irrigation and the introduction of relief works schemes.**” Pg. 150

Title: Confronting neoliberalism: Food security and nutrition among indigenous coffee-growers in Oaxaca, Mexico

Author: Paola Maria Sesia

Type: Dissertation

Published: 2002

Abstract: This dissertation goes into the peasants of Oaxacas’ lives before and after the coffee “bonanza” in Mexico in the 1980’s and shows how current communities have taken to crop diversification to increase food security. Specifically, the study looks at the Analco and Santa Cecilia communities in Mexico.

Use for KGM: This piece gives good support to crop diversification’s promotion of food security. The longitudinal studies focus on coffee and how farmers survived a coffee price crisis with better nutritional levels than before. This may also have use for looking at patterns of how sex, age, and work levels affect nutrition and what should be the focus of KGM’s investments.

Quotes:

“The wisdom to follow such a path [of crop diversification] is supported by a popular awareness that **an over-reliance on the market can have devastating effects on the local capacity to procure enough food.**” Pg. 200

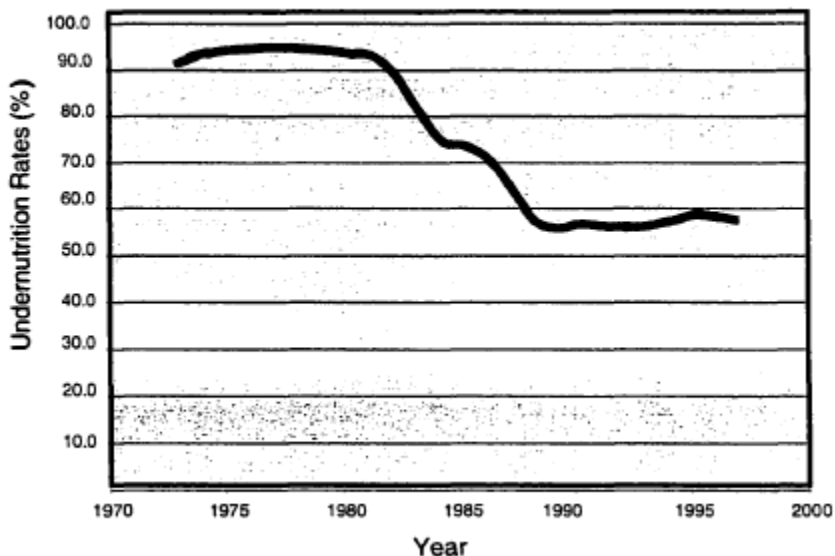
“Faced with money scarcity, Analquefios understandably preferred to stop acquiring cement or other construction materials for their houses or restrict the purchase of new mules than restrict food consumption.” Pg. 240

“Moreover, it was precisely the maintenance of **self-subsistence staple food production**-- wherever local agro-ecological conditions permitted—that allowed local peasant households such as in Analco to survive the debacle of the coffee economy when rural policy changed abruptly and international prices fell dramatically. **It was local capability to assure food security through self-subsistence agriculture and other food procurement activities that prevented Analquefios from suffering hunger.**” Pg. 264

Graph:

Shows that when times are good, under-nutrition goes down but in steady years farmers just subsist and undernutrition rates do not improve. 1980 – 1989 was the “coffee bonanza”

GRAPH 4.14, Historical undernutrition rates (height-for-age), Analco 1972-1997



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Productivity and Food Security

Title: Agricultural Productivity and Poverty Reduction: Linkages and Pathways

Authors: Kate Schneider and Professor Mary Kay Gugerty

Type: Literature Review for Agricultural Development Team of Bill & Melinda Gates Foundation

Published: 2011

Abstract: This literature review investigates the many studies on the links between increases in agricultural productivity and decline in poverty.

Use for KGM: While the individual studies will provide more background on the statistics used this serves as a tremendous summary of how productivity can lead to income security and general improved livelihoods. The quotes below, though extensive, are just a taste of the great wealth of information found in this literature review.

Quotes:

"The **evidence suggests that there are multiple pathways through which increases in agricultural productivity can reduce poverty, including real income changes, employment generation, rural non-farm multiplier effects, and food prices effects.**" Pg. 56

"Fan, Hazell and Thorat (1999) measure the relationship between total factor productivity and poverty outcomes by investigating returns on different productivity increasing investments. They find that investments in roads, agricultural research, development, and **extension had the greatest impact on both productivity and poverty reduction.**" Pg. 57

"Similarly, in a cross-country sample, Gallup et al. (1997) **find a 1% increase in agricultural GDP leads to a 1.61% increase in the incomes of the poorest quintile...**" Pg. 58

"Bravo-Ortega and Lederman (2005) **find that agricultural labor productivity (output per worker) has a significant effect on the average income of the first income quintile (the poorest)** and this relationship is consistent across regions" Pg. 58

" [Thirtle et al, 2001] calculate that a **1% increase in productivity is associated with a decrease of 0.62% to 1.3% in the percent of the population below the US\$1 per day poverty line.** Additionally, the authors regress the productivity measures against the human development index and find that **raising yields by 1% is associated with a 0.12% increase in the HDI** (Thirtle et al. 2001)." Pg. 61-62

"Otsuka (2000) and Binswanger and Quizon (1989) found that **output expansion and the resulting decline in food prices was the primary mechanism through which the green revolution decreased inequality and poverty.**" Pg. 62

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"[Thirtle et al] find that a **1% increase in land productivity (output per unit of land) is associated with an increase in daily energy supply of 5.3% and that a 1% increase in land productivity is associated with a decrease in the count of under-weight children under five of 0.42%** (Thirtle et al. 2001). This is consistent with Fogel's (1991) finding that **increased caloric intake raised productivity among the working poor** in the early stages of Western Europe's development (Fogel 1991)." Pg. 64

"[Datt and Ravallion's] analysis of Indian survey data from 1958–1994 found that **higher real wages and higher farm yields reduced absolute poverty, and that even the poorest benefitted from productivity gains** (Datt and Ravallion 1998)." Pg. 64-65

Tables:

Table 1. Poverty Reduction Pathways through Increased Agricultural Production

Farm Economy
Higher incomes from farm output
On-farm employment
Rural Economy
More jobs upstream and downstream in agriculture & food value chains
Employment in expanding rural non-farm sectors
Increased incomes and employment allow better nutrition, health & increased investment in education leading indirectly to higher labor productivity
Generates more local tax revenue & demand for better infrastructure, contributing to second round effects promoting the rural economy
Linkages in production chain generate trust & information, build social capital and facilitate non-farm investment
National Economy
Reduced prices of food & raw materials raises real wages of the urban poor, reduces wage costs of non-farm sectors
Generation of savings & taxes from farming allows investment in non-farm sector, creating jobs and incomes in other sectors
Earning of foreign exchange allows import of capital goods & essential inputs for non-farm production
Release of farm labor allows production in other sectors

Source: Irz et al. (2001), p. 450–451

Title: Governance, Agricultural Productivity and Poverty Reduction in Africa, Asia and Latin America

Authors: Colin Thirtle and Jenifer Piesse

Type: Article in *Irrigation and Drainage*

Published: 2007

Abstract: The authors use statistical data from 40 countries across Africa, Asia and Latin America to show that governments' ability to govern has an effect on GDP and yields. The study reveals that relatively small investments in agriculture can greatly reduce the poor who are living under USD 1 per day.

Use for KGM: The numbers show that stronger farms (better yields) can lead to poverty reduction and better farmer livelihoods.

Quotes:

"Mellor (2001) argues that **agricultural productivity growth reduces poverty so effectively because it generates income for poor farmers, which is also the source of increased demand for these goods and services**. This reduces urban poverty as well, by slowing migration to the urban areas and since food is

only partially tradable, productivity increases in agriculture also result in lower food prices that primarily benefit both the rural and urban poor." Pg. 166

"For Africa, the number in poverty in the sample countries was 97 million, as of 1990. **The reduction for a 1% yield increase is 0.69 million, using the same elasticity as in the last estimates.**" Pg. 174

"To put these estimates in perspective, **for Africa** the poverty elasticity of agricultural value added was 0.72 and the poverty elasticity of GDP per capita was 0.99, so **yield increases have 73% of the impact of increases in per capita incomes. For Asia**, the equivalent figures are 0.48 and 0.72 and **the ratio is 67%. In both cases, agricultural growth looks like a good policy for poverty reduction, in the sense that agricultural growth generated by R&D expenditures is relatively low cost.**" Pg. 174

Table:

Table VI. Reduction in the numbers on less than US\$1 per day from a 1% increase in yield

Region	Per cent in US\$1 poverty	Number in US\$1 poverty, millions	Reduction in US\$1 per day poverty, millions	Cost per person in US\$
East Asia	15.3	278.32	1.34	179
South Asia	40.0	522.00	2.51	179
Sub-Saharan Africa	46.3	290.87	2.09	144
Middle East and North Africa	7.3	20.85	0.12	NA
Latin America	15.6	78.16	0.08	11 397
East Europe and Central Asia	5.1	23.98	0.12	NA
Total	24.3	1214.18	6.24	NA

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Title: Smallholder Farmers Key to Lifting Over One Billion People Out of Poverty

Authors: Nick Nuttall, Brian Thomson

Type: UNEP Press Release

Published: June 2013

Abstract: This is a press release about UNEP's efforts to raise people out of poverty via the promotion of smallholder agriculture.

Use for KGM: This article provides two quick data points on articles related to increasing yields leading to decreasing poverty.

Quote:

"A previous study showed that a **one-per-cent increase in agricultural per-capita Gross Domestic Product (GDP) reduced the poverty gap five times more than a one-per-cent increase in GDP in other sectors**, especially amongst the poorest people. Another study demonstrated that for **every ten-per-cent increase in farm yields, there was a seven-per-cent reduction in poverty in Africa, and a reduction of over five-per-cent in Asia.**"

Title: Impact of Microfinance on Smallholder Farm Productivity in Tanzania: The Case of Iramba District

Authors: Frank Girabi, Agnes Elishadai, and Godfrey Mwakaje

Published: 2013

Type: Article in *Asian Economic and Financial Review*

Abstract: A study of 98 smallholder farmers (49 had received credit from microfinance institution, 49 had not) to try to show the impact of microfinance on an extremely poor, agricultural area in Tanzania. The study generally finds that access to credit greatly increases agricultural productivity as it relates to farm efficiency and output (not individual farmer output).

Use for KGM: Backs up the direct link between farmer access to credit and better farm productivity, a key outcome for KGM's long-term business model and theory of change.

Quotes:

"The main objective of this study was to test a **hypothesis on whether there has been any significant impact of microfinance on agricultural productivity in Tanzania** with the case study of Iramba district..."
Pg. 228

"An investigation on how the money was used in agricultural production show that as high as **80.6%** of the respondents from the CB **used the loan for buying farm inputs** while **19.4 %** reported to **use the loan for hiring farm labourers**" Pg. 236

"Generally, **results show that there was significant difference in the levels of using improved seeds and fertilizer**...between [credit beneficiaries] and [non-credit beneficiaries]...there was **no significant different in using tractors, hand hoe and ox-plough**. Generally farming technology was dominated by hand hoe." Pg. 236

"Results obtained from multiple regression analysis for smallholder farmers **show positive and significant impacts on agricultural productivity for variables of fertilizers, improved seeds and hired labour**" Pg. 237

Table:

Shows that credit beneficiaries had an increase of ~80% of total production:

Table-3. Farm productivity for sample farmers

Category	Mean	Std. Dev	t-value	2-Tail Sig (P-value)
Total production				
Credit beneficiaries (n=49)	31.8	25		
Non beneficiaries (n=49)	17.7	18.6	3.1	0.002***
Sun-flower				
Credit beneficiaries (n=49)	15.3	14.9		
Non beneficiaries (n=49)	7.6	11.8	2.8	0.005***
Maize				
Credit beneficiaries (n=49)	16.5	17.4		
Non beneficiaries (n=49)	10	11.4	2.1	0.029*

Note: *** - 1% level of significance, ** - 5% level of significance, * - 10% level of significance

Source: Data analysis, 2011

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Water

Title: Linkages between Access to Irrigation Water and Livelihood Strategies Using Sustainable Livelihood Framework

Authors: Jirawan Kitchaicharoen, Benchaphun Ekasingh, Sorak Dithaprayoon and Waraporn Chaiwinit

Type: Academic Paper

Published: 2008

Abstract: An empirical study on how the sustainable livelihood framework can be applied to explain the relationship of access to water and livelihood outcomes. The study finds that access to water has a strong relationship to other livelihood assets (natural, human, physical, etc.).

Use for KGM: This paper provides empirical evidence of how water security can lead to income and food security along with improved livelihoods for the farmers.

Quotes:

"For the human assets which represent farm experience and knowledge of the household head, labor availability and **good health, it was found that in the uplands, the human assets of the households with a good access to water were higher** whereas there is no significant difference between the lowland households." Pg. 230

"**The natural assets in place of access to land, water, fallow and livestock were weakest at the lowland households with bad access to water and strongest at the Upland households with good access to water.**" Pg. 230

"Alike to physical assets, the **financial assets** were also much weaker for the upland households and they were **significantly stronger in the upland households with good access to water.**" Pg. 230

"**Almost all component of the livelihood assets show a significant relationship to private or individual access to water** whereas only natural assets has a significantly relationship to access to communal water." Pg. 231

"**The results of farm income as well as family income show that the households with good access to water had earned more income compared to the households with bad access to irrigation water.** Having better access to irrigation water allows farmers to use their available land for crop production to increase their income." Pg. 233

Title: Agricultural Water and Poverty Linkages: Case Studies on Large and Small Systems

Authors: Intizar Hussain, Mark Giordano, and Munir A. Hanjra

Type: Paper from International Water Management Institute

Published: 2003

Abstract: This paper from IWMI summarizes a series of case studies around the world on water and its linkages to poverty. The 8 different studies focus primarily on the benefits of irrigation within agriculture and how it is related to the farmers' yields, income, and livelihood.

Use for KGM: This article provide 8 great examples of how water stewardship can directly tie to farmers' livelihoods, income and food security.

Quotes:

"In general, **irrigation access allows poor people to increase their production and incomes and enhances income diversification opportunities, reducing vulnerability caused by seasonality and other factors.**" Pg. 52

"While irrigation development can have negative impacts on the poor under some circumstances, **agricultural water/irrigation has been regarded as a powerful factor for providing food security, protection against adverse drought conditions, increased prospects for employment and stable income, and greater opportunity for multiple cropping and crop diversification.**" Pg. 54

"Access to reliable irrigation can enable farmers to adopt new technologies and intensify cultivation, leading to increased productivity, overall higher production, and greater returns from farming. This, in turn, opens **up new employment opportunities, both on-farm and off-farm, and can improve income, livelihoods, and the quality of life in rural areas.**" Pg. 54

"Household **average monthly expenditure in areas with irrigation infrastructure access is 24% higher than in areas with no access to irrigation infrastructure.**" Pg. 58-59

"For example, the **agricultural wage rate in areas where households have access to irrigation is over Rs200 (\$2.22) per day compared with Rs173 (\$1.92) per day in areas with no irrigation.**" Pg. 59

"Past development of land and agricultural water resources in the six countries **have played an important role in significantly improving household, community, and regional food security and in reducing the incidence of chronic poverty through increased productivity, employment, wages, and income**, and by increasing consumption of both food and nonfood items. Preliminary **results of the study suggest that there are strong linkages between agricultural water and poverty.**" Pg. 62

"As a result of improvements in these intermediate variables, the study estimates that farms [upgrading their irrigation via] treadle pump technology see an **average increase of \$100 per year in annual net income with gross incomes of \$300–400 per acre quite common.**" Pg. 67

"This combined technological and [extension services] intervention package resulted in significant **improvements in overall farm management, cropping intensity, and crop yields...** yields have significantly increased (**more than doubling from 2 t/ha to over 4 t/ha**), resulting in **improving food security at both the community and household levels.**" Pg.68