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# THE BUSINESS CASE FOR SUSTAINABLE AGRICULTURE IN ASIA

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by

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## **Abstract**

Kellogg Company sources agricultural commodities from around the world to manufacture its products; the company is committed to enhancing the natural resources and livelihoods of the areas and people from whom it sources its ingredients. As part of its Project K Initiative, Kellogg is working to build the global supply chain of the future by making investments in emerging markets. Kellogg seeks to understand how its current work in Thailand and India (with rice and corn, respectively) impacts the triple bottom line. Specifically, this research evaluates impacts on the environment, farmer livelihoods, and with regards to improving Kellogg's top/bottom lines and security of supply.

Rice represents a particular sourcing priority for the Asia Pacific and Africa region because it is needed by every plant in the region and is central for the production of two of Kellogg's most celebrated brands: Rice Krispies and Special K. The company uses a specific variety - medium grain rice - for the production of its cereal. Historically, medium grain rice has grown only in certain temperate regions; however, increasing climatic stress in these areas and the need for a reliable medium grain rice supply to meet the needs of the growing Asia Pacific region led Kellogg to develop its own variety of seed able to grow in tropical climates. In 2014, Kellogg implemented a medium grain rice pilot program in Thailand.

This project uses farmer and expert survey results and desktop research to determine if Kellogg's initiative can provide a viable source of medium grain rice to support the manufacturing of Kellogg products in Asia Pacific while improving farmer livelihoods through improved agronomic practices and income security and reducing negative impacts on the environment. The primary objective of the survey and subsequent analysis was to determine the necessary elements to create a secure and sustainable supply chain for medium grain rice production in Thailand, and to present interventions Kellogg Company can implement to improve production.

Corn is the main ingredient incorporated into a number of products including the iconic Corn Flakes cereal brand. In India, low cost corn, grown with non-GMO seeds, represent characteristics that are paramount for continued use in Kellogg products. Currently, corn accounts for 9% of total cereal production in India with numbers doubling in the past decade and expected to increase. Nonetheless, yields are about half of the global average with climactic conditions and limited technical resources contributing to lack of capacity to increase quality and quantity of yields.

Through interactions with farmers and millers, complexities within the corn supply chain have been better understood. Survey results gleaned from farmer interviews reveal that a combination of pre-harvest and post-harvest practices contributes to the lessened quality and quantity of corn. Additionally, senior-level management identified their concerns and willingness to support proposed strategy interventions based on responses from farmers. Overall, considering farmer and miller perspectives along with senior-level management provides the opportunity to identify the most viable intervention strategies that are low cost and will have a net benefit for key stakeholders.

## Table of Contents

<b>Executive Summary</b> .....	4
<b>Introduction</b> .....	4
<b>Project Objectives</b> .....	5
<b>Corn in India</b> .....	6
<i>Kellogg’s Supply Network</i> .....	7
<b>History of Kellogg Corn Flakes &amp; Brand Legacy</b> .....	8
<b>Kellogg Presence in India</b> .....	9
<b>Peer Practices and Sustainability Initiatives</b> .....	10
<b>Research Methodology</b> .....	11
Survey Development .....	11
Farmer, Mill & Trader Interviews.....	12
Mill and Trader Survey. ....	13
Kellogg Leadership Survey.....	13
Interview bias.....	13
<b>Survey Analysis</b> .....	13
Farmer Survey Statistics and Insights.....	13
Table: 1 Farmer Demographics.....	14
Table 2: Farmer Practices .....	14
Table 3: Farmer Expectations and Concerns.....	15
Mill Survey Insights.....	16
Internal Management Survey Insights.....	16
<b>Model Approach</b> .....	17
<b>Model Description and Analysis</b> .....	17
Materiality Assessment Matrix.....	17
<b>Identification of Intervention Strategies</b> .....	20
Cost-Benefit Evaluation of Intervention Strategies.....	21
<b>Assumptions and results in Cost-Benefit Analysis</b> .....	21
Cost Categories.....	22
Benefit Categories.....	23
Results .....	23
<b>Recommendation and Next Steps</b> .....	23
Partnership opportunities.....	24
<b>Appendix</b> .....	26

## Executive Summary

The purpose of this project is to identify interventions in the supply chain in order to increase the quality and quantity of corn yields in India. Utilizing a stakeholder materiality assessment, identified priorities have been further analyzed utilizing a cost-benefit analysis (CBA) that identifies and quantifies costs, benefits, challenges and tradeoffs.

Corn is the main ingredient incorporated into a number of products, including the iconic Corn Flakes cereal brand. In India, low cost corn, grown with non-GMO seeds represent characteristics that are paramount for continued use in Kellogg products. Currently, corn accounts for 9% of total cereal production in India with numbers doubling in the past decade and expected to increase.<sup>1</sup> Nonetheless, yields are about half of the global average with climactic conditions and limited technical resources contributing to lack of capacity to increase quality and quantity of yields.

Through interactions with farmers and millers, complexities within the corn supply chain have been better understood. Additionally, demographic information, key practices and key concerns were identified through survey dissemination. Survey results gleaned from farmer interviews reveal that a combination of pre-harvest and post-harvest practices contributes to the lessened quality and quantity of corn. Additionally, a survey of senior-level management and subsequent materiality assessment identified their concerns and willingness to support proposed strategy interventions based on responses from farmers.

Intervention strategies focus on three key areas – technical assistance, post-harvest intervention, and pre-harvest intervention – that can be employed to improve quality and quantity of corn yields. The intervention strategies were then analyzed using a CBA; subsequently, net cost and benefit scenarios were created for each strategy. Accounting for both farmers and millers perspectives along with senior-level management provided the ability to identify the most viable intervention strategies that are low cost and have a net benefit for key stakeholders.

## Introduction

The Kellogg Company leads as a socially responsible, sustainable company by working to source commodities from around the world in a manner consistent with its purpose to “nourish families to they can flourish and thrive.”<sup>2</sup>

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<sup>1</sup> Ministry of Commerce and Industry, Government of India. (2015). “Indian Agriculture Industry.” Retrieved from: <http://www.ibef.org/industry/agriculture-india>

<sup>2</sup> Kellogg Company. (2014). “About Kellogg Company.” Retrieved from: [http://www.kelloggcompany.com/en\\_US/our-vision-purpose.html](http://www.kelloggcompany.com/en_US/our-vision-purpose.html)

The company has continued its commitment to supporting communities and families with its newly stated Global Sustainability 2020 Commitments, in which the company has made dramatic commitments to support responsible sourcing through the use of sustainable agriculture, smallholder farmers, and female and minority workers.<sup>3</sup> The company has also made significant commitments to conserve natural resources through projects to reduce energy, water, waste and excess packaging in its operations.<sup>4</sup>

The Global Sustainability 2020 Commitments represent significant global commitments across all of the Kellogg business units. The company has the following reportable segments, either based on product category or geographic location: U.S. Morning Foods, U.S. Snacks, U.S. Specialty, North America Other, Europe, Latin America, and Asia Pacific.<sup>5</sup> Of these business units, one of the fastest growing is the Asia Pacific region, which posted a 3.1% growth in sales in 2014, driven by strong cereal sales in India, Southeast Asia and Japan.<sup>6</sup>

Within Asia Pacific, corn is an important raw material in production. As the Asia Pacific business unit continues to grow, corn will become increasingly important in procurement, specifically Indian corn. Corn from India can be procured non-GMO, which is important for various Asian markets and it can be procured at low cost while also providing markets to shareholder farmers.

## Project Objectives

A team of University of Michigan's School of Natural Resources and Environment students surveyed corn growers on a ten-day trip to India, with 2-3 days spent in Pune and Sangli, respectively. The following objectives were derived from the survey and upstream supply-chain stakeholder interactions along with the procurement team at Kellogg Company, Mumbai in order to primarily improve the quality and quantity of corn produced<sup>7</sup> in the Indian operations of Kellogg Company.

1. Analyze scenarios relating farmer-level and miller-level in the supply chain utilizing a data driven stakeholder materiality assessment to identify the most significant and applicable intervention strategy by Kellogg Company for positive impact on all relevant stakeholders.

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<sup>3</sup> Kellogg Company. (2014). "Global Sustainability 2020 Commitments." Retrieved from: [http://www.kelloggcompany.com/content/dam/kelloggcompanyus/corporate\\_responsibility/pdf/2014/Sustainability\\_2020Commitments\\_Final.pdf](http://www.kelloggcompany.com/content/dam/kelloggcompanyus/corporate_responsibility/pdf/2014/Sustainability_2020Commitments_Final.pdf)

<sup>4</sup> Kellogg Company. (2014). "Global Sustainability 2020 Commitments." Retrieved from: [http://www.kelloggcompany.com/content/dam/kelloggcompanyus/corporate\\_responsibility/pdf/2014/Sustainability\\_2020Commitments\\_Final.pdf](http://www.kelloggcompany.com/content/dam/kelloggcompanyus/corporate_responsibility/pdf/2014/Sustainability_2020Commitments_Final.pdf)

<sup>5</sup> Kellogg Company. (2014). "2014 Annual Report Form 10-K." p.66 Retrieved from: [http://investor.kelloggs.com/files/doc\\_financials/annual\\_reports/K\\_2013\\_10-K%20with%20supplement.pdf](http://investor.kelloggs.com/files/doc_financials/annual_reports/K_2013_10-K%20with%20supplement.pdf)

<sup>6</sup> Kellogg Company. (2014). "2014 Annual Report Form 10-K." p.19 Retrieved from: [http://investor.kelloggs.com/files/doc\\_financials/annual\\_reports/K\\_2013\\_10-K%20with%20supplement.pdf](http://investor.kelloggs.com/files/doc_financials/annual_reports/K_2013_10-K%20with%20supplement.pdf)

<sup>7</sup> Based on internal stakeholder survey preferences

2. Address the identified significant and applicable intervention strategy derived, using cost-benefit analysis; combining the creation of shared value as increased livelihood for farmers, decreased procurement costs and complexity for millers as well as Kellogg Company in order to secure the supply chain and create value through Corporate Social Responsibility practices for Kellogg Company in the long run.

3. Utilize interview data to provide evaluation of the potential economic and societal impacts to the stakeholders involved and measurable environmental impacts within each applicable intervention strategy.

## Corn in India

Growing crops in India can be a challenging and complex endeavor. The Indian agricultural sector accounts for 18% of GDP and employs half the country's workforce.<sup>8</sup> The country has many strides over the past few years towards significantly boosting yields through the increased use of hybrids and research.

Although India has abundant natural resources, growing across these regions is difficult because the country is so diverse. The India Ministry of Earth Sciences has identified 127 agro-climatic zones in India; this means each zone has a distinct rainfall pattern, soil type, irrigation availability and cropping options.<sup>9</sup> Identifying the best seeds and inputs for a specific region are particularly challenging because climatic zones can vary in as small as region as 10 kilometers. Farmers within this distance of one another in different zones should not be using the same seeds, which is extremely challenging from a technical assistance perspective.

The Government of India has implemented many projects over recent years aimed at increasing investment in the food processing industry, investing in infrastructure and technology for farmers, and stabilizing market process for farmers in time of volatility.<sup>10</sup> One such initiative is aimed at providing insurance to farmers to protect them against price risk; the effort aimed toward encouraging crop diversification.<sup>11</sup>

Currently corn is the third most important cereal crop after rice and wheat, accounting for 9% of total grain production.<sup>12</sup> Corn production has nearly doubled over the past decade from 14 million metric tons in 2003 to 23 million metric tons in 2013. The increase in acreage has been

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<sup>8</sup> Ministry of Commerce and Industry, Government of India. (2014). "Indian Agriculture Industry." Retrieved from: <http://www.ibef.org/industry/agriculture-india.aspx>

<sup>9</sup> Ministry of Earth Sciences, Agricultural Meteorological Division. (2015). "Delineation of Agroclimatic Zones of India under National Agricultural Research Project (NARP)". Retrieved from: <http://www.imdagrimet.gov.in/node/290>

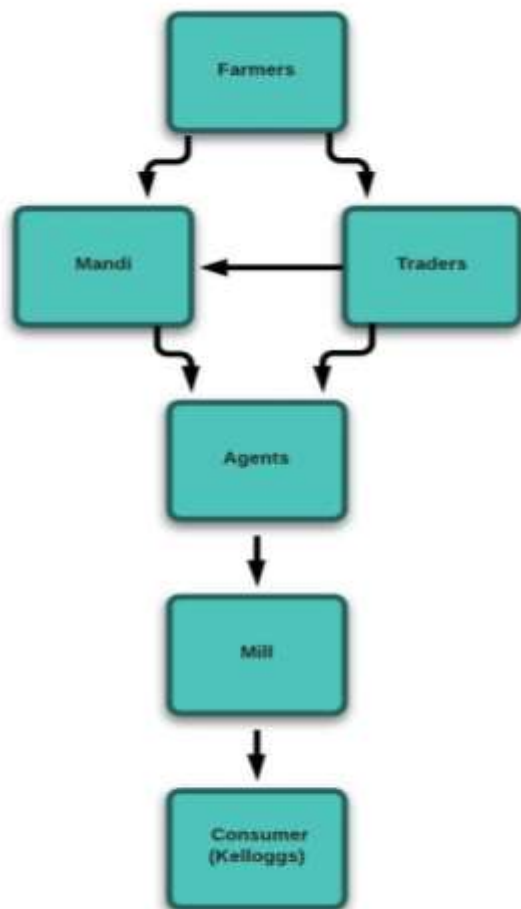
<sup>10</sup> Ministry of Commerce and Industry, Government of India. (2015). "Indian Agriculture Industry." Retrieved from: <http://www.ibef.org/industry/agriculture-india.aspx>

<sup>11</sup> Ministry of Commerce and Industry, Government of India. (2015). "Indian Agriculture Industry." Retrieved from: <http://www.ibef.org/industry/agriculture-india>

<sup>12</sup> Singh, A.D. (2014). "India Maize Summit '14." P.11. Retrieved from: [http://www.ficci.com/spdocument/20386/India-Maize-2014\\_v2.pdf](http://www.ficci.com/spdocument/20386/India-Maize-2014_v2.pdf)

the result of low labor costs, and a lower water table in the rice belt. Despite the rapid increase, it's still estimated that only 60% of corn production is under hybrid cultivation.

In India, corn yields lag far behind the rest of the world at roughly half the global average.<sup>13</sup>



Reasons include: climatic conditions resulting in drought, excess water associated with increased pressure of diseases, lack of development of single cross hybrid technology, limited adoption of improved technology, deficiencies in the production and distribution system of quality seed, small farm holdings and limited resource availability to farmers.<sup>14</sup>

Despite these hurdles, the Indian government has been encouraging the cultivation of corn by raising baseline prices that must be paid at mandi markets. In 2013, the government set a baseline price for Rs 1,310 per quintal, comparatively high compared to rich and other grains.<sup>15</sup> This is because corn is a resilient crop that can be easily used by the starch and feed meal industries.

*Kellogg's Supply Network.* The corn supply chain of India is composed of many actors working to supply the market. The actors within this supply chain consist of farmers, traders, and millers. This complex supply chain composed of various actors provides difficulty in allowing Kellogg direct visibility to the lowest levels of its supply network.

At the base of the supply chain, farmers produce corn throughout two growing seasons, July-October, and October-March. Corn is grown in nine states throughout India.<sup>16</sup> (See Appendix A for a map of growing region.) Farmers then choose to either sell their crop at local mandi markets or to traders.

Mandi markets are local markets where commodities are auctioned off. Crop prices at local mandis depend on a government minimum baseline price, and the quality and quantity of corn being sold on that given day.

<sup>13</sup> Singh, A.D. (2014). "India Maize Summit '14." P.13. Retrieved from: [http://www.ficci.com/spdocument/20386/India-Maize-2014\\_v2.pdf](http://www.ficci.com/spdocument/20386/India-Maize-2014_v2.pdf)

<sup>14</sup> Singh, A.D. (2014). "India Maize Summit '14." P.13. Retrieved from: [http://www.ficci.com/spdocument/20386/India-Maize-2014\\_v2.pdf](http://www.ficci.com/spdocument/20386/India-Maize-2014_v2.pdf)

<sup>15</sup> Singh, A.D. (2014). "India Maize Summit '14." P.21. Retrieved from: [http://www.ficci.com/spdocument/20386/India-Maize-2014\\_v2.pdf](http://www.ficci.com/spdocument/20386/India-Maize-2014_v2.pdf)

<sup>16</sup> Retrieved from: [http://www.ficci.com/spdocument/20386/India-Maize-2014\\_v2.pdf](http://www.ficci.com/spdocument/20386/India-Maize-2014_v2.pdf)

Traders go to local villages to buy crops directly from farmers and often store crops in their own warehouses before selling in mandi markets. A farmer might choose to sell to a trader to avoid the trip to the mandi, or if he needs funds immediately. Traders act as credit for farmers in the off season, but their interest rates can run much higher than banks or other more formal lending mechanisms. Traders working on behalf of mills also go to mandi markets to buy corn for processing into corn grit product needed to its corn flakes.

In the case of Kellogg Company, multiple actors involved in the agricultural supply chain have affected the supply of corn needed to ensure quality raw material for the company's signature Corn Flakes cereal product line. The company's Asia Pacific division producing in India, is now working with a complex supply chain

Unfortunately, because of competing priorities at various levels of the supply chain, the company is faced with many chronic problems in procuring sufficient amounts of quality corn for production. The problems center on issues that influence yield and quality, and can mainly be segregated into pre and post-harvest issues.

Pre-harvest issues include types of seed used and water access. There was a high occurrence of "seed mixing" among poorer farmers surveyed. There is a very high potential for yields to grow as a result of farmers adopting better quality seeds, especially higher quality hybrids.<sup>17</sup> Seed mixing occurs at the mandi level and at the field level when farmers mix different brands of seeds together for planting.

Post-harvest issues include drying and storage. Mills that were surveyed in India had high rejection rates from the occurrence of aflatoxin fungus in crops. Aflatoxin is a fungus that's caused in corn by moisture and heat stress; toxic to warm-blooded animals, any grain infested with the fungus cannot be accepted.<sup>18</sup> Aflatoxin fungus and grain damage can be reduced with proper grain and decobbing procedures, proper handling procedures, minimal reuse of grain sacks, which can host fungus from season to season. The potential for both of these issues to be addressed with technical assistance is also significant. After improved quality yields are obtained, Kellogg Company will be able to achieve a continual supply of product for corn flake production.

## History of Kellogg Corn Flakes & Brand Legacy

Corn is the main cereal incorporated into a number of products including the iconic *Corn Flakes* as well as *Corn Pops*, *Frosted Flakes*, *Crunchy Nut*, *Fruit Loops*, *Crispix* and more<sup>19</sup>. *Kellogg's Corn Flakes* have been an American household staple since the early 20<sup>th</sup> century. The first batch

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<sup>17</sup> Kesireddy, R. R. (2014). Hybrid Maize Market Set To Double in Two Years. *Economic Times*. Retrieved from: <http://economictimes.indiatimes.com/markets/commodities/hybrid-maize-seed-market-set-to-double-in-two-years/articleshow/33471034.cms>

<sup>18</sup> Sumner, P.E. & Lee, D. (2012). Reducing Aflatoxin in Corn During Harvest and Storage. *University of Georgia Cooperative Extension Journal*. Retrieved from: [http://extension.uga.edu/publications/files/pdf/B%201231\\_3.PDF](http://extension.uga.edu/publications/files/pdf/B%201231_3.PDF)

<sup>19</sup> Kellogg Company. "Our Brands." (2011). Cereal Products. Retrieved from: [http://www.kelloggs.com/en\\_US/product-search.pt-Cereal\\*.html](http://www.kelloggs.com/en_US/product-search.pt-Cereal*.html)



of the iconic cereal was created by founder W.K. Kellogg and his brother, Dr. John Harvey Kellogg in 1906 and has since become a household brand in over 180 countries, worldwide<sup>20</sup>. The cereal maverick continued to innovate within the ready-to-eat cereal market, creating new production line and packaging techniques and expanding production to new markets like Canada, Australia, England all before W.K. Kellogg's death in 1951. Continuing through the 1950s, Kellogg production expanded into Mexico and New Zealand<sup>2</sup>.

As a response to increased awareness of the importance of nutrition and the role of fitness, Kellogg became the first cereal company to list the sugar content on the side panel of its products<sup>2</sup>. In 1997, Kellogg's created the W.K. Kellogg Institute for Food and Nutrition Research (WKKI), which is committed to creating 'great-tasting' food from 'wholesome grains', including the staple, corn. One decade later, WKKI expanded to include a 157,000 square-foot pilot plant with office space in order to grow Kellogg's global center for research and innovation activities<sup>21</sup>.

## Kellogg Presence in India

Two of the most popular Kellogg brands in India include the original *Corn Flakes* and *Chocos* – a chocolaty cereal brand of children around the country.<sup>22</sup> According to the Kellogg Company 2013 Annual Investors Report, the Asia Pacific division internal net sales grew by 3.0% resulting from 'favorable volume' and offset by 'unfavorable pricing/mix.'<sup>23</sup> The growth was propelled by steady cereal performance in India, Southeast Asia and Japan. In addition, as of February 2014, new manufacturing & manufacturing facilities have been established in India, Japan and South Korea<sup>5</sup>.

As of August 2014, Kellogg India launched the 'No More Excuses' campaign – an initiative aimed at helping women 'get rid of their excuses' and manage their weight in a healthy way utilizing *Kellogg Special K*<sup>24</sup>. The campaign features brand ambassador Deepika Padukone, a prominent Indian film actress and model, who helps to motivate women to engage with her in a weight management journey. Kellogg India has stated that it is committed to educating Indian consumers about the importance of breakfast cereal as a means to address nutrition and fitness.<sup>6</sup>

This report is well aligned with Kellogg Company's Global Sustainability 2020 Commitments, declared in August 2014. Such commitments include responsible sourcing, sustainable

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<sup>20</sup> Kellogg Company. "Our History." (2011). Our Best Days Are Yours. Retrieved from: [http://www.kelloggs.com/en\\_US/our-history.html](http://www.kelloggs.com/en_US/our-history.html)

<sup>21</sup> Kellogg Company. "Kellogg Company to Expand." (2007). News Room, W.K. Kellogg Institute for Food and Nutrition Research. Retrieved from: <http://newsroom.kelloggcompany.com/index.php?s=27529&item=76229>

<sup>22</sup> Kellogg Company. India Brands (2012). "Brands and Products." Retrieved from: [https://www.kelloggcompany.co.in/Brand\\_Landing.aspx](https://www.kelloggcompany.co.in/Brand_Landing.aspx)

<sup>23</sup> Kellogg Company. (2013). "2013 Annual Report – Fiscal Year End December 28, 2013." Retrieved from: [http://investor.kelloggs.com/files/doc\\_financials/annual\\_reports/K\\_2013\\_10-K%20with%20supplement.pdf](http://investor.kelloggs.com/files/doc_financials/annual_reports/K_2013_10-K%20with%20supplement.pdf)

<sup>24</sup> Kellogg Company, India. (2014). "Kellogg's Special K Gives Women a Reason to Get Back to Live with 'No More Excuses'." Retrieved from: [http://investor.kelloggs.com/files/doc\\_financials/annual\\_reports/K\\_2013\\_10-K%20with%20supplement.pdf](http://investor.kelloggs.com/files/doc_financials/annual_reports/K_2013_10-K%20with%20supplement.pdf)

agriculture and assisting smallholder farmers<sup>2</sup>. In India and around the globe, smallholder farmers play an integral role in sustaining the global food supply and this report contributes directly to identifying and understanding the risks and opportunities such farmers face in specific regions. As stated within the 2020 report, ‘Kellogg will continue to support agricultural suppliers, millers and farmers... [and will] do its part to minimize the impacts of agricultural production and help the agricultural sector be more sustainable<sup>2</sup>. Sourcing of corn in India requires a direct association with millers who obtain corn from smallholder farmers. Ultimately, this assessment will help to identify the needs of millers along with the needs of smallholder farmers in order to help build relationships and drive sustainability improvements along the supply chain in India.

## Peer Practices and Sustainability Initiatives

***PepsiCo India Corporate Citizenship Report (2010-2011).***<sup>25</sup> PepsiCo India focuses on performance and purpose utilizing a four-tiered system to analyze its sustainability goals: performance – short and long-term profitable growth; human sustainability – identifying and addressing multifaceted global nutrition needs; environmental sustainability – utilizing natural resources in a way that promotes long-term viability; and talent sustainability – aimed at creating employment opportunities and cultivating an inclusive workplace. As of 2010, on the environmental sustainability front, PepsiCo sustained ‘water positive’ status in India for the 2<sup>nd</sup> year and was able to save/recharge 10.1 billion liters of freshwater utilized in its manufacturing facilities. The company works with over 22,000 farmers in nine different states to promote sustainable solutions like ‘direct seeding’ of rice and saves 30% more water by eliminating holding water in paddy cultivation. By 2015, PepsiCo aims to improve water use efficiency by 20% per unit production by providing funding and technical support/training to local farmers.

***Nestle in Society: Creating Shared Value (2012).***<sup>26</sup> Nestle aims to address water issues in the supply chain in India by installing a rainwater collection tank. The water collected is used for irrigation and has improved water quality. In addition, the Water Awareness Program has been initiated and aims to promote responsible water use among children in schools near factories and have installed 156 drinking fountains in the schools. As of 2011, Nestle has mapped and assessed supply chains of over 260 major suppliers, including those in India, in order to assess potential sustainability risks and prioritize room for improvement.

***General Mills Global Responsibility (2012).***<sup>27</sup> In 2011, General Mills developed a sustainable sourcing model in order to assess the ingredients and sources for materials in the manufacturing processes in the supplies they purchase, worldwide. The ingredients and materials were

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<sup>25</sup> PepsiCo India (2011). “Corporate Citizenship Report 2010/11 – Performance with Purpose.” [http://www.pepsico.com/Assets/Download/India\\_Sustainability\\_Report.pdf](http://www.pepsico.com/Assets/Download/India_Sustainability_Report.pdf)

<sup>26</sup> Nestle. (2012). “Nestle in Society – creating shared value and meeting our commitments 2012 (Full Report).” Retrieved from: [http://www.nestle.com/asset-library/documents/library/documents/corporate\\_social\\_responsibility/nestle-csv-full-report-2012-en.pdf](http://www.nestle.com/asset-library/documents/library/documents/corporate_social_responsibility/nestle-csv-full-report-2012-en.pdf)

<sup>27</sup> General Mills. (2012). “Global Responsibility 2012 – Health, Communities and Environment.” Retrieved from: [http://www.generalmills.com/~/\\_media/Files/CSR/csr\\_2012.ashx](http://www.generalmills.com/~/_media/Files/CSR/csr_2012.ashx)

measured against dozens of potential risk categories, including ‘animal welfare, greenhouse gas emissions, soil loss, water quality and water use’. With this model, GM is developing strategies to address sustainable sourcing of key ingredients. In addition, GM has collected ‘supplier scorecards’ from its top suppliers in order to assess data on ‘energy use, greenhouse gas emissions, water and solid waste generation’ that may be associated with the ingredients/materials utilized in products.

## Research Methodology

The team used a mixed methods approach to conduct the project, involving grower and expert interviews and a literature review. The work involved: (1) a comprehensive literature review and interviews to develop the survey, (2) Corn farmer field interviews using the customized survey along with interviews with mill owners and traders, and (3) consolidation of collected data, best practices and intervention analysis.

**Survey Development.** To form the survey that would be deployed to smallholder farmers, mill owners and traders in India, the team examined existing surveys and tools developed by reputable NGOs and agricultural organizations working in the region. The team conducted interviews with stakeholders in and outside of the Kellogg organization to understand ongoing project. These sources included:

- Amy Braun, Senior Sustainability Manager, Kellogg Company, Global HQ, USA
- Alicia Perdon, Advanced Innovation Team, Kellogg Company, Global HQ, USA
- Atul Chavan, Senior Manager of Ingredients Procurement, Kellogg Company, Asia Pacific & Africa
- Neval Dnyanoba, Manager of Grain Science, Kellogg Company, India
- Chris Stevens, Head of Agribusiness and Agronomy, Kellogg Company, Asia Pacific and Africa
- Ed Thistlethwaite, Senior Regional Manager, Agribusiness, Kellogg Company, Asia & Africa
- Randal Dell, Agricultural Strategy Manager-Great Lakes, The Nature Conservancy
- Whitney Gantt, Global Director for mAgriculture, Grameen Foundation
- Simon Winter, Senior Vice President, TechnoServe
- Robyn Meeke, Assistant Professor, University of Michigan School of Natural Resources and Environment
- Ravi Anupindi, Professor of Operations Management, University of Michigan Stephen M. Ross School of Business
- Andrew Jones, Assistant Professor of Environmental Health Sciences, University of Michigan School of Public Health

The following resources were used to develop the base survey:

- **Sustainable Agriculture Initiative (SAI) Farmer Sustainability Assessment 2.0:** The SAI Agricultural Initiative was formed in 2002 by Nestle, Unilever, and Danone to

facilitate sharing of sustainable agricultural practices. The farmer sustainability assessment tool is a checklist for farmers to assess their sustainability practices.<sup>28</sup>

- **Progress out of Poverty (PPI):** A Grameen Foundation developed measurement tool for organizations to integrate poverty data into their assessments.<sup>29</sup>
- **Unilever Sustainable Agriculture Code:** Developed in 2010, this code is Unilever's definition of sustainable agriculture and outlines expectations of all raw material suppliers.<sup>30</sup>
- **Living Standards Measurement Study (LSMS) - Integrated Surveys on Agriculture:** A household survey project established by the Bill and Melinda Gates Foundation and the Development Research Group at the World Bank to foster innovation and efficiency in research on the links between agriculture and poverty reduction.<sup>31</sup>
- **Sustainability Assessment of Food and Agriculture Systems (SAFA):** Food and Agriculture Organization of the United Nations built on existing efforts and developed this framework to act as a universal standard for the food and agriculture industry.<sup>32</sup>

The final, 114-question survey went through a series of revisions and was reviewed by Amy Braun, and Atul Chavan for adaptation to the local context before deployment.

**Farmer, Mill & Trader Interviews.** In May 20-31, Ashlyn Gurley, Michelle Mabson and Purnima Subramanian traveled to Mumbai, India to conduct interviews with smallholder farmers and other intermediaries in the supply chain. They also visited mandi markets, corn grit mills, and trader warehouses to gain an understanding of the supply network. Atul Chavan and Neval Dnyanoba served as guides and translators throughout their days of fieldwork in the Sangli and Pune areas. Interviews were arranged through local traders and mill owners; Niket Chheda of P.V. and Sons Milling at Pune and owner of Godavari Industries in Sangli organized interviews and also served as translators.

Over five days interviews were held at six locations with roughly 60 farmers. Answers were recorded by iPad using the customized Quicktap survey tool application with additional note taking. The survey was limited to farmers in the Maharashtra state in South India within Kellogg's supply chain that currently grow corn. This was also limited to smallholder farmers, a grower who cultivate five hectares or less, according to the Food and Agriculture Organization of the United Nations.<sup>33</sup>

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<sup>28</sup> Farm Sustainability Assessment 2.0. <http://www.saiplatform.org/fsa/fsa-2>

<sup>29</sup> Progress out of Poverty. <http://www.progressoutofpoverty.org/>.

<sup>30</sup> Unilever Sustainable Agricultural Code, 2010.

[http://www.unilever.com/images/sd\\_Unilever\\_Sustainable\\_Agriculture\\_Code\\_2010\\_tcm13-216557.pdf](http://www.unilever.com/images/sd_Unilever_Sustainable_Agriculture_Code_2010_tcm13-216557.pdf)

<sup>31</sup> Living Standards Measurement Study: Integrated Surveys on Agriculture, The World Bank.

<http://web.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTLSMS/EXTSURAGRI/0,,menuPK:7420268~pagePK:64168427~piPK:64168435~theSitePK:7420261,00.html>

<sup>32</sup> Dixon, J., Tanyeri-Abur, A. & Wattenbach, H. (2010). Impacts of Globalization on Smallholder Farmers. *Foreign Agriculture Organization*. Retrieved by: <http://www.fao.org/docrep/007/y5784e/y5784e02.htm>

<sup>33</sup> Dixon, J., Tanyeri-Abur, A. & Wattenbach, H. (2010). Impacts of Globalization on Smallholder Farmers. *Foreign Agriculture Organization*. Retrieved by: <http://www.fao.org/docrep/007/y5784e/y5784e02.htm>

**Mill and Trader Survey.** The initial survey was developed with the intent to collect farmer-level data that would aid in garnering a full picture of the economic, social and environmental status of smallholder farmers interacting with Kellogg supply chain in India. Once in Mumbai, it was revealed that other components to the supply chain included the mill and traders, integral intermediaries between the farmer and Kellogg. To understand this relationship, a survey for mill owners and traders were created in country and administered to the mill owners visited and several traders. In creating the mill-level survey, questions were developed based on the relationship between Kellogg and two mills, P.V. and Sons Milling in Pune and Godavari Industries in Sangli. This relationship was defined from the initial meeting between the team, Atul Chavan, senior procurement manager for Kellogg India, and Neval Dnyanoba, Kellogg grain scientist.

**Kellogg Leadership Survey.** Once survey results and trends were analyzed, a second survey was developed using Google Forms to assess how the views of senior-level management within Kellogg Company across regions compares to the view of both farmers and millers. This survey is important for providing context for understanding the varying perspectives of each stakeholder across the value chain, especially management's views of the issues within the value chain. Results will provide direction for developing and understanding ease of implementation, the willingness to support specific intervention strategies and level of importance that stakeholders place on individual strategies in order to weigh different objectives within the modeling instruments outlined in later sections.

**Interview bias.** As with any data, especially reported through translators, a level of bias and inaccuracy must be assumed. This can be attributed to farmer comprehension of questions, translation inaccuracies, and groupthink (i.e. when other farmers were listening/helping with responses). Some difficulty was also realized in obtaining surveys in country. Approximately half (36 out of 60 interviewed) of the farmer surveys were obtained from groups of farmers at local mandi auction markets, and the other half (24 out of 60) of the surveys were obtained from one on one interviews with farmers at their residences. In addition, most interviewed farmers were also already colleagues or business associates of mill owners, they may have felt a conflict of interest in answering questions. While the project team does not attempt to quantify or project the impact of these considerations, their presence must be acknowledged.

## **Survey Analysis**

**Farmer Survey Statistics and Insights.** The primary stakeholders surveyed in this analysis were corn growing farmers in the state of Maharashtra. Due to the presence of a complex supply chain network in the country, it is impractical to determine whether all farmers interviewed produced corn for Kellogg's in the past or will do so in the future. The outcome of the survey was to determine the qualities and practices of an average small-holder corn farmer in the state, their shortcomings, short and long term objectives and to identify areas of external assistance and interventions that is most likely to create direct value to them.

Table: 1 Farmer Demographics

Demographics	Percentage/Average Value	Range (if applicable)
Gender: Male	100%	
Age	36	23-50
Type of Ownership: Land owners	100%	
Years of Ownership	9.2 Years	4-30 Years
Land Holding Size	4.05 Hectares	1.0125-38.88 Hectares
Income	\$7777/Annum	\$5000-\$18500/Annum
Yields Obtained	1.132 Tons/Hectare	1.01 - 1.62 Tons/Hectare

Table 2: Farmer Practices (Italicized text: applicable for developing materiality assessment)

General Practices	Percentage of Respondents
Use of government extension and other information services: Yes	43%
Use of government extension and other information services: Never	2%
Top most sought after information:	
• <i>Seed Variety</i>	33%
• <i>Fertilizer Use</i>	10%
• Soil conservation methods	0%
• Planting methods	0%
• Prices for farmed products	0%
• Available markets	0%
Pre-Harvest Practices	Percentage of Respondents/ Value
<i>Most popular seed variety: Syngenta</i>	36%
Use of irrigation: Yes (Use of Aquifers or bores)	36%
Use of irrigation: No (Rain-fed)	64%
Prominent practice for soil quality maintenance:	
Crop Rotation	100%
Average seeds used per Hectare	23 Kgs
Dominant crop rotated with: Sorghum	61%
Post-Harvest Practices	Percentage of Respondents/ Value
<i>Average period of drying: On open ground</i>	3.5 Weeks
Average storage period	3.5 Months
<i>Storage methods:</i>	
• <i>Gunny/polyester sacks (often reused)</i>	97%

• <i>Loose in barns</i>	3%
<i>Presence of Aflatoxin fungus reported: often</i>	90%
<i>Mixing of seed varieties during drying/storage</i>	100%

Table 3: Farmer Expectations and Concerns  
(Italicized text: applicable for developing materiality assessment)

<b>Farmer Expectations and Concerns</b>	<b>Percentage of Respondents/ Value</b>
Willingness to join Farmer Cooperative: Under the right circumstances without having to take initiatives	83%
<i>Type of information expected from buyer: Seed Variety</i>	<i>100% [for yield improvement]</i>
Expect weather related risks	88.89%
<i>Satisfaction with access to market price information: Yes</i>	<i>80%</i>
<i>Satisfaction with price received: No</i>	<i>60%</i>
<i>Resources needed for growing better quality corn:</i>	Better weather conditions (including water access): 55% <i>Better inputs: 27%</i> <i>Technical Assistance: 9%</i> <i>Pricing: 9%</i>

Based on the survey and direct interaction with various groups of corn farmers in the surveyed region, the biggest farming concerns were identified in a manner that can be utilized by Kellogg Company to suitably assist the corn growers with practical intervention strategies.

Under each area of farmer survey assessment as grouped in the three tables above, survey statistics and verbal interaction facilitated in identifying the most common and prominent issue for farmers interviewed.

Use of government extension services and other technical assistance services was irregular and often seen as a burdensome procedure; therefore most farmers did not actively seek them. This makes provision of technical assistance a potentially rewarding intervention if offered in a manner that allows better access to farmers. Out of the farmers that made use of government and other technical services, the most sought after information were about quality of seed variety and type of fertilizer. Water access is not uniform among all farmers in the two regions surveyed, while it was relatively for the rich farmers with larger land holdings to irrigate, the poorer farmers depended mostly on rainfall. Although most farmers used local seed brands as they were cheaper, farmers often mixed seed varieties in different plots of their sowing. At 36%, Syngenta brand was the most popular seed variety reportedly used, but often not the only seed variety used by the farmer in a season. Other seed variety brands used included Pioneer, Kaveri, Cargill, and Champion. Post-harvest practices, another determinant of corn quality, involved open air drying on bare ground.

This practice often causes variation in corn moisture content and allows growth of aflatoxin fungus. Drying is followed by de-cobbing and the corn kernels are stored in gunny or polyester sacks that are often reused. Reuse of bags causes further spread of fungus from the corn that was previously stored in these bags. A better practice calls for the use of fresh/clean bags. 60% of the farmers surveyed were dissatisfied with the price obtained for their corn at the mandi and this is most likely attributed to the post-harvest practices that influence quality and the mixing of seed variety which is undesirable to the mandis' direct customers, the mill. Mandis are increasingly adopting practices of screening corn for aflatoxin and presence of the fungus yields a lower price to the farmer.

Most of the farmer concerns such as information about the weather and use of adaptive growing techniques, information on seed variety and other basic post-harvest practices can be directly addressed via direct technical assistance.

**Mill Survey Insights.** Mills are the most important and direct stakeholders to Kellogg. Based on the interaction with the millers, it is essential to note that millers have the biggest stake in the intervention processes and are actively willing to cooperate and strategize with Kellogg's to derive mutual benefits from the interventions. The most tangible and direct value created through interventions at the farmer level will be realized by the millers in the form of reduced complexity in their procurement networks and decrease in direct operation costs due to better quality grain, segregated by variety for their different milling processes.

Typically both the mills produce 30-35% of their raw corn into grits used by Kellogg Company; 30% is used for producing corn meal; 30% for corn feed and 10% corn flour. In the current scenario, the biggest cause of rejection and operational strain faced by the mill owners is the raw material corn obtained in mixed varieties, followed by the occurrence of the aflatoxin fungus. The two reasons cause the millers to have a constant need for devising strategic alternate sourcing networks, adding to their variable costs. Both millers are unable to communicate their quality needs directly to the farmers or the traders because of the established supply network system. Godavari Industries currently has a procurement network within a 600 KM radius from their mills and P.V. & Sons has one 300 KM radius from their mill. Cost of raw material goes up to 60-65% of their total costs. Based on our interaction with the mill, we also came across

**Internal Management Survey Insights.** The objective of the survey sent to Kellogg's internal management was to garner the management's vision for this project and detail their priorities in stakeholder engagement in the context of technical and economic feasibility and willingness to implement various interventions.

Survey response indicated to the primary objective of the project as "increasing quality and quantity of corn procured", which expects to secure the supply chain in the long run through creation of shared value and benchmarking corporate social responsibility practices. This suggests that the reasonable need lies in gradually improving current farming practices and eliminating the difficulties faced on the grounds of rejection of poor quality of corn. Procuring increased quantity is also integral to the company at this juncture, when the company sales have



grown by 3% owing to growth in the Asia-Pacific region<sup>34</sup>. The survey also indicates the importance of ease of implementation of the project to Kellogg Company in the context of reduced costs, higher returns and minimal time in intervention implementation all weighted equally important. The concluding analysis was built based on the survey inputs of Kellogg leadership.

## Model Approach

The proposed interventions are expected to create shared value with external stakeholders of the upstream supply chain. It is therefore essential to assess and evaluate the priorities of the various stakeholder groups (i.e. the Farmer, Miller and Kellogg Company) and assess their priorities using a multi-criterion assessment process for strategic intervention development. Based on our surveys, we have garnered a list of priorities which is mapped on to a matrix using the materiality assessment approach. Materiality assessment is a process in sustainability reporting as endorsed by the Global Reporting Initiative<sup>35</sup>. It is an exercise in stakeholder engagement to identify key issues or “Material Aspects” on which the corporation or business must seek to intervene.<sup>36</sup>

## Model Description and Analysis

Materiality Assessment Matrix. The major intersection of priority areas/criteria identified from the 3 surveys is defined below:

Priorities	Definition
Provision of Direct Inputs	The need for and ease of implementation in providing farmers with direct inputs such as seeds, water access, drying and storage equipment along with technical assistance.
Formation of Maize Co-operative for Farmers	The need for and ease of implementation in assisting the initiation and formation of a self-regulated farmer’s maize co-operative in the state.
Address Climate Risks and Water Availability	The need for addressing and assisting farmers with technical support and providing access to water co-joint with relevant organizations and scientific researchers.

<sup>34</sup> Kellogg Company. (2013). “2013 Annual Report Form 10-K.” p.19 Retrieved from: [http://investor.kelloggs.com/files/doc\\_financials/annual\\_reports/K\\_2013\\_10-K%20with%20supplement.pdf](http://investor.kelloggs.com/files/doc_financials/annual_reports/K_2013_10-K%20with%20supplement.pdf)

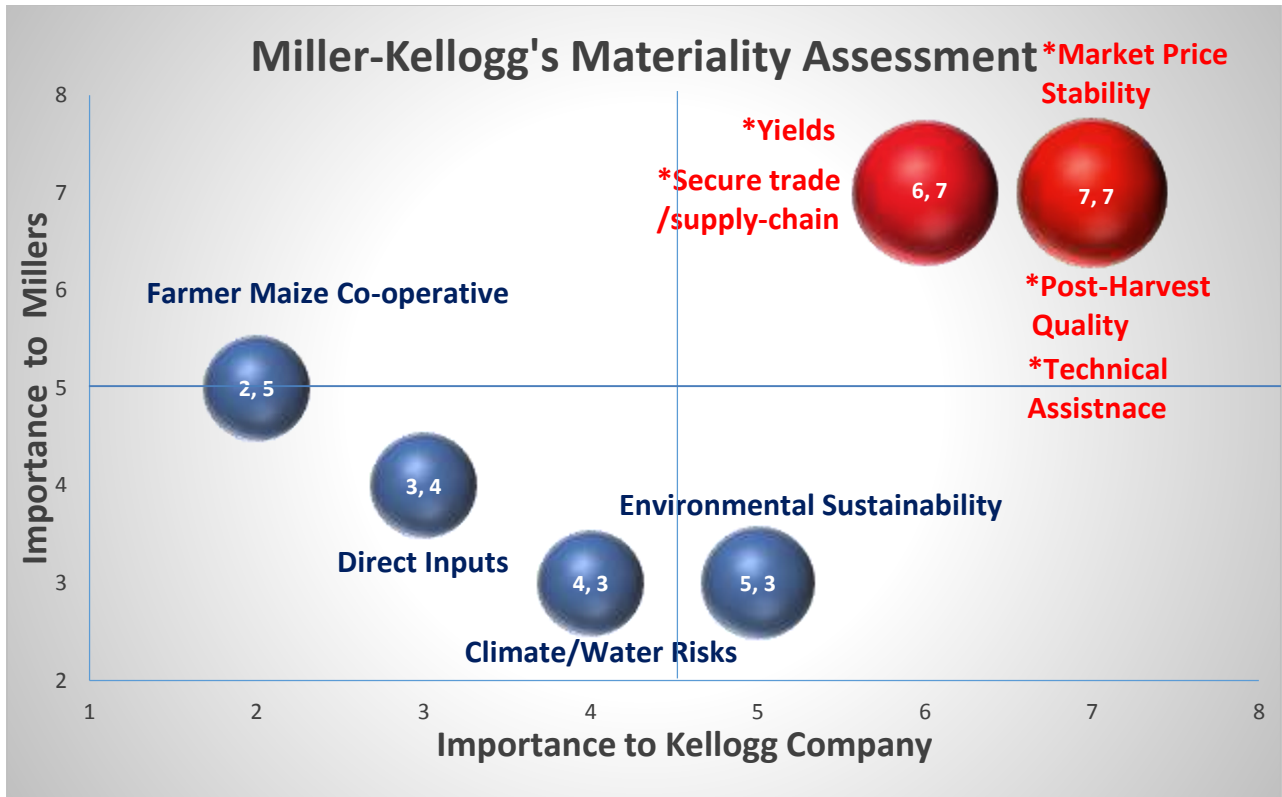
<sup>35</sup> Global Reporting Initiative. (2015). “Materiality in the Context of the GRI Framework.” Retrieved from: <https://www.globalreporting.org/reporting/G3andg3-1/guidelines-online/TechnicalProtocol/Pages/MaterialityInTheContextOfTheGRIReportingFramework.aspx>

<sup>36</sup> Global Reporting Initiative. (2015). “GRI G4 Implementation Manual.” P. 12. Retrieved from: <https://www.globalreporting.org/reporting/G3andg3-1/guidelines-online/TechnicalProtocol/Pages/MaterialityInTheContextOfTheGRIReportingFramework.aspx>

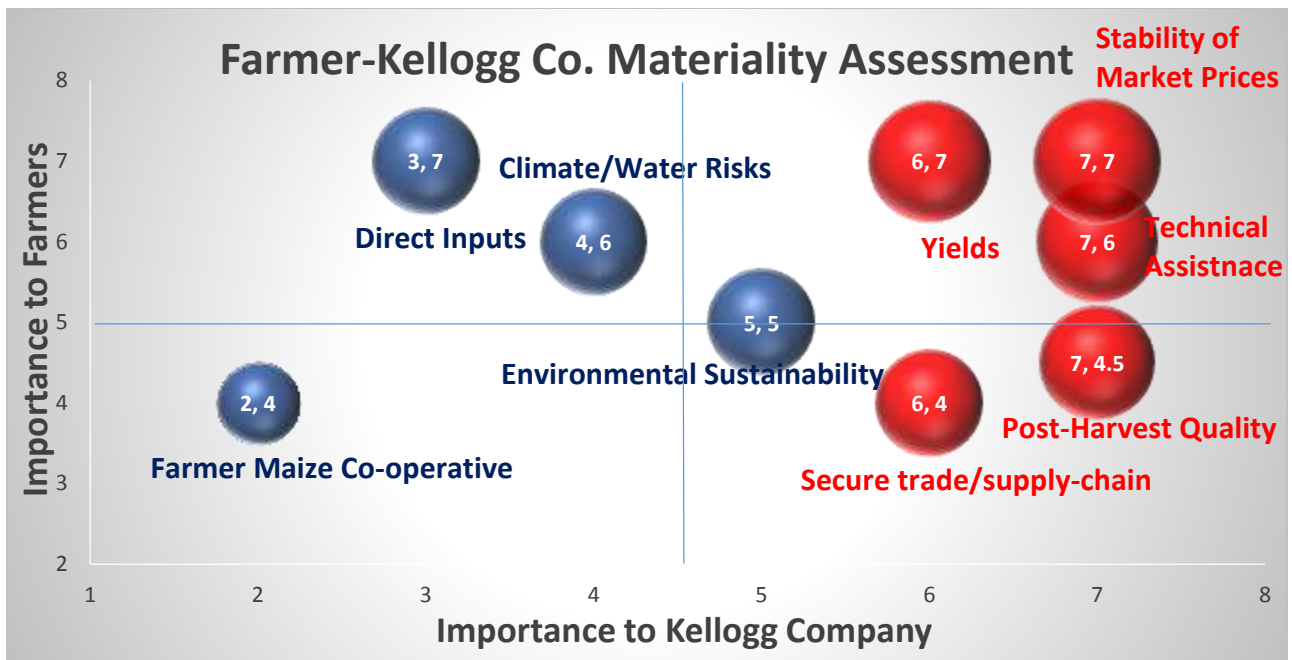
Provision of Technical Assistance	The need for and ease of implementation in providing resources to communicate valuable technical information to help improve both pre and post- harvest practices.
Address Environmental Sustainability	The need for and the ease of implementation for addressing and optimizing the various aspects of environmental sustainability including soil health, crop strength, use of fertilizers, water management, and environment friendly storage practices.
Address Interventions to Stabilize/Secure Market Price of Corn	The need for and the ease in implementation of applicable interventions that could help stabilize crop prices for both the buyer and the seller through appropriate contract growing.
Secure Trade/Supply Chain	The need to secure trade with the current entities in the long term with minimal discrepancies to all entities involved.
Address Intervention to Improve Corn Yields	The need for and ease of implementation to directly improve corn yields as it is the major cause of concern for farmers in the country, obtaining yields less than half of the current yields in the United States.
Address Intervention to Improve Post-Harvest Corn Quality	The need for and ease of implementation to directly improve corn quality through relevant support and interventions to improve post-harvest practices.

The various priorities described above were scored on a scale of 1-7 and weighted across its significance to both stakeholders in order to determine the absolute essential priority, from which an intervention strategy could be developed.

The priorities for the farmer were scored on the basis of need, ease of access and feasibility in the geographical and cultural context of farmer. The priorities for the miller were scored on the basis of possible interest in intervention strategy and the level of tangible value realized. The priorities of Kellogg Company were scored on the grounds of ease of implementation that includes fewer costs, higher returns, frequency and complexity of engagement with different stakeholders, time required to implement strategy and creation of tangible corporate social responsibility value and standards. The combined materiality assessments for this particular system of supply chain are mapped below.



**Above: Materiality Assessment Matrix for Farmer and Kellogg Company. Priorities highlighted in purple were analyzed using CBA. (\*Overlapping points)**



**Above: Materiality Assessment Matrix for Mill and Kellogg Company. Priorities highlighted in purple were analyzed using CBA.**

Based on the materiality map identified for the 3 stakeholders, we find that the most common highly valued priorities are:

- Provision of Technical Assistance
- Address Interventions to Stabilize/Secure Market Price of Corn
- Address Intervention to Improve Post-Harvest Corn Quality
- Address Intervention to Improve Corn Yields

From knowledge and understanding of the system interactions, variability's and constraints at play in each of the above priorities, intervention strategies were developed and a cost-benefit analysis was evaluated for each intervention strategy.

## Identification of Intervention Strategies

Based on the materiality map for the 3 stakeholders, the most common highly valued priorities were identified. From these priorities, three main intervention strategies were developed for analysis as follows:

1. ***Provision of Technical Assistance:*** This intervention would entail direct farmer engagement through hiring a knowledgeable individual to carry out relevant extension services through direct communication with farmers in the field. This form of communication is expected to address most important issues around pre and post-harvest quality of corn and developing trust and long term relationships with farmers. However, with such an intervention strategy, there is no guarantee of the benefits derived as there is no guarantee that the assisted farmer would sell to Kellogg's through the mandi system. There is also no clear incentive for the farmer to implement some of the best practices that may be cost intensive (such as buying clean gunny bags for each harvest, or premier quality seeds of the same variety). Other challenges include identifying and maintaining relationships with farmers in the long run where in even if benefits are tangibly realized, they will require a few years' time for such realization.
2. ***Stabilize Market Prices of Corn through intervention at the Post Harvest Level:*** This intervention seeks to address three of the top priorities combined with two methods of intervention strategy.
  - Strategy 1: Providing technical assistance with direct farmer contract: This intervention includes direct technical engagement and assistance as well as provision post-harvest equipment. This includes buyback contracts with farmers.
  - Strategy 2: Providing inputs and direct farmer contract: In this intervention, direct technical assistance will be provided through the mill using mill personnel, provision of post-harvest equipment to farmers. This includes farmer buyback contracts. The assumption here is that it is more cost effective for the miller to directly assist on the ground, as they already have local relationships. Whereas if the mill provides direct inputs as well, it would be reflected in the increase of procurement costs from mill to Kellogg's.

While this intervention primarily seeks to eliminate occurrence of aflatoxin in the supply chain, it also guarantees reaping direct benefits. However challenges surrounding control over quality of seed variety used and mixing along with the need to gain farmer trust and alter existing supply network will need to be further addressed.

3. ***Stabilize Market Prices of Corn through intervention at the Pre Harvest Level:*** This intervention also seeks to address three of the top priorities combined with two methods of intervention strategy with a focus on pre-harvest practices.
- Strategy 1: Providing technical assistance with direct farmer contract: This intervention includes direct extension services, and providing inputs such a uniform quality seeds at a contracted subsidy. This also includes direct farmer contracting, essentially a buyback guarantee.
  - Strategy 2: Providing inputs and direct farmer contracting: This intervention entails direct extension services, but that they will be provided through the mill-by-mill personnel. Costs for provision of quality seeds for corn produced by the farmers at a subsidy is also calculated. In order to derive full benefits of this intervention, a contract must be agreed upon between the farmer and buyer.

While this intervention primarily seeks to enhance crop quality and yields in the supply chain, it also guarantees reaping direct benefits. However there would be challenges in identifying the right variety of quality seed to be widely distributed along with the need to gain farmer trust and alter existing supply network. There may also be the need to additionally support farmers with post-harvest techniques.

Cost-Benefit Evaluation of Intervention Strategies. For each of the intervention strategies identified, the concurrent costs and benefits were estimated. While the benefits are mostly intangible, usually realized indirectly, some of the benefits have been quantified as applicable in the long term such as monetizing reduction in raw-material and sourcing cost to mills which is reflected in procurement costs to Kellogg's; monetizing absence of procurement cost fluctuation and value of corporate social responsibility in each case. Translation of benefits in the form of reduced operational costs from improved quality of procurement is usually more directly realized at the mill level. Increased quantity of procurement does not necessarily translate into direct benefits to Kellogg as there has been no major or quantified cost to changes in operation management due to unavailability of corn grits as there is a cushion of alternative supply from having two mill sources.

## **Assumptions and results in Cost-Benefit Analysis**

Following are the assumptions in quantifying values in the cost-benefit analysis. The quantified values may be altered as is subjective during project implementation. *[Numerical results and analyses for cost benefit model have been omitted from this report, as they are based on proprietary data of Kellogg Company. What follows is a broad summary of the model setup and findings.]*

- All calculations were based on average data for the year 2013
- Most benefits are intangible and may not be realized directly or immediately
- It is assumed in interventions #2 and #3 farmers require an incentive to accept and sign contract for an “assistance and buy-back” scheme
- CSR value quantified: embedded in CSR value are mostly intangible or indirectly realized values such as increased profitability from enhanced brand reputation and insulation from direct or indirect regulatory penalties (such as the CSR mandate regulation in India). This is valued in the form of increased consumer purchase intentions<sup>37</sup>. An increase in purchase intention although quantified as 1.4% for tech service sector corporations was used and 30% of such intentions was assumed to be realized. Additional coefficients used were score for social responsibility initiative, a farmer livelihood score based on the type of intervention (i.e. score used in farmer’s materiality assessment priorities) and a coefficient for the percentage of product lines that used corn in the Asia-Pacific region. All of the coefficients were used as a function of Kellogg’s Asia Pacific sales revenue<sup>38</sup> for the year 2013.
- The analysis was done for a period of 6 years in total, i.e. 5 additional years from the year of implementation.
- Each intervention’s cost-benefit analysis was done involving two scenarios, i.e. optimistic and conservative. In the optimistic scenario the benefits are assumed to be realized fully from year 2 with CSR value being realized in year 6. In the conservative scenario, partial benefits were found to be realized in year 2, 3, 4 and full benefits in year 5, 6 without any consideration of CSR value.
- Optimistic and conservative scenarios in the analysis are limited in considering all possibilities.

**Cost Categories.** Broad cost categories identified for each intervention strategy entail the following. The costs values were evaluated based on knowledge sourced internally from Kellogg’s, information sourced from surveys on the ground and online information search.

- *1. Provision of Technical Assistance:* Costs associated with appointing personnel and providing onsite technical resources and periodic interaction with diverse farmer groups.
- *2. Stabilize Market Prices of Corn through intervention at the Post Harvest Level:* Costs associated with provision of direct technical assistance and resources (drying/storage inputs) via contract in strategy 1, versus mill supported provision of technical assistance and resources via contract in strategy 2.
- *3. Stabilize Market Prices of Corn through intervention at the Pre Harvest Level:* Costs associated with provision of direct technical assistance and resources (subsidized quality seeds) via contract in strategy 1, versus mill supported provision of technical assistance and resources via contract in strategy 2.

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<sup>37</sup> McKinsey and Company publication, “What really drives value in corporate responsibility?” Dec 2011. Retrieved from <http://bit.ly/1DGxGbH>

<sup>38</sup> Kellogg Company. (2013). “2013 Annual Report Form 10-K.” p.19 Retrieved from: [http://investor.kelloggs.com/files/doc\\_financials/annual\\_reports/K\\_2013\\_10-K%20with%20supplement.pdf](http://investor.kelloggs.com/files/doc_financials/annual_reports/K_2013_10-K%20with%20supplement.pdf)

Benefit Categories. Broad benefit categories identified for each intervention strategy entail the following. The benefit values were evaluated based on knowledge sourced internally from Kellogg’s, information sourced from surveys on the ground and online information search.

- *1. Provision of Technical Assistance:* Benefits associated with reduced mixing of seed varieties, improved quality from better drying practices and long term CSR values.
- *2. Stabilize Market Prices of Corn through intervention at the Post Harvest Level:* Benefits associated with procurement cost stability for both Kellogg’s and Mill from contract procurement, quality and farming practice improvement at the post-harvest level, i.e. with elimination of aflatoxin fungus, long term CSR values and additionally costs saved with mill support for strategy 2.
- *3. Stabilize Market Prices of Corn through intervention at the Pre Harvest Level:* Benefits associated with procurement cost stability for both Kellogg’s and Mill from contract procurement, substantial quality and farming practice improvement at the pre and post-harvest level, with not only the elimination of aflatoxin fungus but with bigger, harder corn that makes superior quality corn grits thereby reducing mill’s operational costs, long term CSR values and additionally costs saved with mill support for strategy 2.

Results. The degree of net-benefit values have been tabulated below:

<b>Intervention 1:</b>	<b>Intervention 2:</b>	<b>Intervention 3:</b>
Optimistic Scenario: Net Positive Value	Optimistic Scenario: Net Positive Value	Optimistic Scenario: Net Positive Value
Conservative Scenario: Net Negative Value	Conservative Scenario: Net Negative Value	Optimistic Scenario: Net Positive Value

## Recommendation and Next Steps

Based on the cost-benefit analysis, we see that mill assisted post-harvest intervention is the most suitable in the given system. Given that both the optimistic and conservative scenarios produce net positive benefits, it seems an ideal intervention for all the relevant parties surveyed and involved in the supply chain, i.e. farmers, millers and Kellogg’s. However there would be challenges in identifying the right variety of quality seed to be widely distributed along with the need to gain farmer trust and alter existing supply network. There may also be the need to additionally support farmers with post-harvest techniques.

Following this strategy, the next steps in the process of implementation will be to identify relevant mill support strategies and identify farmer group for a pilot program. Optimal seed varieties for wide use and supporting seed manufacturers must be identified to work with in parallel. Following this costs and benefits must be optimized for drafting contracts with farmers.

Once the pilot program is conducted and assessed for benefits, the program can be scaled up to meet potential needs.

Partnership opportunities. Some of the potential partnership opportunities identified in order to fulfill the recommended intervention are as below.

### ***International Maize and Wheat Improvement Center (CIMMYT)***

CIMMYT works to develop research and training services to improve farming systems for maize and wheat<sup>39</sup>. Through prolonged partnership with national governments, development banks and private agencies, CIMMYT is committed to reducing poverty and hunger while promoting sustainability in the increase of maize and wheat crop systems<sup>36</sup>. The aforementioned objectives align directly with the Global Sustainability 2020 Commitments as well as the continued partnership with Mas Agro. Mas Agro is an initiative that bridges smallholder and women farmers with agricultural research and development organizations to raise crop yields, increase incomes and reduce climate change in Mexico<sup>40</sup> – this effort can be leveraged by forging the existing relationship in Mexico and bridging the efforts on the ground in India.

Currently, the CIMMYT office in India works directly with scientists to improve the quality of maize through use of test plots carried out in different climactic zones. Projects address the growing issue of water availability, a critical concern identified through surveys from smallholder farmers<sup>41</sup>. Understanding that most maize is grown under rain-fed conditions and the water variability that farmers face, CIMMYT has partnered with a number of India-based organizations to focus on developing drought and temporary waterlogging tolerant maize varieties<sup>38</sup>. Such hybrids are ready to be tested and may serve as an opportunity for Kellogg to take advantage of in helping to identify farmers who are interested in taking part in the trials.

### ***Syngenta Test Plots:***

Some of the other challenges identified on the ground were farmer's inaccessibility to seed test plots. This inaccessibility hinders farmers from being able to test out quality seed varieties thereby relying primarily on large-scale trial and error in selecting seed varieties. Potential collaboration with Syngenta for getting access to test plots brings about a more comprehensive approach in prioritizing farmer needs and addressing the recommended intervention.

In 2014, Syngenta created the Good Growth Plan, which outlines Syngenta's commitment to maintaining a sustainable food system and its goals to make measureable impacts by 2020<sup>42</sup>. Several commitments, including empowerment of smallholders and increased crop efficiency

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<sup>39</sup> International Maize and Wheat Improvement Center (2015). Who We Are. Received from: <http://www.cimmyt.org/en/who-we-are>

<sup>40</sup> Kellogg Newsroom Press Release (2014) Kellogg Committed To Empowering Women And Smallholder Farmers – 01/08/14. Received from: <http://newsroom.kelloggcompany.com/2014-01-08-Kellogg-Committed-To-Empowering-Women-And-Smallholder-Farmers>

<sup>41</sup> International Maize and Wheat Improvement Center (2015). India and CIMMYT – Highlights of a longstanding partnership for agricultural development. Received from: [http://www.cimmyt.org/en/component/docman/doc\\_download/25-india-cimmyt](http://www.cimmyt.org/en/component/docman/doc_download/25-india-cimmyt)

<sup>42</sup> Syngenta Global (2014) Good Growth Plan. Received from: [http://www.syngenta.com/global/corporate/en/goodgrowthplan/Documents/pdf/The%20Good%20Growth%20Plan\\_%2016pp%20brochure%20ENG.pdf](http://www.syngenta.com/global/corporate/en/goodgrowthplan/Documents/pdf/The%20Good%20Growth%20Plan_%2016pp%20brochure%20ENG.pdf)



align with the Global Sustainability 2020 Commitments, outlined above. “Reference farms<sup>39</sup>” are being built across various geographies in order to measure baseline benchmarks for different crops with the ultimate goal being to increase crop yields. In 2012, Syngenta worked to grow corn using less water to address the drought that U.S. farmers were facing at the time. Even under drought conditions, yields increased by 10-20 percent when compared to conventionally farmed plots<sup>39</sup>.

Syngenta India operates two business divisions including crop protection and seed processing in three locations<sup>43</sup>. Published test plot results are not available online, however information on U.S. test plots are available to the public. As noted above, such reference farms include data on a variety of seed brands, including Pioneer and DeKalb and provide information on yield, grain moisture – in order to understand which seeds perform best within each geographical location, and number of seeds planted<sup>44</sup>. A partnership to develop similar test plots in Maharashtra, India would provide smallholder farmers with the ability to evaluate seed quality and yields with relatively low risk.

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<sup>43</sup> Syngenta Global (2015). India Vision and Business Divisions. Received from:  
<http://www.syngenta.com/global/corporate/en/about-syngenta/countries/pages/in.aspx>

<sup>44</sup> Syngenta U.S. Agriculture and Seeds (2015). NK Corn Plot Report – Monroe, MI. Received from:  
<http://www3.syngenta.com/country/us/en/agriculture/seeds/corn/nk/Pages/plot-report.aspx?PlotId=1098700&location=Milan-MI-48160>

# Appendix

## Appendix A

State Wise Maize Acreage and Production, 2010-11



## Appendix B: Mill Component Pricing Chart <sup>45</sup>

<b>Component</b>	<b>Percentage of Mill's costs</b>
<b>Raw Material &amp; Procurement</b>	<b>60%</b>
<b>Logistics Costs</b>	
<b>Cost of corn kernel</b>	<b>30%</b>
<b>Cost of bags</b>	<b>15%</b>
<b>Corn Procurement Logistics</b>	<b>15%</b>
<b>Fixed Operational Costs</b>	<b>15%</b>
<b>Capital</b>	<b>7%</b>
<b>Labor</b>	<b>8%</b>
<b>Variable Operational Costs</b>	<b>25%</b>
<b>Electricity</b>	<b>16%</b>
<b>Maintenance</b>	<b>4%</b>
<b>Rejections/line management</b>	<b>2%</b>
<b>Labor</b>	<b>3%</b>

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<sup>45</sup> Assumptions based on the mill survey and Chopra, S., & Meindl, P. (1997). Supply Chain Management: Strategy, Planning & Operation; Not reflective of actual component pricing

## Appendix C: Farmer Survey

<b>Name</b>	
<b>What is your gender?</b>	<b>Male Or Female</b>
<b>Age</b>	
<b>Do you have children?</b>	<b>Yes or No</b>
<b>Of your male children ages 5-12, what percentage attends school regularly (more than 80% of the time)?</b>	<b>less than 25%; 25-49%; 50-74%; 75-99%; 100%</b>
<b>Are you a(n)</b>	<b>a: Owner farmer; b. Rented/tenant farmer; c. Lease farmer; d.Farmer manager for an individual land owner</b>
<b>How many years have you: owned the farm/ is your lease/ work for the same individual?</b>	
<b>Is anyone in your household a member of a farmer group or cooperative?</b>	<b>Yes/No</b>
<b>If yes, which one(s)?</b>	
<b>If no, Is there a farmer group or cooperative you would like to join?</b>	
<b>What does success mean to you?</b>	
<b>Which has been your best production year and why was that (i.e. what does successful mean)?</b>	
<b>How do you measure profitability?</b>	<b>Yield per hectare; How much of the yields are sold at desired price; Margin;</b>
<b>Total land on farm (per type of ownership)</b>	<b>In acres</b>
<b>How many hectares of corn do you grow?</b>	
<b>How long (in years) have you grown corn?</b>	

<b>How did learn to farm?</b>	
<b>What was your yield in tons per hectare for your last growing cycle per crop?</b>	
<b>What would have helped you to grow more?</b>	
<b>How much did you sell from your last growing cycle per crop? (in kg)</b>	
<b>Did you sell your corn at the baseline price set by the government? If no, was it sold above or below the baseline?</b>	
<b>What price did you receive for your production last growing cycle? (Rs)</b>	
<b>Were you satisfied with the price you received from your crop last year?</b>	<b>Yes; I'm not sure; No</b>
<b>How do you decide whether to go to a trader or the mandi?</b>	
<b>How do you access pricing information?</b>	<b>a. Gov't extension services ; NGOs; Private services/ Farmer Co-ops; Agro-chemical experts; Neighbour; Village leader; Newspapers; SMS: Radio; Mill</b>
<b>Are you satisfied with the access to pricing information that you have?</b>	<b>Yes; No</b>

<b>Tell us about any government extensions you use for farming?</b>	
<b>Does the trader/mandi have specifications or restrictions about the corn you sell?</b>	<b>Yes ; No</b>
<b>Is there any incentive to improve quality?</b>	
<b>What % of last year's rice/corn harvest was rejected or sold at a reduced price?</b>	
<b>What services or information would you like to receive from your buyer?</b>	
<b>What is the biggest determinant of when you harvest?</b>	<b>needing money; Crops mature; Weather; Availability of transportation or Storage resources; Need to plant next crop; Other</b>
<b>For next year, do you think your crop will be:</b>	<b>better; same ; worse</b>
<b>And why?</b>	
<b>What technical assistance access do you have to help you grow your crop?</b>	
<b>Are you satisfied with your access to technical assistance?</b>	<b>Yes; No</b>
<b>In the last production year, how many times did you receive training or advice from an extension worker/agronomist?</b>	
<b>What was the advice?</b>	
<b>Where did you get it?</b>	

<b>What information, technology, or resources would be most helpful in improving your crops and yields?</b>	
<b>What would be most important/helpful to you if you were to grow corn (education, technology, inputs)?</b>	
<b>What are your main costs in producing corn?</b>	<b>labor; pesticides; fertilizer; land; water; seeds; machinery; electricity</b>
<b>What is the cost of producing corn per hectare?</b>	
<b>Do you have access to credit?</b>	<b>Yes or No</b>
<b>Are any of your crop inputs provided on credit? (by bank? by middleman?)</b>	
<b>What are the terms (length)? The interest rate?</b>	
<b>Do you have crop insurance?</b>	
<b>How do you select which variety you grow (i.e. how do you make an informed choice)?</b>	
<b>Where do you buy your seeds from (i.e. how do you ensure they are high quality)?</b>	
<b>Which seed varieties do you use?</b>	<b>Syngenta; Monsanto; Pioneer; Kaveri; Other</b>

<b>Why do you use these seed varieties?</b>	
<b>Do you think your seed is high quality?</b>	<b>Yes or No</b>
<b>How many seeds do you plant per ha?</b>	
<b>Do you mix seed varieties? How many varieties and why?</b>	
<b>Do you reuse seeds post harvest for the next viable season?</b>	
<b>How do you improve the productivity of your soil?</b>	<b>Minimum tillage to preserve structure; Add fertilizer; Crop rotation; Organic manure</b>
<b>Do you use change your crops from planting season to season to improve your soil (i.e. crop rotation)?</b>	<b>Yes or No</b>
<b>What is your rotation plan per cycle? (Interviewer, write season #: # ha of crop)</b>	
<b>Have you worried about the following risks in the past year?</b>	<b>government policy ; economic situation; rising costs; falling crop prices; debt; poor yields; weather; community relationships; insufficient labor; land disputes; land scarcity; lack of buyers.</b>
<b>Which is the biggest worry from above?</b>	
<b>Do you consider yourself at risk from weather variations (e.g. floods, droughts, etc)?</b>	<b>Yes or No</b>
<b>Do you use irrigation?</b>	<b>Yes or No</b>
<b>How do you source your water for irrigation</b>	<b>Aquifer/bore; River/lake; Man made dams; Rainfed/none;</b>



<b>What is your water irrigation method?</b>	<b>flood; channel</b>
<b>Do you ever suffer from water shortage?</b>	<b>Yes or No</b>
<b>How do you manage your water usage?</b>	
<b>Do you apply fertilizer?</b>	<b>Yes or No</b>
<b>If yes, what kind?</b>	
<b>How many times per crop?</b>	
<b>How much fertilizer in kg/ha? do you apply in each application (interviewer: separate with commas)</b>	
<b>What is the ratio of nutrients (N:P:K) in each application? (interviewer: put the ratio separated by " : " i.e.: 16:20:0, 15:15:15...)</b>	
<b>If 100% equals the ideal amount of fertilizer that you would like to use, what % of that amount were you able to use last year?</b>	
<b>Where do you get your fertilizer?</b>	
<b>How do you decide how much nutrients to add each crop cycle?</b>	
<b>Do you conduct soil tests?</b>	<b>Yes or No</b>
<b>If yes, how often and which tests?</b>	
<b>How do you control for pests?</b>	

<b>Where do you get your pesticides?</b>	
<b>Are you satisfied with this access you have to pesticides?</b>	<b>Yes or No</b>
<b>Where do you get your herbicides?</b>	
<b>Are you satisfied with this access you have to herbicides?</b>	<b>Yes or No</b>
<b>Have you received safe application training for herbicides/pesticides?</b>	<b>Yes or No</b>
<b>If yes, from who?</b>	
<b>How many non family members did you employ last crop cycle?</b>	
<b>How many family members worked on the farm last crop cycle?</b>	
<b>How many of your paid workers are women?</b>	
<b>How many family members who work on the farm are women?</b>	
<b>Who does most of the work on the rice crop, such as weeding, harvesting, etc?</b>	<b>Mainly men from the family; Mainly women from family; Mainly boys; Mainly girls; Hired Labor</b>
<b>What is your household income? (per year)</b>	
<b>Do you have off-farm income? If yes, how much?</b>	

<b>Do you have any outstanding debt?</b>	<b>Yes or No</b>
<b>If yes, how much?</b>	
<b>Do you have savings?</b>	<b>Yes or No</b>
<b>Of your female children ages 5-12, what percentage attends school regularly (more than 80% of the time)?</b>	
<b>What is the highest grade your over 12 children have completed?</b>	
<b>What is the highest grade that the male spouse has completed?</b>	
<b>What is the highest grade that the female spouse has completed?</b>	
<b>Do you have electricity?</b>	<b>Yes or No</b>
<b>If no, what do you use for lighting?</b>	
<b>Has there ever been financial stress on your family? (getting at food security)</b>	<b>Yes or No</b>
<b>If yes, how often did this happen?</b>	<b>Often/frequently; Sometimes; Rarely</b>
<b>Do you level your land prior to planting? How or why not?</b>	

<b>Do you use animals for crop management?</b>	
<b>How do you harvest your corn? (manual and machinery)</b>	
<b>What kind of machinery do you specifically use for corn?</b>	
<b>Do you dry your corn after harvest?</b>	<b>Yes or No</b>
<b>if yes, how do you dry it?</b>	<b>On the ground; Artificial heating; Other methods</b>
<b>Where/ how do you normally store your corn?</b>	<b>metal bins; loose in sheds; in bags; other</b>
<b>Average time period of storage (months)</b>	
<b>During storage do you -</b>	<b>store with husk; store without husk</b>
<b>Do you ever have problems with fungal growth before or after harvest? Black fungal growth on the tip of the corn (aflatoxin growth)</b>	
<b>How do you transport your harvest to from storage to market?</b>	
<b>Which of the following have you tried to find information on?</b>	<b>Fertilizer use; recommended seed variety; Soil conservation methods; Planting methods; Pricing information; Places to sell produce</b>
<b>Which of the following were you successful in finding information on?</b>	<b>Fertilizer use; recommended seed variety; Soil conservation methods; Planting methods; Pricing information; Places to sell produce</b>

<b>Which of these sources of information do you trust?</b>	<b>Gov't extension services, NGOs; Traders; Millers; ; Newspapers; Radio; Farmer co-ops; Neighbor; Village leader; Agro-chemical experts</b>
<b>What three things do you aspire to achieve in your life?</b>	<b>Expand my farming activities; Buy own farm equipment; Have a modern home; Educate Children; Off-farm business/employment; Own transportation; own milling machine</b>
<b>Interviewer to answer: Were there any special circumstances about this interview?</b>	
<b>Do you have a smart phone? If yes, do you use it to access information? How?</b>	

**Appendix D: Mill Survey**

<b>How many years has the mill been in operation?</b>
<b>How many employees do you have?</b>
<b>How many of these employees are women?</b>
<b>What is the monthly processing capacity of the mill? (Tons?)</b>
<b>How many different corn varieties come to the mill?</b>
<b>What percentage of each variety of products is produced from corn? (Feed, Flour, Meal, Grits)</b>
<b>Do you have other customers for your grits product?</b>

<b>How do you assess the quality of the incoming corn? Who sets these quality standards- internally, or the customer?</b>
<b>What is the best corn variety for the milling process?</b>
<b>What characteristics of corn determine the best type to mill? What qualities does this corn have that makes it ideal?</b>
<b>How do you communicate quality requirements to Mandi traders?</b>
<b>What are the grounds for the grounds for grain from the Mandi being rejected? What percentage of grain has been rejected in the last year?</b>
<b>What are biggest costs of operating? How much are your annual expenses?</b>
<b>What are your annual revenues?</b>
<b>From how far away do you source?</b>
<b>Do you own the trucks that transport the corn? Where does the product go from here? How do you store your grain prior to processing?</b>
<b>How do you store your grain prior to processing? Do you utilize private or government owned warehouses for storage? Why?</b>
<b>Tell us about your supply network. Does it vary based on climate, demand, the number of farmers, and traders?</b>