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# LINKING SMALL-SCALE VEGETABLE FARMERS TO SUPERMARKETS: EFFECTIVENESS ASSESSMENT OF THE GMED INDIA PROJECT

microREPORT #166

**FEBRUARY 2011**

This report was written by Elizabeth Dunn, Hannah Schiff and Lucy Creevey for ACDI/VOCA with funding from USAID under the Accelerated Microenterprise Advancement Project (AMAP) Knowledge and Practice II task order.

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# ATTACHMENTS

ATTACHMENT 1. Process Evaluation Interviews

ATTACHMENT 2. Enumerator's Manual

ATTACHMENT 3. Second-round Research Survey Questionnaire

ATTACHMENT 4. Codebook for Second-Round Research Data Entry

ATTACHMENT 5. IHD Final Report on Quantitative Findings

# ACRONYMS

APMC	Agricultural Produce Marketing Committee
GMED	Growth-oriented Microenterprise Development Project
ITC	Formerly Indian Tobacco Company
MSE	Micro and Small Enterprise
Rs	Indian Rupees

# GLOSSARY

**Cash and carry:** Small fresh produce retail outlet stores in urban areas established to specialize in high-quality produce, thus competing with other fresh produce retailers or grocery stores.

**Cluster:** For the purpose of this report, a group of farmers in relatively close proximity. The GMED project organized farmer clusters around demonstration plots or collection centers.

**Corporate buyer:** A large, private enterprise engaged in retail sales of fresh produce or other goods.

**Horizontal linkages:** Linkages between actors performing the same function in the value chain, e.g. a farmers' association.

**Lead farm:** Relatively larger plot where GMED installed demonstration plots.

**Lead farmer:** Farmer with a relatively larger plot of land who is elected by neighboring farmers (with smaller plots) to serve as a leader. In the GMED project, lead farmers were responsible for sharing GMED learning and technologies with 12 to 15 neighboring farmers.

**Lead firm:** In the GMED project, a buyer who works with farmers to upgrade their production, including productivity and quality, and then in turn purchase products directly from the farmer.

**Mandi:** State-run wholesale markets for agricultural produce.

**Organized retail:** Retailing undertaken by formal, licensed operators who are registered for sales tax, income tax, etc., including corporate-backed hypermarkets and retail chains, as well as privately owned large retail businesses. Unorganized retailing, on the other hand, refers to the traditional formats of low-cost retailing, for example, the local *kirana* shops, owner-operated general stores, push cart and roadside vendors, etc.

**Outgrower:** In the context of the GMED project, the term “outgrower” is used to refer to farmers who were trained by lead farmers.

**Process upgrading:** Improvements that increase the efficiency of production either through better organization of the production process or the use of improved technology.

**Product upgrading:** Improving product quality and increasing value for consumers. Product upgrading usually stems from changes in customer preferences, or the desire for higher value added, higher quality, and consequently more profitable products for small and medium businesses or smallholder farmers.

**Program model:** A generic plan for a set of activities designed to achieve specific objectives. The economic development program model on which GMED is based seeks to facilitate the linking of small-scale farmers into competitive value chains through 1) technical assistance for upgrading and 2) building mutually beneficial vertical relationships that link small-scale farmers to corporate buyers.

**Rytu bazaar:** A farmers' market in Hyderabad run by the Government of Andhra Pradesh for smallholder farmers.

**Shade net:** A structure covered with netting to improve crop production by protecting it from weather damage and moderating temperature.

**Vertical linkages:** Linkages between buyers and sellers at different levels of the value chain.

# ACKNOWLEDGEMENTS

The authors wish to acknowledge several individuals and organizations that contributed to this report. Dr. Rajendra Prasad Mangain and his team at the Institute for Human Development in India provided expert field management of the survey data collection, data entry and preliminary analysis. Claire Simon contributed to data cleaning and the University of Florida Statistical Consulting Unit completed the longitudinal data analysis. Jack Croucher conducted the qualitative fieldwork and Dr. Gary Woller directed the baseline survey. The authors also wish to thank Dr. Jeanne Downing of USAID and Ruth Campbell of ACIDI/VOCA for their excellent guidance, review and editing.

# EXECUTIVE SUMMARY

## PROJECT CONTEXT

The fresh vegetable component of the India GMED project is representative of many similar programs that seek to link small-scale farmers to competitive value chains. To integrate small-scale farmers into competitive value chains, GMED followed a two-pronged approach that included, first, technical assistance to facilitate farmer upgrading and, second, the establishment of mutually beneficial vertical relationships linking small-scale farmers to corporate buyers, in this case domestic supermarket chains.

The fresh vegetables value chain in India is dominated by small-scale farmers cultivating an average of 1.3 hectares. Traditionally, farmers have sold their produce through government-regulated wholesale markets (*mandis*), which were established under the Agricultural Produce Marketing Committee Act (APMC) of 1966. Beginning in 2006, some Indian states began to relax APMC regulations, thus opening the door for direct contact between farmers and corporate buyers. This was a key development for the design and implementation of the GMED project, since the fresh vegetable component aimed to establish direct commercial relationships between small-scale vegetable farmers and corporate supermarkets in the growing organized retail sector.

Developing and strengthening new vertical linkages was a crucial program element. Due to the historic influence of the mandi system, there were few direct linkages between producers and retailers. Under the mandi system, supermarkets had little control over the quality, reliability or variety of produce they could procure. Thus, as APMC restrictions were relaxed, supermarkets had an incentive to invest in direct linkages with producers. Small-scale vegetable farmers also had an incentive, so long as they could expect to obtain a higher price and a more reliable market for their production.

The evaluation was conducted in four geographic regions (clusters): Medak cluster in Andhra Pradesh, Pune and Kolhapur clusters in Maharashtra and Malerkotla cluster in Punjab. In three of the clusters (Medak, Pune and Malerkotla) GMED activities were conducted in collaboration with ITC, an Indian conglomerate operating a chain of supermarkets. In the fourth cluster (Kolhapur), GMED collaborated with Foodland, another supermarket chain, and Nandani Cooperative, a large farmer's cooperative.

The value chain experienced dynamic change over the course of the four-year study. In the beginning, during 2006, contract farming in some regions was just becoming possible due to changes in the APMC. During 2007 and early 2008, the demand for quality fresh produce in domestic supermarkets was strong and retailers were planning rapid expansion of their operations. Then, in late 2008, corporate expansion plans were placed on hold as the Indian economy responded to global recession. By the time the final data were collected in 2009, some of the existing retail outlets had been closed and contact had ended between farmers and corporate buyers in some areas.

## METHODS AND FINDINGS

This document reports the findings from an effectiveness assessment of the GMED project based on a mixed-method approach. The evaluation examined project outputs, outcomes and impacts by means of four major research components: 1) an evaluability assessment in 2006 to define the causal model and design the evaluation; 2) a longitudinal, quasi-experimental survey, in which 712 farmers in treatment and control villages were interviewed in 2007 and 2009; 3) a process evaluation to assess the implementation history of the project; and 4) a qualitative field study to understand the pathways by which change occurred.

The mixed-method approach provides insights that reach beyond measuring the magnitude of change to reveal features of the dynamic contexts in which private sector development programs operate. The results of the quantitative component, analyzed as a 2X4 factorial arrangement of treatments, provide information on changes in outcome and impact variables over time. The qualitative component provides insights on the causal links connecting project activities, outputs, outcomes and impacts. It also illuminates the statistical findings from the perspectives of program beneficiaries and partners. The process evaluation helps researchers and practitioners understand how program activities and outputs were delivered over time and how the implementation path could affect project effectiveness.

The findings indicate that the project was largely successful in achieving the outcome of increased farmer awareness of process and product upgrading. By 2009, the project had promoted improved cultivation techniques to a total of 2,666 farmers. Farmers in the treatment villages were more familiar with the production and post-harvest improvements promulgated by the GMED project than farmers in the control villages. In addition, the percentage of farmers who were aware of the new practices was highest in those clusters where the GMED project operated for the longest time (see table below).

The assessment results confirm the efficacy of the farmer-to-farmer approach as a mechanism for widespread diffusion of upgrading information throughout a local area. Mr. S. R. explained his work as a lead farmer working with his neighbors in the village of Anna Sagar, of the Medak cluster:

“As a lead farmer I give suggestions to the fellow farmers on how to buy good quality seeds, fertilizers, manure, etc. How and when to harvest the crop to get a good price from ITC... giving fellow farmers [suggestions] about which crop to be sown in which season to get better yield... how to improve their crop to produce better grade”.

While the qualitative interviews provide details on the nature of the interactions between lead farmers and extension workers, the survey results show, by contrast, that there was limited direct contact between average farmers and extension workers. Moreover, farmer participation in formal training courses was uncommon. Instead, the survey results indicate that farmers rely primarily on neighbors, family and friends—including neighboring lead farmers—for information about upgrading.

The table below shows the rates at which households were aware of and adopted techniques introduced by the project. It also shows the percentage of adopters who reported that the techniques were useful. The demonstrations of new technologies for vegetable cultivation provided many farmers with the opportunity to increase productivity. This was substantiated by Mr. S. R., the same lead farmer from Medak cluster:

“We are using tractor for plowing our field in very few hours. Rest of time we spend in our productive works. The quality of the products has improved a lot since we are aware of the modern techniques. We are happy with the timely suggestions of the ITC people.”

The success of the GMED project in facilitating sustained vertical linkages between small-scale farmers and corporate buyers was limited to the Medak cluster. Factors limiting success in the other three clusters included the global economic recession, changes in state regulations affecting the business environment and changes in the business strategies of the lead firms on which the project depended. These same factors contributed to significant declines in the number of farmers selling vegetables and the value of farmers’ vegetable revenues between 2007 and 2009. While these declines were experienced by all groups, there were some large differences between the treatment and control groups and between clusters. Farmers in the treatment villages reported vegetable sales at twice the rate of control group farmers (61 percent compared to 32 percent,  $p \leq .0001$ ). Differences between clusters were also significant ( $p \leq .0001$ ). Coming out on top were the Medak farmers, with two-thirds of them still selling vegetables in 2009.



**Awareness, Adoption and Evaluation of New Production Practices**

	<b>Upgraded Production Practices</b>					
	<b>On-Farm Grading</b>	<b>Drip Irrigation</b>	<b>Fertigation</b>	<b>Crops Under Shade Nets</b>	<b>Mulching Paper</b>	<b>Seed-Tray Nurseries</b>
<b>Awareness</b> (n=712)						
Number (%) of farmers aware of practice	564 (79%)	598 (84%)	492 (69%)	445 (63%)	374 (53%)	486 (68%)
Differences by cluster	higher in Medak (p≤.0001)	higher in Medak and Pune (p≤.0001)	higher in Pune and Kolhapur (p≤.0001)	lower in Malerkotla (p≤.0001)	higher in Medak (p≤.0001)	higher in Medak (p≤.001)
Differences by household type	marg. higher in treatment group (p≤.10)	higher in treatment group (p≤.01)	higher in treatment group (p≤.01)	higher in treatment group (p≤.001)	higher in treatment group (p≤.0001)	higher in treatment group (p≤.001)
<b>Adoption</b> (n=712)						
Number (%) of farmers adopted practice	293 (41%)	225 (32%)	177 (25%)	88 (12%)	88 (12%)	87 (12%)
Differences by cluster	higher in Medak (p≤.0001)	higher in Medak (p≤.0001)	higher in Medak (p≤.05)	higher in Medak (p≤.0001)	higher in Medak (p≤.0001)	higher in Medak (p≤.001)
Differences by household type	Ns	ns	ns	ns	ns	ns
<b>Usefulness</b> (n=number of adopters)						
Number (%) of adopters saying practice is useful	251 (85%)	169 (75%)	137 (77%)	37 (42%)	37 (42%)	86 (99%)
Differences by cluster	52% in Medak (p≤.0001)	34% in Medak (p≤.0001)	20% in Medak (p≤.0001)	4% in Medak (p≤.0001)	7% in Medak (p≤.0001)	ns
Differences by household type	Ns	ns	ns	ns	ns	ns

Abbreviations: ns=differences are not statistically significant

## LESSONS LEARNED

- *Farmers can readily learn upgraded practices from other farmers, but well-qualified technical and extension personnel are needed to initiate the learning process.* The GMED project provided on-the-ground development of new technologies and extensive collaboration with lead farmers on numerous demonstration farms. It was generally successful at spreading information about technical innovations and improved cultivation and post-harvest practices. The use of demonstration farms, along with careful development of technical packages and effective training of extension personnel, were the catalysts that made farmer-to-farmer spread of information possible.
- *The establishment of sustained vertical relationships is a vital mechanism driving effectiveness.* Where vertical relationships were established and sustained, as in the Medak cluster, there were positive outcomes in terms of farmer adoption of upgraded practices. Strong vertical linkages proved to be essential for eliciting an upgrading response from farmers. Where these linkages did not materialize or could not be sustained, such positive outcomes were not observed. Awareness of improved production practices is a necessary precursor to upgrading, but linkages to higher value markets must be in place to provide farmers with enough economic incentives to invest in upgrading their production and post-harvest practices. Despite popular perception that Indian supermarkets were sourcing from small-scale farmers, the survey results indicate very low market penetration by corporate buyers in the areas surveyed in 2009.
- *Even temporary exposure to new types of governance can provoke widespread shifts in business practices.* The evaluation revealed an unanticipated but important benefit for small-scale vegetable farmers: even the temporary presence of corporate buyers with transparent purchasing practices was enough to transform trading practices in the mandis. Transparent linkages between farmers and corporate buyers, even when they were not sustained, broadened farmers' marketing experiences and altered farmer expectations. Mandi traders became aware that vegetable farmers' marketing options were beginning to expand, giving farmers new choices about where to sell and at what price. This loosened the perceived monopsony power of the mandis and, in many instances, had a moderating effect on their dealings with farmers. The potential impact of this change is significant, since the survey confirmed that mandis are the most often used market outlet for small-scale vegetable farmers.
- *Changes in the business and enabling environment are key factors related to project effectiveness.* The change in the APMC regulations was a prerequisite for GMED's two-pronged intervention in India's fresh vegetable value chain. In the Malerkotla cluster of Punjab, regional implementation of the APMC tax at first favored direct transactions between small-scale farmers and supermarkets. An unanticipated change in the interpretation of the APMC regulation reduced the profitability of these transactions, which precipitated the closing of ITC's direct procurement operations in the Punjab.
- *Value chain development projects need effective mechanisms to manage the inherent risks of the facilitation approach.* While the reliance on lead firms to serve as catalysts for change is one of the strengths of the value chain development approach, it also creates risks due to the fact that project implementers lack control over factors critical to project success. For example, GMED project outcomes related to new market relationships were significantly limited due to global economic events, changes in the business and enabling environment and business decisions made by lead firms. The global recession and contraction of the Indian supermarket industry dampened anticipated growth in the number of supermarkets and, subsequently, reduced the volume of transactions between small-scale farmers and corporate buyers. The global recession precipitated ITC's withdrawal from Pune and may have contributed to the breakdown of negotiations between Foodland and Nandani Cooperative in Kolhapur.

In summary, based on combined statistical, qualitative, and archival evidence, the program model represented by the GMED project has been shown to be effective in spreading awareness of technologies for process and product upgrading. In the one region where vertical relationships between small-scale farmers and corporate buyers were established and maintained, farmers readily adopted the upgraded practices and benefited from integration into the value chain. However, conditions in the global market and enabling environment constrained project effectiveness and prevented the market linkages component from reaching anticipated scale. Moreover, project effectiveness was limited by business decisions that GMED could not control. If these inherent risks can be managed effectively, then the general program approach represented by the GMED project offers a potentially effective way to integrate small-scale farmers into competitive value chains and facilitate economic growth and the generation of wealth in low-income communities.

# I. INTRODUCTION

## A. OVERVIEW

Among the new generation of private sector development programs, there are several programs that seek to link small-scale farmers to competitive value chains.<sup>1</sup> The fresh vegetable component of the India GMED project is representative of many of these types of programs, which work to stimulate new market relationships and improve product quality in order to facilitate the development of competitive value chains, enhance economic growth and generate wealth in low-income communities.

In order to better understand the broad program model represented by the GMED project, this evaluation follows an effectiveness assessment approach. It considers the full causal chain linking project implementation activities to the immediate changes experienced by small-scale farmers and to long-run impacts on these farmers and the fresh vegetable value chain. This study is part of a broader research initiative—the Private Sector Development Impact Assessment Initiative (PSD IAI)—that seeks not only to evaluate the new generation of private sector development projects but also to improve evaluation tools and methods.<sup>2</sup>

## B. EVALUATION APPROACH

The purpose of the evaluation was to assess the effectiveness of the general program model represented by the fresh vegetable component of the GMED project. This program model seeks to facilitate the linking of small-scale farmers into competitive value chains through 1) technical assistance for upgrading and 2) building mutually beneficial vertical relationships that link small-scale farmers to corporate buyers, in this case domestic supermarket chains.

A mixed method approach was used to evaluate the outputs, outcomes and impacts of the GMED project. This evaluation approach encompassed four major components:<sup>3</sup>

1. An **evaluability assessment** to define the causal model for the project and shape the design of the effectiveness assessment. The evaluability assessment was conducted in July 2005.
2. A **longitudinal survey** to measure the magnitude of project outcomes and the size and direction of project impacts. The first round of the survey was conducted in the first quarter of 2007 and the second round was conducted two years later, in the first quarter of 2009.
3. A **process evaluation** to assess project outputs and determine how project interventions were implemented over time, in each location and under what contextual circumstances. The process evaluation was conducted in the fall of 2008.

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<sup>1</sup> Examples include Kenya BDS (EMG); B-ACE Philippines (SDC Asia); Wal-Mart supply chain, Honduras (Fintrac); TIPCEE, Ghana (Chemonics); Kenya Maize (ACDI/VOCA); and PROFIT Zambia (NCBA/EMG). These projects follow variations of a similar basic model, while emphasizing different parts of the value chain.

<sup>2</sup> For more information on the effectiveness assessment approach and the Private Sector Development Impact Assessment Initiative, the reader is referred to AMAP Report “Assessing the Effectiveness of Economic Growth Programs” (May 2010).

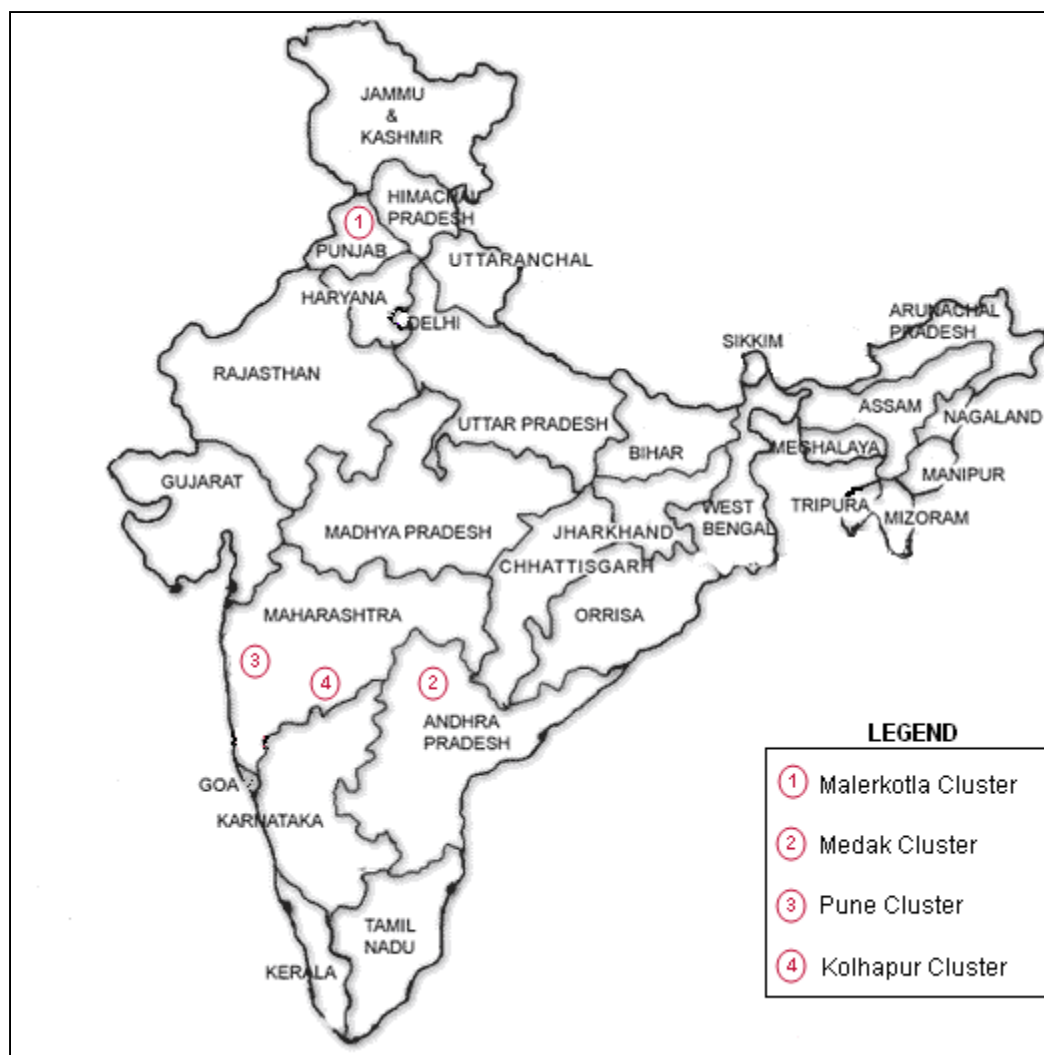
<sup>3</sup> The methods used in each of these evaluation components are described in more detail in appendix A. Data collection instruments, field manuals and interim reports are available as attachments to this report.

4. A **qualitative field study** to unveil the processes linking outputs, outcomes and impacts and to examine alternative causal explanations for the observed changes.

The evaluation was conducted in four geographic areas, otherwise referred to as *clusters*. The names and locations of the four clusters are indicated in figure 1:

1. Malerkotla Cluster in Punjab,
2. Medak Cluster in Andhra Pradesh,
3. Pune Cluster in Maharashtra and
4. Kolhapur Cluster in Maharashtra.

**Figure 1. Map of GMED Clusters for Fresh Vegetable Interventions**



In three of the clusters (Medak, Pune and Malerkotla) GMED activities were conducted in collaboration with ITC, an Indian conglomerate operating a chain of supermarkets. In the fourth cluster (Kolhapur), GMED collaborated with Foodland, another supermarket chain, and Nandani Cooperative, a large farmer’s cooperative. Within each cluster, the study includes villages where the GMED project was active (treatment villages) and similar villages in the same region

but not directly subject to GMED activities (control villages). Table 1 lists the treatment and control villages within each cluster and indicates the number of respondents included in the panel survey for each area.

**Table 1. Distribution of Panel Sample by Cluster and Treatment Group**

State	Cluster	Treatment Villages	Control Villages
Andhra Pradesh	<b>Medak</b> (n=99)	Anna Sagar Nawabpet Cheersagar (n=67)	Karkapa (n=32)
Maharashtra	<b>Pune</b> (n=148)	Chas Kalawadi (n=86)	Bata Gharagaon (n=62)
Maharashtra	<b>Kolhapur</b> (n=387)	Nandani Kothali Shirdhan Udgaon (n=258)	Tung Bavachi (n=129)
Punjab	<b>Malerkotla</b> (n=78)	Diler Garh Jamal Pur Narika Khurd (n=49)	Narodi (n=29)
<b>Total Respondents</b>	<b>712</b>	<b>460</b>	<b>252</b>

### C. ORGANIZATION OF REPORT

The report begins with a description of the Indian fresh vegetable value chain as it existed in early 2007 at the time of the first survey. Section II also describes changes in the enabling environment and retail practices leading up to the study period. These changes contributed to the creation of a dynamic context for the GMED interventions. The description of the study context is followed, in section III, with a detailed examination of the GMED project, the implementation path it followed and the nature of the project interventions. These interventions, or project outputs, were designed to promote farmer upgrading and build new vertical relationships between small-scale farmers and the emerging supermarket industry. As is often the case in the implementation of private sector development projects, the outputs of the GMED project varied over time and location.

Section IV draws from both quantitative and qualitative information to examine the outcomes of the GMED project. The section begins with a brief demographic description of the farmers in the study, then reports changes observed during the study period, including changes related to learning and upgrading in farmers' production practices. Changes related to market relationships, vegetable revenue and the structure of the value chain are explored in section V, while the closing section summarizes the main conclusions and discusses the implications of the findings.

# II. INDIAN FRESH VEGETABLES: A VALUE CHAIN IN TRANSITION

## A. END MARKETS

A large population base and high consumption of fresh vegetables make the domestic market an attractive target for small-scale farmers in India. Food purchases represent an estimated 53 percent of consumption expenditures for Indian consumers, as compared to 9.7 percent for Americans and 15 percent for Japanese.<sup>4</sup> Also, although cold storage could improve the efficiency of even the domestic fresh vegetable value chain, the relatively simpler infrastructure and transportation needs make the domestic market more viable than export markets. The focus of the GMED project (and indeed, of most small-scale vegetable producers) is therefore the local markets, usually within the same state where production is based. The major end market channels domestically are individual consumers purchasing from roadside pushcart vendors or small retail shops, and larger institutions purchasing from wholesale mandis or other aggregators.

According to the president of operations for Reliance Fresh as quoted in 2008, “About 95 percent of India's retail sector is made up of small, family-run stores and the sector has not been tapped by big businesses.”<sup>5</sup> Reliance Fresh was among several grocery stores seeking to tap into this market with higher-value products sold in small supermarket-style stores (see more on this in Section B below). These retailers sought to stimulate a trend in consumer tastes toward higher-quality staple foods like grains and fresh vegetables. Along with this shift toward new store formats and higher-quality products, corporate retailers saw an opportunity to shift consumers toward branded foods. As noted above, Indian consumers spend a relatively large portion of their income on food, and much of it is unbranded. Reliance Fresh created the “Reliance Select” brand targeted at the increasingly large market segment of quality-conscious consumers in India’s sizeable middle class.

## B. RETAILING

Beginning in 2006, various Indian states began to relax the APMC regulations that restrict contract farming. This was a key development for the design and implementation of the GMED project, since its fresh fruit and vegetable component aimed to link small farmers directly with corporate buyers in the growing organized retail sector. Given this focus, the success of the program model and the lasting impacts of the project are dependent on changes in the organized retail sector in India. Trends in the global and domestic Indian retail sector translate into differences in the local market and in the quantities and qualities of produce corporate buyers purchase from small farmers. These trends also affect *how* major retailers buy produce—what payment and delivery mechanisms and intermediaries they use—which in turn affects how farmers market their produce.

In early 2008, the modern food retail industry in India was predicted to grow at 27 percent per year over the next three years.<sup>6</sup> This rapid growth rate never materialized, due in part to the global economic downturn beginning in October 2008. This food retail sector, which caters to the Indian middle class, is now predicted to grow at only 12-15 percent per year.<sup>7</sup> Before the downturn, Food Bazaar—one of the more successful modern Indian retail chains—

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<sup>4</sup> [http://www.london.edu/assets/documents/facultyandresearch/Reliance\\_Fresh.pdf](http://www.london.edu/assets/documents/facultyandresearch/Reliance_Fresh.pdf), p 3

<sup>5</sup> [http://www.london.edu/assets/documents/facultyandresearch/Reliance\\_Fresh.pdf](http://www.london.edu/assets/documents/facultyandresearch/Reliance_Fresh.pdf), p 2

<sup>6</sup> Final Report: Market Assessment and Business Model Evaluation, Accenture, 2008

<sup>7</sup> “Fresh Fruits and Vegetables Sector in India” S. Venkatraman, Rabo India Finance, April 2009

expected to have 350 stores by 2009. They currently have 155. Spencer's, another major chain, had 450 stores in April 2008 and planned to have 2,000 open in 2009.<sup>8</sup> As of April 2009, Spencer's operated only 250 stores.<sup>9</sup>

Although the downturn clearly had an adverse affect on corporate food retailers—causing many to scale back operations and a few to close entirely—people in the industry continue to believe that modern retail will eventually be a major part of fresh produce retailing in India. At the Fresh Produce India Conference in April 2009, industry leaders acknowledged that their expectations for expansion may have been too high and that they were struggling through the start-up period. On a more positive note, some saw the economic downturn as an opportunity to focus on improving quality and efficiency and to determine the most appropriate roles for intermediaries and service providers.

Although retailers are still planning to expand and remain interested in sourcing from small farmers, the uncertainty and supermarket contraction has already affected farmers. At the ground level, this unfortunate turn of events appears to be broken promises from corporate buyers and other outsiders. Farmers expected to reap a higher return from retailers on a regular basis as a result of the improvements made in quality and efficiency and adopting GMED-promoted technologies. Some farmers saw the retailers initially come in and begin to build mutually beneficial, long-term relationships, and then discontinue these relationships when they closed the retail outlets in the area. In other cases, the planned stores have not opened, so the expected buyer never arrived.

### **C. WHOLESALING: THE MANDI SYSTEM**

India's traditional system of agricultural trading involves large numbers of small-scale farmers selling to various types of intermediaries through the government-mandated wholesale system. The Agricultural Produce Marketing Committee Act (APMC) was enacted in 1966 by the Indian government as an attempt to ensure that small-scale producers received a fair price for their produce. The act requires that agricultural produce be sold only through government-regulated markets, called *mandis*. In effect, it prevents farmers from legally engaging in contracts directly with buyers and imposes substantial taxes on buyers purchasing through the mandis.

Lack of regulation and oversight by the government has reduced transparency in the system. Collusion and price-setting have become common practice among the profusion of traders and agents, in turn clouding price discovery and obscuring incentives for farm-level upgrading. According to a study conducted by the World Bank in 2006, it is common in India to have six or seven intermediaries between the farmer and the consumer, and although traders pay attention to quality and realize price differences, these premiums are not typically passed on to farmers.<sup>10</sup> In addition, most mandis lack adequate capacity in proper post-harvest handling and practices, wastage is high (up to 15 percent) and quality is not maintained. The World Bank study conducted in four states found the infrastructure and facilities in the mandis surveyed to be "limited and rudimentary." Less than 40 percent of the markets had a drying area, less than 20 percent had cold storage, and less than 10 percent of the shops in mandis had packing or fumigation equipment. Parking facilities were also limited.<sup>11</sup>

Mandis in Maharashtra generally had better infrastructure than the other states surveyed in the World Bank study (Uttar Pradesh, Orissa and Tamil Nadu), but the overall inadequacy of the market infrastructure was found to have a significant impact on the prices received by farmers. For tomatoes and potatoes, 3 percent of the value of the crops is estimated to be lost due to spoilage at the trader level. For mangoes, this figure reaches 10 percent of the value of the

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<sup>8</sup> Final Report: Market Assessment and Business Model Evaluation, Accenture, 2008

<sup>9</sup> Current store numbers were reported in conversation by company representatives at the Fresh Produce India Conference, April 2-3, 2009.

<sup>10</sup> India: Taking Agriculture to the Market. World Bank, 2006., p. 25

<sup>11</sup> India: Taking Agriculture to the Market. World Bank, 2006, p. 33



produce. As the study notes, “actual crop losses are likely to be higher as the traders tend to account only for losses from physical wastage and do not factor in price discounts on commodities as quality deteriorates in the market.”<sup>12</sup>

## D. PRODUCTION

The fresh fruit and vegetables value chain in India is dominated by small-scale farmers cultivating an average of 1.3 hectares.<sup>13</sup> There is generally a lack of organization among farmers and a lack of organized fresh produce supply chains, with deficiencies in grades and standards and cold storage infrastructure. Levels of mechanization in production are generally low, with most tasks done by hand.<sup>14</sup> The most common method of plowing is with oxen—typically hired. Soil testing is rare and fertilizers are frequently applied without knowledge of the proper measurements. During rainy months, production is rain-fed, and tube wells are used for irrigation in dry months. As is the case in agricultural value chains in so many developing countries, access to improved technologies for production and post-harvest handling is limited for small-scale producers of fresh fruits and vegetables in India. Combined with lack of cold storage and improper handling at mandis, the result is low quality and post-harvest losses of 30-40 percent.<sup>15</sup> Another key constraint in the value chain is a lack of transparent price discovery systems between farmers and the various end markets in which their produce is sold. Other supporting markets required to improve the quality of small-scale production, such as technical extension services and financial services, are also weak or not tailored to meet needs of the smallholders.

Small-scale producers typically grow local, traditional varieties of vegetables to sell to intermediaries at the local level, including traders, agents or brokers in the state-run wholesale markets (*mandis*). Wholesalers from the mandi supply pushcart vendors and small retail shops, as well as supermarket-type organized retail stores. Larger commercial farmers also sell through the mandi system, and, where permitted, directly to the growing organized retail sector. The India Retail Report 2007 estimated that organized retail<sup>16</sup> made up 4.6 percent of the retail market in India, or \$12.4 billion out of \$270 billion in total retail.<sup>17</sup>

The basic structure of the value chain, as observed in 2007, is depicted in figure 2. Just prior to the time of the project intervention, lack of efficient aggregation of small-scale production, government regulations regarding marketing of agriculture produce and low quality of small-scale production prevented the large organized retailers from sourcing from small-scale farmers. The fresh vegetable component of the GMED project was implemented just as new market channels were opening to directly link small-scale vegetable farmers to organized retail markets within India.

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<sup>12</sup> India: Taking Agriculture to the Market. World Bank, 2006, p. 36

<sup>13</sup> <http://www.highbeam.com/doc/1G1-172191046.html>

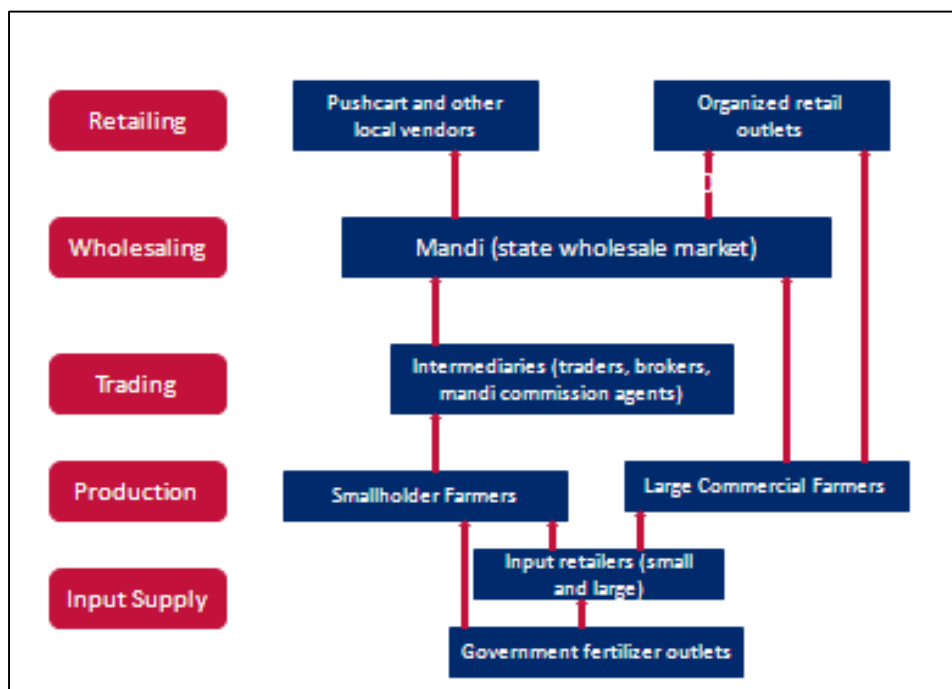
<sup>14</sup> See the GMED Baseline Research Report for more information:  
[http://www.microlinks.org/ev\\_en.php?ID=24762\\_201&ID2=DO\\_TOPIC](http://www.microlinks.org/ev_en.php?ID=24762_201&ID2=DO_TOPIC)

<sup>15</sup> GMED Final Report

<sup>16</sup> Organized retailing is defined as retailing undertaken by formal, licensed operators who are registered for sales tax, income tax, etc., including corporate-backed hypermarkets and retail chains, as well as privately owned large retail businesses. Unorganized retailing, on the other hand, refers to the traditional low-cost retailing, for example, the local *kirana* shops, owner-operated general stores, push cart and roadside vendors, etc.

<sup>17</sup> <http://www.indiaretailing.com/retail-report.asp>

Figure 2. Simplified Indian Fresh Vegetable Value Chain Map



## E. INPUT SUPPLY

Access to irrigation equipment and high-quality inputs has long been a major constraint for small-scale farmers in India. Flood irrigation is the most common method of irrigation for majority of farmers in India for all crops. Drip irrigation technology has been available since at least 1989, but the benefits of this technology were confined to a very small informed group of large farmers only in selected states of western and southern parts of India. The cost of establishing a complete drip irrigation system for one acre of land at current prices is approximately \$1,000-\$1,200. State governments provide subsidy for up to 50-60 percent of the total cost of the equipment. The technology needed modifications to suit the budget and plot size of small farmers in India.

In the GMED program areas, mandi traders represented a major source of inputs for small-scale vegetable farmers. The traders sold low-quality inputs such as old, non-hybrid seeds, fertilizers containing up to 25 percent sand, and adulterated pesticides. In addition, they provided production financing at rates of up to 65 percent.<sup>18</sup> Inputs could also be bought from small input retailers in villages (in cases where farmers are close enough to villages). Subsidized fertilizer could be purchased at government fertilizer outlets, though much of it is sold to larger farmers and traders who resell it, rather than to individual smallholder farmers. Several large input supply companies, such as Syngenta and Jain, also existed, but served primarily larger commercial farmers.

<sup>18</sup> Zeb Jones, GMED Final Report, p. 5

# III. LINKING SMALLHOLDERS TO CORPORATE BUYERS: THE GMED INDIA PROJECT

## A. GMED PROGRAM OVERVIEW

The Growth-Oriented Microenterprise Development program (GMED) was designed to develop sustainable and scalable approaches to job creation by fostering the growth of micro- and small enterprises (MSEs). In its two main components, agribusiness and urban services, GMED provided technical assistance to MSEs by strengthening their capacity, developing business support services and linking them to higher-value markets. In the agribusiness component, embedded services were the primary service delivery mechanism. GMED sought to enter into partnerships with large firms and help them establish long-term commercial relationships with MSEs. GMED acted as a technical advisor to these partner firms and organizations in order to expand the scope and effectiveness of the embedded services and ensure proportionate benefits for the MSE service recipients. The urban services component utilized advisory services to municipal governments as the primary tool for improving solid waste management through outsourcing to MSEs. The urban services component exceeded all of its targets in 2007 and was deemed sustainable by the project staff and the USAID mission. The World Bank adopted the approach used in the GMED urban services component and continued to apply it in further municipalities using the materials and templates developed by the project. The component was ended at that time.

The agribusiness component originally planned to work in broilers, organic produce and fresh fruits and vegetables. Shortly after project start-up, the staff determined that their interventions were neither desired nor needed in the broiler industry. The organic foods subcomponent also closed at the end of 2007 when it was determined that the domestic market was not yet ready for large-scale provision of organically certified food. On the basis of the rapid growth in organized retail, the GMED team decided to apply the remaining program resources to introduce small-scale vegetable farmers to this growing market channel, where returns to investment had been higher. For this reason and because of the applicability of the experience in this subcomponent to future value chain programming, the second round of this evaluation focused solely on the fresh vegetable component of GMED.

## B. THE FRESH VEGETABLES COMPONENT<sup>19</sup>

### I. DEVELOPING AND STRENGTHENING NEW VERTICAL LINKAGES

Developing and strengthening new vertical linkages was a crucial program element, given the aim of linking small-scale farmers to the growing organized retail sector. Due to the historic influence of the government-mandated wholesale system (mandis), no direct linkages existed between producers and retailers. As noted earlier, the mandi system allowed supermarkets little control over the quality, reliability or variety of produce they could procure. Thus, supermarkets had an incentive to invest in direct linkages with producers. If producers could obtain a higher price and a more reliable market for their produce, they also had an incentive.

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<sup>19</sup> GMED also conducted activities to support fresh vegetable producers in the Kamlapur cluster in Maharashtra state, but this cluster was not included in the evaluation for several reasons: 1) the study already included two clusters in Maharashtra state; 2) activities in Kamlapur were not fully defined at the time the baseline research was conducted. 3) the project was financed separately, under a PRIME grant, and 4) the focus was to benefit communities affected by HIV/AIDS. The activities in Kamlapur consisted of technical assistance provided directly by GMED without a market linkage to a specific corporate partner. The Kamlapur area is near enough to Nandani that the farmers may have benefitted from GMED interventions with Nandani Cooperative.

GMED attempted to establish such linkages through a “lead farmer” model. Farmers with larger plots of land were elected by neighboring farmers to serve as leaders who would be responsible for sharing GMED learning and technologies with 12 to 15 farmers. GMED worked with ITC<sup>20</sup>, a large private company, to set up clusters of lead farmers and other participating farmers in the states of Punjab, Andhra Pradesh and Maharashtra. ITC hired extension agents, constructed cluster-level collection stations and helped install demonstration plots on the lead farms. The provision of extension services by the buyer was a way of strengthening the relationship and building farmer loyalty while providing important technical information.

GMED also worked with the Nandani Cooperative, a 5,400-member fresh fruit and vegetable cooperative in Maharashtra. Despite the incentives for doing so, managing procurement from large numbers of small-scale farmers is not typically among the core competencies of large supermarkets, and many would prefer not to handle large numbers of small transactions. Thus GMED intended to upgrade the capabilities of the cooperative to meet the requirements of organized retail and connect it with a large Indian wholesale and retail food distributor.

## **2. FOSTERING PROCESS AND PRODUCT UPGRADING**

GMED fostered upgrading of production processes and product quality through demonstrating new technologies and by training retailers’ extension agents to provide advice and training to farmers as an embedded service. The project’s interventions in this area also included technical assistance on improved production and post-harvest practices. GMED introduced simple technologies and practices including soil and water testing, seed-tray nurseries, shade netting, raised beds with plastic mulching, staking of vine plants and implements to ensure uniform planting depth and spacing and proper field preparation. GMED also introduced drip irrigation and fertigation (application of fertilizers in the irrigation water). The technologies were aimed at reducing losses and improving quality via improved inputs and handling.

## **3. CAUSAL MODEL FOR THE FRESH VEGETABLE COMPONENT**

The basic logic underlying the fresh vegetables component of the GMED project was that a combination of technical assistance at the farm level and facilitation of market linkages would ultimately result in increased sector competitiveness and reduced poverty. The desired impacts would be achieved by enabling farmers to increase their quality and efficiency to a point where higher-value markets (organized retailers) would consistently purchase their produce. This would not only result in increased incomes in the near term, but would also fundamentally shift the rules of the game by giving farmers a viable alternative market to the badly organized and often exploitative mandi. A simplified version of the causal model developed by the project implementers and research design team is provided in table 2.

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<sup>20</sup> ITC Limited is an Indian conglomerate with annual revenue of \$6 billion. The company began in 1910 as the Imperial Tobacco Company and has since diversified into a range of sectors, including packaging, paper goods, personal care, cigarettes, information technology, and agribusiness.

**Table 2. Causal Model for GMED Fresh Vegetable Component**

Activities	Outputs	Outcomes	Impacts
<p>Train extension workers to assist small-scale farmers in improving product quality and post-harvest handling processes.</p> <p>Facilitate small-scale farmer access to embedded extension and training services from corporate buyers</p>	<p>Training materials developed</p> <p>Demonstration plots established</p> <p>Farmers trained in new production technologies, quality standards and post-harvest processes</p>	<p>Farmers adopt new techniques and varieties</p> <p>Increased productivity</p> <p>Increased product quality</p> <p>Increased investment in productive inputs</p> <p>Reduced post-harvest losses</p>	<p><u>Value Chain Level</u></p> <p>Increased small farmer participation in domestic market for higher value vegetables</p> <p>Increased value chain competitiveness</p> <p><u>Firm Level</u></p> <p>Increased profits from vegetables</p> <p><u>Household Level</u></p> <p>Increased household income and assets</p> <p>Improved housing conditions and access to basic services</p> <p>Reduced poverty</p>
<p>Facilitate formal and informal commitment between small-scale vegetable farmers and corporate buyers</p> <p>Develop and establish systems for reducing the costs and risks of incorporating small-scale farmers into organized retail supply chains</p>	<p>Memoranda of understanding signed with corporate buyers</p> <p>Commitments made by farmers, farmers' groups, and buyers to implement new business models linking farmers to corporate buyers</p>	<p>Corporate buyers establish new collection centers and retail outlets</p> <p>Increased sales from small-scale farmers to corporate buyers</p> <p>Strengthened business relationships between small-scale farmers and corporate buyers</p>	<p>Increased household income and assets</p> <p>Improved housing conditions and access to basic services</p> <p>Reduced poverty</p>

### C. PROJECT OUTPUTS

This section describes the direct outputs of the project. There were outputs from activities related to vertical linkages and outputs from activities related to upgrading. There were some differences across clusters in the implementation of the project. For example, while demonstration plots were established in all four clusters, cash and carry outlets were only opened in three of the four clusters. Table 3 provides a listing of seven main project outputs and indicates how these were distributed across the four geographic clusters.

**Table 3. Interventions to Promote Upgrading and Vertical Linkages, by Cluster**

Clusters	Interventions						
	Training in seed production and use	Training in fertilization and pest control techniques	Training in post-harvest management	Seed nurseries established	Demonstration plots established	Collection centers established	Cash and carry outlets established
Medak				✓	✓	✓	✓
Pune					✓	✓	✓
Kolhapur		✓	✓	✓	✓		
Malerkotla	✓	✓	✓		✓	✓	✓

## **I. ACTIVITIES TO CREATE AND STRENGTHEN VERTICAL LINKAGES**

At the time that the assessment was planned and launched, GMED had signed a memorandum of understanding with a single lead firm, ITC. After the baseline research was conducted, GMED also worked with a variety of other lead firms and implementing partners. In the Buyer-Farmer model, the lead firm is a buyer who works with farmers to upgrade their production, including productivity and quality, and then in turn purchases products directly from the farmer. In the Buyer-Intermediary-Farmer model, the lead firm is a buyer who works through farmer groups or farmer associations, who act as the intermediary between the farmer and the lead firm. ITC used the Buyer-Farmer model of working with farmers. The basic plan was for ITC to select farmers living and working in the treatment areas that possessed certain characteristics and group them into clusters. ITC would provide extension services to the selected farmers (e.g., training, demonstration plots) via a network of extension agents and lead farmers. Next, ITC would purchase the vegetables from the cluster farmers to sell through their “cash and carry” wholesale outlets. (The initial plan was to sell through wholesale, not retail outlets.) ITC planned to eventually source from 20,000 farmers in the selected areas. GMED, in turn, would provide technical assistance in organizing the farmer clusters. GMED was expected to provide one technical expert per ITC cluster, for a total of three.

ITC adopted a non-binding agreement with their fresh fruit and vegetable suppliers, dubbing this system “contact” farming rather than contract farming, since it did not obligate farmers to sell their produce to ITC. The decision to make agreements non-binding was due in part due to the difficulty of enforcing contracts in India, but it also encouraged ITC and its suppliers to develop a relationship of trust and loyalty on the basis of transparency and reliability rather than a legal arrangement. This loyalty became the key to explaining the endurance of the vertical linkage when Reliance Fresh, another large retailer, offered a higher price to farmers; ITC was apparently able to retain their supplier base at lower prices because they offered other embedded services, such as technical extension. Initially, ITC bought all grades of produce supplied by the farmers organized by GMED, but after two seasons phased out their purchase of Grade C produce. The GMED representative interviewed noted that although farmers were resistant to this change at first, lead farmers were able to aggregate the unwanted Grade C produce and sell it to the mandi.

Another lead firm with which the GMED project partnered was Foodland, an Indian supermarket chain. Whereas ITC used the Buyer-Farmer model described above, Foodland used the Buyer-Intermediary-Farmer model with the 5,400-member Nandani Cooperative in the Nandani district of Maharashtra State as the intermediary. Members of the cooperative faced difficulty in meeting the demand of the Mumbai market because of the 7-hour transport time and lack of refrigerated transport. Foodland was interested in sourcing directly from production zones and utilizing the transport logistics arm of the parent company (Radhakrishna Group) to preserve the quality of the fresh produce on its long journey. In 2007, GMED introduced Nandani to Foodland and a memorandum of understanding was signed between Foodland and GMED. The agreement stipulated that Foodland would purchase produce with specific requirements from Nandani Cooperative. All post-harvest activities up to the farm gate were to be handled by Nandani, using Nandani’s existing cold storage facilities. Foodland would transport the produce in refrigerated trucks. Foodland also agreed to supply their management/logistics expertise.

The respondent who had previously worked with Foodland noted that GMED staff “did their best in terms of bringing Foodland and Nandani together, providing the introduction of Nandani to Foodland, setting up demonstration plots, and helping Foodland understand Nandani’s management structure.” GMED continued to organize and facilitate meetings between the two parties to establish a working relationship. The respondent from Nandani Cooperative reported that GMED provided technical assistance to its members during the period from 2006-2008 and marketing support beginning in January 2008. As a result, the respondent said, member farmers obtained better prices and the cooperative’s membership grew.

Although Foodland did sporadically purchase from Nandani, no formal purchase agreement was ever made, and the long-term, consistent relationship desired was not established. A number of factors contributed to this outcome. Nandani Cooperative could not provide use of its cold storage facilities as promised because they were in disrepair and the Cooperative lacked the resources to restore them. Nonetheless, Foodland placed an order via fax for a specific quantity of vegetables in April 2008 based on what Nandani indicated they had available. Due to either failed receipt of the fax or inability to deliver by the specified time (an important requirement for Foodland), Nandani failed to fill the order. Foreseen purchases of grapes also went uncompleted because, according to the representative from Foodland, Nandani's price was too high—Rs10-15/kg higher than the market price.

The representative from Nandani reported that the relationship with Foodland was less fruitful than hoped because Foodland did not offer a higher price than other buyers and only bought the top grade of produce, causing the cooperative the inconvenience of selling the remaining grades elsewhere. The respondent from the GMED project confirmed that the prices offered were impractical for Nandani farmers, and added that Foodland did not announce the price in advance (as ITC did) and that small order sizes were a constraint. The respondents from both Foodland and Nandani pointed to management and resource issues at Nandani as constraints to the success of their supplier-buyer relationship. It can also be inferred from the comments made by the GMED and Foodland respondents that Foodland failed to build trust with the farmers to the extent that ITC did with its suppliers. Foodland was resistant to offer credit or other services due to previous bad experiences near Nandani, and this also seemed to hinder the relationship.

## **2. ACTIVITIES TO PROMOTE UPGRADING**

The project reports indicate that GMED accomplished many of its intended outputs, particularly those related to the demonstration and extension of new technologies.<sup>21</sup> The project developed 12 training modules and intervened directly with nearly 3,000 vegetable farmers, providing training and access to 16 different demonstration plots to learn about the application of new technologies. Project reports estimate that an additional 12,800 farmers indirectly benefited through spillover of information from family, friends and neighbors. The planned scale of the project was significantly higher than the scale achieved, but the project did make significant strides in disseminating new technology and critical production and post-harvest techniques to raise productivity and quality. Specific interventions included the following:

- Training on how to grow seedlings and proper seed usage.
- Soil and water testing for recommendations of fertilizer and water requirements.
- Integrated nutrient management.
- Training on spray pump calibration and proper use of pesticides (including integrated pest management).
- Training in grading and sorting.
- Training on transportation and packing material.
- Establishment of demonstration plots to exhibit technologies including drip irrigation, fertigation, raised bed cultivation, mulching, proper spacing of plants, netting, and roto-tilling.

GMED created training materials on agronomic practices, post-harvest management, disease and pest management. One training kit was created for each of the following crops: capsicum, tomato, cucumber, cauliflower, cabbage,

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<sup>21</sup> A complete listing of project outputs, compiled from project reports, is provided in appendix B.

potato, onion, brinjal (eggplant), beans, sweet pea, carrot, radish, zucchini, hot pepper, okra, bitter gourd, sponge gourd, and bottle gourd.

A general manual was also developed on disease and insect identification, diagnosis and management recommendations. Another general manual on spray pump calibration and spraying techniques was developed, as well as a calibration chart that allows farmers to see how much active ingredient and how much chemical to use (wheel meter), but this was not published because of USAID pesticide use regulations. Smaller leaflets for each crop were also developed.

Much of the training material was developed in 2007. In 2007 and 2008, the materials were revised and translated into local languages. In the spring of 2008, video training materials were developed during the establishment of the new demonstration plot at Anna Sagar (Medak Cluster). This material included sequences showing nursery construction, seedling production, soil preparation, formation of planting beds, installation of shade netting and drip irrigation/fertigation tape, vertical production techniques, and harvest and post-harvest operations.

The project took an approach that promoted embedded services delivered as part of a commercial transaction between project partners and farmers. Thus, much of the training was delivered to the extension staff of partners such as ITC or Nandani Cooperative. GMED also offered technical support and supervision to the partner extension agents and occasionally trained farmers directly. Training frequently took place on demonstration plots. Five demonstration plots were developed in Punjab, five in Andhra Pradesh, and six in Maharashtra. The total numbers of farmers selling to project partners by the end of the project were 299 in Punjab, 131 in Andhra Pradesh, and 2,236 in Maharashtra. The target number of farmers selling to corporate partners by the end of the project was 5,000. Qualitative research suggested that the uptake of the package of practices demonstrated could have been improved if supporting markets such as input supply and financial services had also been strengthened.

## **D. IMPLEMENTATION ISSUES**

The basic responsibilities of GMED's arrangement with ITC were fulfilled on both sides; however, there were significant delays and a failure to scale up the activities as planned (for ITC to reach 20,000 farmers). The process evaluation interviews revealed opposing accounts of the cause of the delays. According to the representative of ITC interviewed, constraints in the budget and staff of the GMED project were at fault. The respondent reported that two technical experts initially arrived and that there was a significant delay in the arrival of the third. He explained that in order to scale up, increased technical staff would have been needed, and that GMED's budget constraints prevented that.

According to the representative of the GMED project interviewed, the delays owed to ITC's slowness in opening the retail stores, which led to disappointment among farmers who expected to be able to sell to ITC during the first growing season. The ITC representative also noted that the failure to scale up to 20,000 supplier farmers was in part due to ITC's preoccupation with setting up other parts of the supply chain, such as transport and outlets; coordinating the development of the many mutually dependent functions at once was no small task (see section II. C. for more on this).

Another apparent timing issue during implementation related to the signing of a second memorandum of understanding between ITC and GMED. The initial MOU ended September 30, 2007, and delays in signing a new agreement prevented GMED's formal engagement with the Malerkotla cluster from October 2007 to the project's end in early 2008. Around the same time, in the fall of 2007, issues related to the APMC tax resulted in ITC deciding to end all procurement from the Malerkotla cluster. The Punjab state government had waived the APMC tax for vegetable procurement outside the mandi system. However, once ITC brought the vegetables into Chandigarh for sale



in their retail outlets, ITC unexpectedly became liable for the APMC tax. This reduced ITC's profitability enough for them to end the operation.

## **E. IMPLICATIONS FOR PROJECT EFFECTIVENESS**

The two main components of the GMED project—vertical linkages and upgrading—were mutually dependent because the project relied primarily on embedded services as the delivery mechanism for technical knowledge. The project intended to spread innovation and upgrading primarily through corporate buyers' extension agents rather than by directly training all the farmers in the intervention areas. The implication of this approach is that, for a large number of farmers to be trained, the contact between the corporate buyers and the farmers (the vertical linkage) would need to be frequent and long-lasting. On the other hand, small-scale farmers' opportunities to make repeat sales to corporate buyers were dependent upon the farmers' ability to upgrade and meet the buyers' quality requirements in sufficient quantities and on a timely basis.

The mutually dependent nature of the two project components has implications for project effectiveness. Despite substantial efforts to forge meaningful relationships between ITC and producers and to encourage uptake of new technologies, the project failed to achieve its targeted scale, both in the volume and duration of sales to corporate buyers and in the adoption of new technologies by farmers. This failing can be attributed to several factors. The enabling environment issues in Punjab (Malerkotla cluster) forced the cessation of direct procurement in June 2007. In the Kolhapur cluster, scale was adversely affected by lack of management capacity and inadequate infrastructure in the Nandani Cooperative. Lack of trust between the leaders of the cooperative and the corporate buyer prevented the buyer from offering financing for needed infrastructure improvements and effective vertical relationships were never established.

In the Pune and Medak clusters, conditions were more favorable for achieving the objectives of the project. The process evaluation and qualitative research indicate that the interventions in those two clusters were largely successful at encouraging upgrading and introducing a direct procurement model based on mutually beneficial commercial relationships between corporate buyers and small-scale producers. However, the general economic downturn and the negative effects on supermarket operations led to a halt in direct procurement activities in the Pune cluster in June 2008. By the time of the second survey in early 2009, only the vegetable farmers in the Medak cluster were still selling their produce to the corporate buyers, although even this was at a reduced rate. As illustrated by the results in the next section, the technical assistance, in the form of extension services and demonstration farms, were largely successful in promoting upgrading. However, initially successful efforts at establishing new vertical relationships had generally been unsustainable in the face of widespread cutbacks in supermarket operations.

# IV. CHANGES RELATED TO LEARNING AND UPGRADING

## A. FARMER CHARACTERISTICS

### I. DEMOGRAPHIC CHARACTERISTICS

The farmers participating in the panel study reflect the general profile of farmers targeted by the GMED project.<sup>22</sup> The typical survey respondent is a married man, around 50 years old, who reports farming as his main occupation and has more than a decade of farming experience.<sup>23</sup> The majority of these farmers live in households with 4-6 members. There were 712 households included in the panel study: 460 households (65 percent) reside in treatment villages and 252 households (35 percent) reside in control villages.

Education levels vary among the farmers. While 27 percent of the farmers have completed secondary school and 10 percent have completed higher secondary, the rest of the farmers have less than a secondary education: 17 percent have completed middle school, 16 percent have completed only primary school and 22 percent have no formal education. There is also some variation in caste membership among the respondents, with 20 percent of farmers classified as members of Scheduled Castes, Scheduled Tribes or Other Backward Castes.<sup>24</sup>

### 2. FARM SIZE

Average farm size for these small-scale vegetable producers is four acres, with average cultivated area at 3.3 acres.<sup>25</sup> Virtually all of the cultivated land is under some type of irrigation. There are some interesting results related to farm size. At the time of the baseline, farmers in the control group cultivated about 20 percent more land than farmers in the treatment group ( $p \leq .001$ ). In the two years between surveys, there was a marked reduction in farm size for both groups, which narrowed or erased the gap in farm sizes between the two treatment groups. These declines in land area are most likely the result of the sharp decline in vegetable production, which is discussed in section V.<sup>26</sup>

In the baseline, farmers in the control group held more land than farmers in the treatment group. Between the two surveys, however, both groups experienced a decline in land area, with control group farmers experiencing greater losses than treatment group farmers. In the case of irrigated land, control group farmers cultivated 21 percent more irrigated land at the time of the baseline than treatment group farmers (4.2 acres compared to 3.3 acres,  $p \leq .001$ ). By the time of the endline survey, the difference between groups was no longer statistically significant. This was because the control group had experienced a greater decline than the treatment group in average land area cultivated.

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<sup>22</sup> Unless specifically noted, there were no significant differences in the demographic and economic characteristics of farmers in the treatment and control villages.

<sup>23</sup> Average farming experience was 27 years (median experience was 25 years) and 90 percent of survey respondents had 10 or more years of farming experience.

<sup>24</sup> Collectively these three groups are known as the “backward classes”. They have historically faced economic and social discrimination, although the Indian Constitution now includes a quota system to reverse the effects of discrimination.

<sup>25</sup> Farm size was relatively uniform among respondents: 90 percent of farmers owned less than eight acres and 94 percent cultivated 8 acres or less.

<sup>26</sup> It is possible that the decline in land area reflects some unknown change in data collection procedures. However, the same question format and enumerator instructions were used in both survey rounds, so this is not a likely explanation.

### 3. HOUSING

Home ownership was essentially universal among the respondents. While there were no significant differences in home ownership rates between the treatment and control groups, there were slight differences across geographic clusters. In the Pune and Kolhapur clusters of Maharashtra, the home ownership rate was 100 percent, while it was slightly lower in the Medak and Malerkotla clusters (96 percent,  $p \leq .001$ ).

Housing quality is measured in terms of the building materials used: non-durable (*kutcha*), durable (*pucca*), or a combination of durable and non-durable materials (*semi-pucca*). For the sample as a whole, there were no significant differences in housing quality between treatment and control households. Most houses were *semi-pucca* (50 percent), followed by *pucca* (37 percent) and *kutcha* (13 percent). Housing quality did vary across the three states ( $p \leq .001$ ), with the majority of households in Punjab (56 percent) living in *pucca* houses and the majority of households in Andhra Pradesh (62 percent) living in *semi-pucca* houses. Households in Maharashtra had the poorest housing quality, with 18 percent of households living in *kutcha* houses, compared to only one percent of households in the other two states. Flush toilets were found in 79 percent of homes, with only small and marginally significant differences between treatment and control households.

## B. LEARNING AND UPGRADING: STATISTICAL FINDINGS

### I. FORMAL TRAINING

Only nine percent of the survey respondents reported that they completed a formal training course in agriculture during the two years between surveys. There were no significant differences between treatment and control groups in terms of the percentage who reported training. Similarly, no significant differences were detected between the four geographic clusters.

Among the 67 respondents who reported that they had completed a formal training course, the most common source for that training was a cooperative or farmers' organization (51 percent). The second most common source for formal training in agriculture was a government extension agent (31 percent). There were no significant differences between the treatment and control groups in terms of sources of training, probably because the sample was very small.

The GMED project did not provide formal training courses to farmers. Instead, GMED provided training to private extension workers who were employed by the corporate buyer. This plan was based on the idea that the private extension agents would provide embedded technical services to small-scale farmers, either directly or through demonstration farms and lead farmers.

### 2. EXTENSION SERVICES

The availability of extension services over the two years between surveys differed significantly by cluster ( $p \leq .001$ ). Farmers in the two Maharashtra clusters reported that extension services were available to them at a much higher rate: in Pune, half the farmers had extension services available, while availability was even higher in Kolhapur (58 percent). This is in contrast to relatively low availability in Medak (17 percent) and Malerkotla (8 percent). There were, however, no significant differences by treatment group.

A similar pattern emerges in terms of the type of extension available: geography plays a significant role in determining whether farmers have access to private extension, government extension or both ( $p \leq .0001$ ). As indicated in table 4, farmers in Medak and Malerkotla reported little or no access to government extension. On the other hand, this type of extension was most common in Pune, where government extension was available to 27 percent of farmers.

**Table 4. Availability of Extension Services Reported in 2009, by Cluster and Extension Type (government, private or both) (percent)**

Clusters	Type of Extension Services Available				
	Government Only	Private Only	Both Government and Private	No Extension Available	
Medak	2	15	0	83	100
Pune	12	23	15	50	100
Kolhapur	5	39	13	42	100
Malerkotla	0	6	1	92	100

Among those farmers who had extension services available to them (n=321), the number of times they received advice was more closely related to cluster location than to treatment group. Not only were Medak farmers the least likely to report extension services available to them, but those who did receive services averaged only 0.75 consultations over the two-year period. Farmers in Kolhapur and Malerkotla were advised an average of 1.5 times over the same period. Only in Pune was there a significant difference between treatment and control farmers in the number of times advised: treatment farmers were advised an average of 2.1 times compared to only 1.3 times for control farmers (p≤.001).

### 3. UPGRADING: NEW PRODUCTION PRACTICES

A major objective of the GMED project was to facilitate the upgrading of production practices among small-scale farmers. Based on survey results examining six production practices, it is evident that the project was successful in promoting awareness of these upgraded practices. Farmers in the treatment villages are aware of the upgraded practices in significantly higher numbers than farmers in the control villages. However, this greater awareness does not translate into higher adoption rates. Instead, adoption rates are more closely associated with geographic cluster. The six production practices are listed across the top of table 5, arranged in order from highest to lowest adoption rates.

Farmers in the Medak cluster stand out in numerous ways:

- Medak farmers are aware of four out of the six practices at a significantly higher rate than farmers in the other clusters
- Medak farmers adopted all six of the upgraded practices at significantly higher rates than farmers in other clusters.
- Among farmers who adopted the new practices, Medak farmers were significantly less likely to consider the practices to be useful.

For five of the six upgraded practices, the skepticism of the Medak farmers stands in sharp contrast to the attitudes of other farmers. This skepticism may have its roots in cultural differences, agro-ecological dissimilarities between the cluster locations or field method inconsistencies. Or it may be due to the fact that the Medak farmers had been selling to corporate buyers on a more consistent basis and were the only farmers still selling to corporate buyers at the time of the second-round survey. Perhaps they had come to consider these upgraded practices to be “business as usual”. Whatever the reason, there is a large enthusiasm gap between the Medak farmers and their counterparts in Maharashtra and the Punjab.

While the main relationships between new production practices, cluster location and treatment group are indicated in table 5, there also are some interaction effects that are not reflected in the table. As the table indicates, awareness of

upgraded production practices is consistently higher for treatment group farmers than for control group farmers overall. But the situation in Kolhapur is reversed in that farmers in control villages are more aware of several practices than treatment group farmers: mulching paper ( $p \leq .0001$ ), seed tray nurseries ( $p \leq .01$ ) and cropping under shade nets ( $p \leq .05$ ).<sup>27</sup> In Medak, the treatment group farmers were not only more aware of the use of mulching paper than the control group, but the gap favoring treatment group farmers was significantly higher in Medak than in the other clusters ( $p \leq .0001$ ). This just means that the “treatment effect” was noticeably greater in Medak.

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<sup>27</sup> There was also marginally significant evidence to suggest that the Kolhapur control group is more aware of drip irrigation and fertigation practices than the treatment group.

**Table 5. Awareness, Adoption and Evaluation of New Production Practices**

	Upgraded Production Practices					
	On-Farm Grading	Drip Irrigation	Fertigation	Crops Under Shade Nets	Mulching Paper	Seed-Tray Nurseries
<b>Awareness</b> (n=712)						
Number (%) of farmers aware of practice	564 (79%)	598 (84%)	492 (69%)	445 (63%)	374 (53%)	486 (68%)
Differences by cluster	higher in Medak (p≤.0001)	higher in Medak and Pune (p≤.0001)	higher in Pune and Kolhapur (p≤.0001)	lower in Malerkotla (p≤.0001)	higher in Medak (p≤.0001)	higher in Medak (p≤.001)
Differences by household type	marg. higher in treatment group (p≤.10)	higher in treatment group (p≤.01)	higher in treatment group (p≤.01)	higher in treatment group (p≤.001)	higher in treatment group (p≤.0001)	higher in treatment group (p≤.001)
<b>Adoption</b> (n=712)						
Number (%) of farmers adopted practice	293 (41%)	225 (32%)	177 (25%)	88 (12%)	88 (12%)	87 (12%)
Differences by cluster	higher in Medak (p≤.0001)	higher in Medak (p≤.0001)	higher in Medak (p≤.05)	higher in Medak (p≤.0001)	higher in Medak (p≤.0001)	higher in Medak (p≤.001)
Differences by household type	ns	ns	ns	ns	ns	ns
<b>Usefulness</b> (n=number of adopters)						
Number (%) of adopters saying practice is useful	251 (85%)	169 (75%)	137 (77%)	37 (42%)	37 (42%)	86 (99%)
Differences by cluster	52% in Medak (p≤.0001)	34% in Medak (p≤.0001)	20% in Medak (p≤.0001)	4% in Medak (p≤.0001)	7% in Medak (p≤.0001)	ns
Differences by household type	ns	ns	ns	ns	ns	ns

Abbreviations: ns=differences are not statistically significant

#### 4. SOURCES OF INFORMATION FOR LEARNING AND UPGRADING

Farmers learn about new production practices from a variety of sources. The survey reveals several interesting results about how farmers obtain information for upgrading. In the box at left, the information sources are listed in order of

<b>Sources for Upgrading Information</b>
Neighbors, Relatives and Friends
Model Farmers
Private Company/Private Extension
Farmer Groups/Cooperatives
Government Extension
Input Suppliers
Television
Newspapers

relative importance (high to low). For the sample as a whole, the most important source for learning about new practices is neighbors, relatives and friends (NRF). For each of the six production practices, more farmers relied on informal learning from NRF than from any other source. On the other hand, the relative importance of each information source differed significantly across the four clusters ( $p \leq .0001$ ).

In the Medak cluster, the reliance on informal learning from NRF was strikingly high and consistently the most important source of information.

For 86 percent of Medak farmers, this was how they learned about drip irrigation and 72 percent turned to NRF for information about on-farm grading. The percentage of Medak farmers turning to NRF for the other four practices ranged from 59 (mulching paper) to 68 (seed tray nurseries). Also consistent across the different production practices was that Medak farmers' second most important source of information for upgrading is private companies/private extension. In Medak, it appears that some farmers initially hear about upgraded production practices from the extension employees of corporate buyers; then the information is widely diffused among neighbors, relatives and friends. This is consistent with the farmer-to-farmer model promoted by the GMED project.

The situation is reversed in Malerkotla, where farmers are heavily dependent for their upgrading information on corporate buyers and buyers' private extension staff. This is very consistent across the six production practices and ranges from a high of 77 percent of farmers for information on mulching paper to a "low" of 56 percent of farmers for information on on-farm grading. For the other four practices, the number of Malerkotla farmers who look to private extension for upgrading information ranges between 65 and 69 percent. The second most important source of information in Malerkotla is neighbors, relatives and friends.

The Pune and Kolhapur clusters, both in Maharashtra, share many similarities that set them apart from Medak and Malerkotla farmers. Farmers in Pune and Kolhapur are the most likely to indicate that they turn to lead farmers for upgrading information. In general, NRF is the most important source of information for most of the practices, followed closely by lead farmers.<sup>28</sup> In Pune, however, lead farmers were cited as the most important source of information for mulching paper (42 percent of Pune farmers) and on-farm grading (39 percent of Pune farmers).

In general, farmers in Pune and Kolhapur are more evenly distributed in their reliance on each type of information source than farmers in the other two clusters. While NRF and lead farmers were their top two sources of information, Pune and Kolhapur farmers turned to corporate buyers and private extension services as an important third source of information. Only in Kolhapur, home of the Nandani cooperative, did a small but consistent number of farmers (4-14 percent) cite government extension and cooperatives/farmer groups as their most important sources of information for upgrading.

Finally, there were small but significant differences between the treatment and control group farmers in their sources of information for upgrading. Treatment group farmers were more likely than control group farmers to cite lead farmers and private companies/extension agents as their most important source of information for three of the six upgrading practices—drip irrigation, fertigation and seed tray nurseries. This finding, along with the relative

<sup>28</sup> Some caution should be exercised in drawing sharp distinctions between model farmers, on the one hand, and neighbors, relatives and friends, on the other hand, since model farmers are community members who live near other farmers.

importance overall of these two sources of information and the consistently higher level of awareness of upgraded practices among treatment group farmers, all point to the success of the GMED model in spreading information about upgrading.

## **C. LEARNING AND UPGRADING: QUALITATIVE FINDINGS**

### **I. NEW TECHNOLOGIES AND PRACTICES**

The initial plan for GMED had been to train lead farmers who could then hold demonstrations in their plots and train other average farmers in new techniques for growing vegetables. Lead farmers would exhibit the results of using new techniques: higher quality produce. The lead farmer approach did not work as planned in all areas (see section 3 below) although the success of “demonstration” was indeed validated, and extension workers effectively replaced the lead farmer as the method of drawing in and training farmers.

The qualitative findings indicate that the package of technologies and improved cultivation practices were well conceived and executed and were very well received by the farmers. It seems that the limitations of the lead farmer approach were quickly recognized and the implementation was modified to increase the number and role of extension workers and agents employed by the project. In many areas, especially in the Pune, Kolhapur and Medak clusters, the extension workers played a crucial role in expanding and deepening the efforts of the technical experts. They also served an important liaison role between the lead farmers with their demonstration plots and other area farmers.

The results of demonstrations of new technologies for use in vegetable cultivation were positive for many farmers. This was confirmed by Mr. S. R., lead farmer from Anna Sagar (Medak Cluster):

“We are using tractor for plowing our field in very few hours. Rest of time we spend in our productive works. The quality of the products has improved a lot since we are aware of the modern techniques. We are happy with the timely suggestions of the ITC people.”

The importance of introducing new technologies through demonstration was underscored even in areas where GMED had not undertaken demonstration activities directly but had encouraged input suppliers, including Syngenta and Jain Irrigation Systems, to do so. Mr. K. R. in Nawabpet (Medak Cluster) asserted:

“There are significant changes in handling of our vegetables crops: we have learned about improved cultivation practices mainly through television and observing other farmers’ practices. There is no training given by ITC or GMED. A private seed company [Syngenta] and a fertilizer company come and give suggestions to us on what seed is most suitable to our conditions, when to cultivate certain crops and how much fertilizer to use. A local man has started a vegetable seed nursery. We are happy and getting better yield by using the seed we buy from this company. Drip farming is now being used to cultivate the land. This method we came to know through television.”

### **2. LIMITATIONS OF THE DEMONSTRATION EFFECT**

Although the demonstration method was effective in promoting upgrading, long-term and replicable improvements in small-scale agriculture as a result of introducing new technologies were not seen because neither financing nor long-term supply of improved inputs were available to farmers. Interviews with farmers and focus group members in Nandani underline the problem. It is clear from the interviews that the introduction and demonstration of new technologies and improved cultivation methods were the main achievements of the project in the Kolhapur Cluster, but the impacts from upgrading were limited by the absence of strong vertical and supporting market linkages.



A participant in the focus group discussion expressed the need to go beyond the introduction of new technologies:

“The problems facing small farmers are lack of information, money. They are not ready to accept new techniques due to lack of money. To encourage small farmers he should be given guarantee to take the crops and given good price. As is now the farmers do all the heavy work and the brokers get commission—they earn more than the farmers. Small farmers got good information from GMED got to know that after using improved seed and inputs we can get good crops. But then again we do not get good markets.”

When asked which technologies he learned about through GMED that he still uses, average farmer Mr. M. K. responded:

“..shade net and nursery seedlings. I would have liked to use more, especially drip irrigation, but I can’t afford it.”

According to average farmer Mr. S. J.

“We were taught the use of mulching paper and post harvest packaging by GMED extension workers, but now the mulching paper is not available in the market here.”

### **3. LEAD FARMERS AND EXTENSION WORKERS**

Technical assistance was provided to farmers through several channels including extension agents initially hired and trained by GMED and later employed by ITC and field extension workers who were recruited, trained and employed by GMED. In Anna Sagar, lead farmers who were recruited and trained by GMED developed demonstration plots on their farms. A demonstration farm and nursery also was developed directly by GMED, which continues to be operated by ITC. Informants mentioned a range of technical assistance, including the introduction of improved quality and varieties of seeds, drip irrigation, shade netting to protect certain vegetables from excessive sun light, structures to support shade netting and promote vine cultivation of tomatoes, improved methods of tilling, mulching and raised bed cultivation especially for root vegetables, proper use of fertilizers and pesticides (including integrated pest management) and improved post-harvest handling. Advice was also given to farmers on optimizing production according to proper spacing and timing of plantation.

The intended role of the lead farmer is described in the statement of Mr. S. R., lead farmer from Anna Sagar:

“As a lead farmer I give suggestions to the fellow farmers on how to buy good quality seeds, fertilizers, manure, etc. How and when to harvest the crop to get a good price from ITC... giving fellow farmers [suggestions] about which crop to be sown in which season to get better yield... how to improve their crop to produce better grade”.

In Pune, an extension agent trained the lead farmers with some success. This is described by lead farmer Mr. B. G.:

“Mr. A. G. [the extension agent] initially went to quite a few farmers to explain about new farming concepts. He later identified a few of them as lead farmers based on their knowledge and interest in farming. We responded to what he was teaching us and therefore we became lead farmers. We then acted as teachers when other farmers came to visit our farms”.

In other clusters, however, many lead farmers did not provide instruction to average farmers, and the project began to use extension agents as trainers instead. In these areas it was the extension agent who was the key to reaching average

farmers and helping them understand how they could introduce new technologies and practices on their farms. This was explained by average farmer Mr. A. in Pune:

“The GMED extension worker has been very active in our region. He has taught us the use of seedling trays, shade net usage, drip lines, mulching paper, t-tape usage and, also, same-day harvest concept. Mr. Anil [GMED staff] took us for a farmer visit to Jain Irrigation in Jalgoan to understand importance of drip irrigation. He taught us about vermi-composting and the usage of biofertilizers”.

The focus group in Pune echoed the importance of the extension agent:

“...Small farmers have been motivated by better prices and training in the use of on-farm inputs... the extension agent has been an important motivating factor—he is very knowledgeable and enthusiastic and gets on well with all farmers. He has encouraged us to try new things that we would not have tried on our own.”

# V. CHANGES IN MARKET LINKAGES WITHIN THE VALUE CHAIN

## A. VERTICAL LINKAGES AND MARKETING OF VEGETABLE CROPS: STATISTICAL FINDINGS

### I. VEGETABLE SALES AND REVENUES

Between 2007 and 2009, there were dramatic declines in both the number of farmers selling vegetables and the average revenues they received from vegetable sales. This was due to a downturn in the general economy, the contraction of the supermarket industry and the closing of a number of retail outlets during the two-year period between surveys. In Pune and Malerkotla, ITC ended direct procurement from farmers, while expansion plans in Medak were put on hold. In Kolhapur, the anticipated linkages between Foodland and Nandani Cooperative failed to materialize.

Only half of the farmers (363 of 712) reported that they had sold vegetables in the twelve months leading up to the second survey. There were large differences between the treatment and control groups and between clusters in terms of the percentage of farmers selling vegetables. Farmers in the treatment villages reported vegetable sales at twice the rate of control group farmers (61 percent compared to 32 percent,  $p \leq .0001$ ). Differences between clusters were also significant ( $p \leq .0001$ ). Coming out on top were the Medak farmers, with two-thirds of them still selling vegetables. On the other hand, the hardest hit cluster was Malerkotla, where only one-fourth of the farmers continued to sell vegetables. The numbers in Pune and Kolhapur were between the two extremes, with about half the farmers reporting vegetable sales in the year leading up to the 2009 survey.

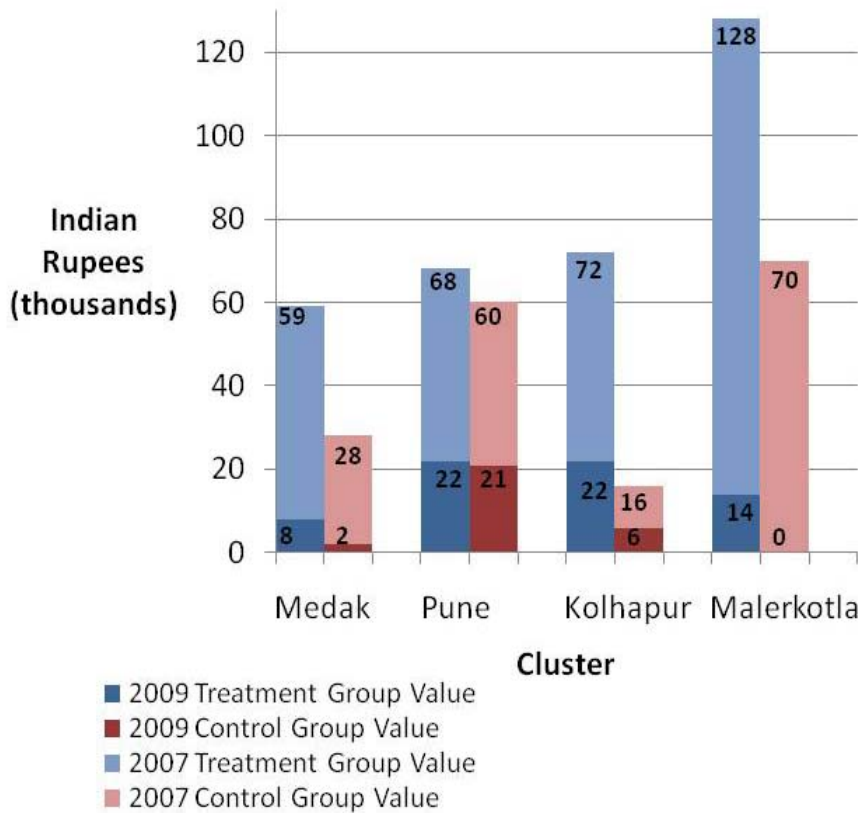
Average vegetable revenues dropped for both treatment and control groups in all four clusters ( $p < .001$ ). Vegetable revenues follow consistent patterns across the four clusters (see figure 3):

- Average vegetable revenues for farmers in treatment villages were higher than for farmers in control villages in both rounds of the survey in all four clusters. These differences were less pronounced in Pune, where vegetable revenues in the treatment and control villages were more similar.
- Average vegetable revenues dropped significantly between the two rounds of the survey for both the treatment and control groups in all four clusters.
- While the monetary value of the declines were higher for farmers in treatment group villages,<sup>29</sup> the percentage declines in revenues were similar for treatment and control farmers within each cluster.
- The percentage declines for treatment and control groups were higher in Medak and Malerkotla (85 to 95 percent) than were the declines in Pune and Kolhapur (65 to 70 percent).

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<sup>29</sup> In Pune, the difference in monetary value between the decline for the treatment and control groups was not statistically significant at  $p \leq .05$ .

**Figure 3. Average Vegetable Revenues for Farmers in Treatment and Control Villages, by Cluster, 2007 and 2009**



## 2. VEGETABLE MARKETING

Despite the opening of new market opportunities, the local mandi is still the most frequently cited type of buyer in the second round survey, with 59 percent of farmers selling at least some of their vegetables at this traditional market. Another 31 percent transported their vegetables to sell them at a distant mandi, making this the second most frequently cited type of market. Sales at farmer’s markets (ryutu) and sales to cooperatives/farmer organizations were reported with similar frequency, at eight percent for each of these two types of buyers. Less frequently reported, at two percent or less, were direct sales to neighbors, sales to merchants against debt, and sales to government agencies. There were no farmers in the sample who reported selling their vegetables to lead farmers.

The only farmers who reported vegetable sales to corporate buyers were farmers in the treatment villages of the Medak cluster. Out of the 67 farmers in the Medak treatment group, there were 32 farmers who sold vegetables to corporate buyers in the twelve months prior to the second survey. None of the control group farmers in Medak, and none of the farmers in the other three clusters reported sales to corporate buyers ( $p \leq .0001$ ). These differences are remarkable and highlight corporate buyers’ low level of penetration into the study areas during the months leading up to 2009.

Most farmers sold their vegetables in only one or two types of markets. Of the 363 farmers who reported that they cultivated and sold vegetables in the year preceding the endline survey, the majority (70 percent) reported that they only sold to one type of buyer. Another 25 percent reported that they sold vegetables to two types of buyers in the past year, with just five percent selling to three types of buyers. There were differences between districts ( $p \leq .05$ ), with Medak farmers selling to more types of buyers than farmers in other clusters. In addition, treatment group farmers in

general sold to more types of buyers ( $p \leq .001$ ), with the advantage held by treatment group farmers over control group farmers being even more pronounced in the Medak cluster ( $p \leq .01$ ). All of the Medak farmers who sold to corporate buyers reported that they sold to more than one type of buyer.

## **B. CHANGES IN MARKET RELATIONSHIPS: QUALITATIVE FINDINGS**

### **I. DEVELOPMENT OF VERTICAL LINKAGES**

GMED initiated the process of market transformation to enhance market access with the arrival of ITC collection depots in the project areas. Other supermarkets followed and established collection depots even where ITC withdrew, as they did in Pune and Malerkotla. The arrival of supermarkets opened up an entirely new option for marketing fresh vegetables, thus adding to the alternatives available to farmers and increasing competition among the buyers to the benefit of the farmers.

The way this system worked was demonstrated in the villages of Anna Sagar and Nawabpet of the Medak cluster. In both regions, the purchasing agents were recruited by ITC from among the farmers. This not only enhanced ITC's understanding of their suppliers but it has also resulted in a higher level of trust between the farmers and the buyers. Trust and transparency are two important characteristics of the value chain interactions fostered by ITC. Given the exploitative nature of the traditional mandi system, this has worked to the benefit of both ITC and the farmers. Over and over again the farmers expressed their trust in ITC and the system it has established. Prices are posted at the depot as well as being communicated by the buyer. The characteristics of Grade A quality for each type of vegetable are clearly posted at the ITC depot on charts that include both verbal descriptions and illustrations. Grading is done on the spot in the presence of the farmer. Weighing of the farmer's produce is done on the spot, in the farmer's presence on electronic scales and payment is made on the spot in cash to the farmer. No commission is charged from the farmer.

Mr. P. R. expressed the sentiments of virtually all the farmers in the area when he spoke about his trust in ITC and his willingness to operate without an advance purchase contract:

“(We have) no agreement with ITC. Whatever we can, we sell it to ITC. We know that ITC would take our crop as long as it meets quality standards. They are transparent in their dealings with us (weighing and payment; posting prices). This is the trust we have with the ITC”.

In terms of vertical linkages, this “contact farming” approach (in contrast to “contract farming”) seems to have worked well in the Medak Cluster where it still defines the relationship between ITC and farmers. In the other clusters, vertical linkages do not appear to have been established under the GMED Project.

An interesting situation uncovered during the qualitative study challenges the conventional wisdom that farmers are more likely to default in market linkage arrangements.<sup>30</sup> In this case, it was the otherwise experienced and highly regarded ITC that abruptly pulled out from the Pune and Malerkotla clusters without taking the time to inform the farmers. While there may have been legitimate business reasons to warrant such a sudden exit, the failure to inform the farmer suppliers worked against the project goals of building mutual trust in vertical relationships. In the Pune

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<sup>30</sup> See J. Coulter, et.al. “Marrying Farmer Cooperation and Contract Farming for Service Provision in a Liberalising Sub-Saharan Africa” Overseas Development Institute, No. 48, 1999. Also, Poulton, N. C., Dorward, A., and Kydd, J., (1998) 'The Revival of Smallholder Cash Crops in Africa: Public and Private Roles in the Provision of Finance', Journal of International Development, 10 (1).

case informants reported that the reason for the departure had more to do with poor management than with legitimate business decisions.

While other supermarket chains have followed and set up collection depots in these areas, there is no evidence that they have invested in developing any sustainable relationships with the farmers who supply them with fresh produce. This has been verified by a senior agribusiness manager working for Reliance, who asked not to be named. He attributes this to an overall lack of understanding of the subsector as a whole by the parent companies. Many of these chains are owned by large corporate houses for whom agribusiness, and particularly fresh produce, is an entirely new activity.

On the other hand, in addition to the case of ITC in Medak, there are positive examples indicating that large corporate chains are able to establish strong relationships with farmers. These include Pepsico in Pune and *Khet Se* in Sang Rur, Punjab. In these cases, the vertical linkages are well established, business services facilitation is active and the farmers appear quite satisfied with the arrangements.

## **2. EXPANSION OF FARMERS' MARKETING OPTIONS**

GMED's program model worked as planned in only one of the areas included in the qualitative study—Medak. There, ITC had already decided to establish market linkages with farmers. Going hand in hand with the technological innovations GMED introduced was the expanded market opportunity opened up by ITC. Together these two initiatives created a program model that has achieved a notable degree of success, particularly in the Anna Sagar area, and laid a strong foundation for continued growth and progress.

Prior to the entrance of ITC and GMED, market opportunities available to vegetable farmers were restricted to the mandis and the *rythu bazaar*. With ITC opening collection depots and GMED introducing technical innovations, farmers were able to benefit from both improved inputs and improved market opportunities. GMED interventions most certainly made it possible for more farmers to take advantage of the market opportunities that ITC pioneered and other corporate buyers followed.

The importance of this dual approach cannot be overstated. Without GMED interventions ITC may not have received the level of quality and quantity improvements that allowed the Anna Sagar region to become a sustained leader in the supply chain of fresh vegetables to the Hyderabad/Secunderabad metropolitan region. This expansion of market options continues to have noticeable impacts throughout the fresh vegetable subsector in terms of improved competition and streamlined operations.

Farmers now have four options from which to choose to sell their vegetables: 1) ITC, 2) other corporate buyers who followed ITC onto the scene in both Anna Sagar and Nawabpet, 3) the local farmer's retail market (*rythu bazaar*) and 4) the mandis at Vantamavadi in Anna Sagar and at Shankarpalli and Vikarabad in Rangareddi District near Nawabpet. Furthermore, one unanticipated impact of the project has been changes in the mandis toward more favorable treatment of farmers (see below).

Farmers now make informed decisions on where to sell their produce. The general pattern is to first sell as much top grade produce to ITC as possible. The next stop is at the depots of the other corporate buyers who purchase both grades A and B but do not offer a premium price for grade A. The farmer then decides if he wants to sell some percentage at the local farmer's market (*rythu bazaar*) and the remainder at the mandi. If he has time constraints, he will skip the local farmer's market and sell all of his remaining produce at the mandi.

Average farmer Mr. P. R. from Anna Sagar described his family's approach:

“We have three buyers: ITC: they purchase the products we have which are of good quality standards to some extent only. We sell vegetables ourselves (my wife does) at the local Rytu Bazaar if we have time. Mandi at Vantamavadi: the rest of the products are sold to the mandi at any cost. Sometime we get better price for one crop (from ITC compared to the mandi) and get lesser price on other.”

ITC estimates it buys 12 percent of total fresh vegetable production from both areas, all of it grade A and at a premium not offered by others; the other corporate buyers account for an additional 28 percent and that from all grades; the remaining 60 percent gets sold at the mandi and local farmer’s market. (source: Mr. J.R., ITC Procurement Manager, Hyderabad). This correlates closely with other sources, such as Mr. M.R., lead farmer, Anna Sagar, who told us that 50 percent goes to all the corporate buyers (including ITC) and 50 percent to the open market.

The above description does not catch the actual complexity of the market operations, particularly the price complexity. It turns out that the most lucrative market is the retail *rytu* bazaar where individual purchased quantities are small but price per kilogram is higher than anywhere else. On the cost side is the time that it takes to sell at this market, an activity usually done by women in the family. There is also a cost for gaining access to the *rytu* bazaar but it is negligible at Rs 400 per year.

Mr. B. R., an average farmer in Nawabpet, had this to say:

“We have three buyers. ITC: they take only limited quantity of Grade A product and we get better price. Rytu Bazaar: we farmers take the harvest to the farmers market in nearby towns and sell the products ourselves in the market. We get good profit from selling the harvest. Mandis: They take away commission and transportation cost is very high so whatever we get after selling the product is very less.”

Even mandi prices are complex. On any given day the price for certain vegetables can exceed that offered by ITC. For example, when the study team visited the Vantamavadi mandi, cauliflower was selling at Rs 10 per head while it had sold at ITC that same day for Rs 7.50 per head. On the other hand, tomatoes at the mandi were Rs 2 per kg while at ITC they sold for Rs 3.50 per kg. The mandi also charges farmers a 10 percent commission.

When asked why they would sell cauliflower to ITC at a lower price, the farmers responded that ITC prices are stable and publicized in advance while mandi prices change daily and are not known until the transaction takes place. The Vantamavadi mandi prices are determined by the prices in Bowenpally, which is the main mandi in Secunderabad.

What is clear is that the farmers seem to have a handle on the market: they know they have choices, they know the costs and benefits, and they seem comfortable making informed choices with this knowledge. Of course just about every farmer we spoke with told us they would like higher prices for their vegetables, but the overwhelming sense is that of relative prosperity.

### **3. IMPACTS ON THE MANDIS**

A significant and apparently sustainable effect of the GMED/ITC collaboration has been on the operation of the mandis. The increased competition generated by the arrival of mainly ITC and to a lesser extent the other supermarket chains, along with the fair and transparent manner in which they deal with their suppliers, has had a dramatic effect on changing the behavior of the mandi traders. This is no trivial achievement.

As Mr. J.D. in Pune said:

“Companies like ITC and Reliance have made the local mandi aware that if they do not treat us fairly, these malls [supermarkets] will go off with all the market. Therefore these private

companies and their presence keep a check on the local market and commission agents. Due to this competition, we the sellers are being benefited.”

The traders in the mandis have for years exploited farmers through their monopoly grip on agricultural trade in general. They took advantage of the failure of the mainstream financial institutions to provide credit and of the absence of farmer organizations. Like so many well-intentioned reforms, the mandi system was manipulated to benefit the powerful and politically well connected. It is unlikely that changes in the behavior of mandis of the sort witnessed in a number of clusters, particularly in Medak and Pune, would have ever come about if the farmers had not been exposed to the equitable, transparent, and respectful treatment they received from ITC. This caused an awakening among the farmers that led to demands for better treatment and increased transparency at the mandis. This is not to imply that conditions at the mandis are perfect, but significant change has taken place to the benefit of the farmers. Previous exploitative behavior on the part of the traders has significantly decreased.

### **C. FARMERS' PERCEPTIONS OF PROGRAM IMPACTS**

Where the two-pronged approach was successful in fostering both technical improvements and market linkages, farmers expressed a high degree of satisfaction. Even where market linkages were not established, the demonstrations of innovative technologies and cultivation practices were very popular with the farmers. Outside of the Medak Cluster, however, there was dissatisfaction with the failure of the market linkage component to take hold. There was a perception that the program was too short-lived to have any lasting impact.

In Nandani, for example, the focus group reported that they were using upgraded production techniques but had not succeeded in establishing commercial relationships with corporate buyers:

“With respect to the previous four years they used to conduct farming by traditional methods but now they have made changes to drip irrigation, feeding fertilizers, improved seeds, etc. Production has increased, but in terms of markets [there is] little difference than before. We did not sell to supermarket chains before nor do we now.”

In all areas visited during the qualitative field research, farmers indicated that buyers were expressing increased interest in the fresh vegetable subsector. As the Medak case shows, the market for fresh vegetables expanded dramatically with the arrival of ITC and subsequent arrival of the other chains. Farmers were quick to understand these changes, assess their marketing options and take advantage of the opportunities at hand. However, the same degree of subsector development was not experienced in the other clusters.

Many farmers certainly benefitted from the GMED project. To the extent that they have been able to upgrade the quantity and quality of their produce, the subsector as a whole has also benefitted. Most of the interviewed farmers indicated that they had experienced an increase of sales of fresh vegetables and profits resulting from those upgrades. These increases can by and large be attributed to the program's introduction of innovative technologies and improved practices that led to increased productivity and quality. Some, as in Malerkotla, felt that they had substantially increased their incomes while most others acknowledged a small or modest increase. The increase in incomes came from both added productivity and better prices for higher quality products as well as from cost savings resulting from the program's instructions on appropriate use and dosages of fertilizers and pesticides.

In many cases, farmers directly attributed these improvements to GMED. Thus Mr. J. D., an average farmer in Pune said in that he thought GMED had had an impact on farmer behavior:



“Yes GMED introduced itself as working with ITC and that ITC will buy all the produce that we grow. This was new in those days and people wanted to try something other than the local commission agents. Therefore we started growing vegetables that GMED told us to.”

Mr. A., also from Pune, said

“We have changed the type of crops (we now grow more vegetables, but not different vegetables except for brinjal) and we now sell to malls [shopping centers] and other corporate buyers whereas before we only sold to mandis or at the local bazaar.”

The region where the positive impacts of GMED were most clearly perceived (and where they were most strongly reflected in farmers’ improved crops, wider market opportunities and increased sales) was the Anna Sagar region in the Medak cluster. In this area, GMED is still well recognized among the larger farmers. These farmers appreciate the technical contributions the project brought to vegetable cultivation. As noted above, GMED was instrumental in introducing many important changes including the use of drip irrigation, shade netting, vine structuring of tomatoes, new and improved varieties of seeds, correct use of fertilizers and pesticides and other cultivation practices that allowed for considerable increases in both the quantity and quality of vegetables. Widespread use of drip irrigation and shade netting and tomato vine cultivation are visible throughout the area. It appears, however, that the most capital-intensive improvements were more widely adopted by larger farmers and did not reach smaller farmers in any meaningful manner. But, in any case, larger farmers did appreciate the improvements, which they clearly attributed to the project.

GMED’s degree of involvement and that of ITC varied by cluster, which shaped farmers’ outlook on the effectiveness of the GMED program. While GMED staff only visited Nawabpet once, ITC was active in the area and promoted product quality improvements, which they promulgated through the efforts of a GMED-trained extension agent. In Pune, ITC had withdrawn by the time of the final interviews, leaving the farmers unsure of what they could expect in the future. In Malerkotla, farmers recalled the techniques demonstrated by the GMED technical specialist but lamented that there was not enough instruction before ITC and GMED withdrew. According to lead farmer Mr. C. S.,

“The person [GMED technical expert] taught us the basics but he never came back to finish the job and teach us the details.”

## VI. CONCLUSION

The program model represented by the GMED project is based on a two-pronged approach of introducing innovative technologies and cultivation practices to increase production and improve product quality, while at the same time linking farmers to new market opportunities that value the quality increases and compensate farmers for their investments in upgrading. The overall objective of the GMED project was to increase productivity and product quality and ultimately increase income and reduce poverty among vegetable farmers on small farms. One of the major project strategies was to introduce farmers to new technologies, quality standards and post-harvest processes through lead farmers or private extension agents. The other major strategy was to work with corporate buyers to help them establish mutually beneficial vertical linkages with small farmers. After analyzing the two rounds of survey data, project reports, and results from the qualitative study and process evaluation, several basic conclusions can be made about the overall effectiveness of the GMED project.

### **A. THE GMED PROJECT WAS EFFECTIVE IN SPREADING AWARENESS OF NEW PRODUCTION TECHNOLOGIES AND FARMING PRACTICES.**

The project was largely successful in achieving the outcome of increasing farmer awareness of upgrading opportunities. The survey results indicate that farmers in the treatment villages are more familiar with the production and post-harvest improvements promulgated by the GMED project. This pattern is consistent across all six practices. In addition, the percentage of farmers who are aware of the new practices is higher in those clusters where the GMED project operated for a longer time.

The qualitative results support the conclusion that the GMED project was effective in spreading information about upgrading. Lead farmers in the treatment villages readily associated the new practices with GMED. They considered the practices to be valuable and they indicated a strong interest in learning more. Farmers expressed confidence in the expertise of GMED technical personnel and GMED-trained extension workers.

### **B. FARMER-TO-FARMER CONTACT WAS THE MOST IMPORTANT MECHANISM FOR SPREADING NEW INFORMATION.**

The assessment results confirm the efficacy of the lead farmer approach as a mechanism for widespread diffusion of upgrading information throughout a local area. While the qualitative interviews highlight interactions between lead farmers and extension workers, the survey results reveal that average farmers had limited direct contact with extension workers. Moreover, farmer participation in formal training courses was uncommon. Instead, the survey results indicate that farmers rely primarily on neighbors, family and friends—including neighboring lead farmers—for information about upgrading.

This heavy reliance on farmer-to-farmer spread of upgrading information was consistent across clusters and treatment groups, with the exception of the Malerkotla cluster. Farmers in Malerkotla, by contrast, cited private companies (corporate buyers) and private extension workers as their most important source for upgrading information. If this information is considered alongside 1) the finding that 92 percent of Malerkotla farmers reported that they did not have access to extension and 2) the early departure of ITC from the region, then it is easy to understand why awareness of upgraded practices was lowest in the Malerkotla cluster.

The implication for programming is that farmers can readily learn about upgraded practices from other farmers, thus freeing up valuable extension resources. However, the importance of farmer-to-farmer contact does not negate the need for well-qualified technical and extension personnel to initiate the learning process. The GMED project provided on-the-ground development of new technologies and extensive collaboration with lead farmers centered on numerous demonstration farms. The use of demonstration farms, along with careful development of technical

packages and effective training of extension personnel, were the catalysts that made farmer-to-farmer spread of information possible.

### **C. ADOPTION OF NEW TECHNOLOGIES WAS SIGNIFICANTLY HIGHER WHEN ACCOMPANIED BY SUSTAINED VERTICAL LINKAGES BETWEEN FARMERS AND CORPORATE BUYERS.**

The findings emphasize the importance of the second piece of the program model, namely linking farmers to new market opportunities. Building sustainable vertical relationships is a vital mechanism for driving the development of this value chain. Where these vertical relationships were established and sustained, as in the Medak cluster, there were positive outcomes in terms of farmer adoption of upgraded practices. Where these linkages did not materialize or could not be sustained, such positive outcomes were not observed. Even though the GMED project was generally successful at spreading information about technical innovations and improved cultivation and post-harvest practices, strong vertical linkages proved to be essential for eliciting an upgrading response from farmers.

Taken together, these results help to refine the general program model by clarifying the sequencing between farmer upgrading and the establishment of new vertical relationships. The evidence indicates that linkages to higher value markets must be in place to provide farmers with enough economic incentives to upgrade their production practices. Awareness of improved production practices is a necessary precursor to upgrading, but it is not sufficient to elicit an upgrading response. It is unrealistic to expect farmers to invest in upgrading on the basis of the uncertain possibility of selling to higher value markets in the unspecified future.

Despite the widespread perception that Indian supermarkets have begun to source from small-scale farmers, the survey results indicate very low market penetration by corporate buyers in 2009. This implies that there is a great deal of opportunity for expanding these kinds of market linkages.

### **D. THE GMED PROJECT HAD LIMITED SUCCESS IN CREATING SUSTAINED VERTICAL LINKAGES BETWEEN SMALL-SCALE FARMERS AND CORPORATE BUYERS.**

Project outcomes related to new market relationships were significantly limited due to global economic events, changes in the business and enabling environment and business decisions made by lead firms. The global recession and contraction of the Indian supermarket industry dampened anticipated growth in the number of supermarkets and, subsequently, reduced the volume of transactions between small-scale farmers and corporate buyers. The global recession precipitated ITC's withdrawal from Pune and may have contributed to the breakdown of negotiations between Foodland and Nandani Cooperative in Kolhapur. In Malerkotla, the closing of ITC's direct procurement from farmers was due to unanticipated changes in the business and enabling environment related to regional implementation of the APMC tax. These events were certainly outside the control of the GMED project.

On the other hand, the project's limited success in creating sustained vertical linkages between farmers and corporate buyers points to an inherent risk in the general program model. While the reliance on lead firms to serve as catalysts for change is one of the strengths of the value chain development approach, it can also carry inherent risks in that project implementers lack leverage over large multinational corporations such as ITC. The outcomes of the intervention are dependent on the business decisions of one or more lead firms that are free to move at their own speed (or not at all). This implies the need to create and incorporate mechanisms to manage the risks inherent in this program approach.

## **E. EVEN THE TEMPORARY PRESENCE OF CORPORATE BUYERS WITH TRANSPARENT PURCHASING PRACTICES WAS ENOUGH TO CHANGE TRADING PRACTICES IN THE MANDIS.**

The evaluation revealed an unanticipated but important benefit for small-scale vegetable farmers stemming from changes in the behavior of mandi traders. Transparent linkages between farmers and corporate buyers, even when they were not sustained, broadened farmers' marketing experiences and altered their expectations. Traders in the mandis became aware that vegetable farmers' marketing options were beginning to expand, giving farmers new choices about where to sell and at what price. This loosened the perceived monopsony power of the mandis and, in many instances, had a moderating effect on their dealings with farmers. The potential impact of this change is significant, since the survey confirmed that mandis are the most important market outlet for small-scale vegetable farmers.

In conclusion, based on combined statistical, qualitative, and archival evidence, the program model represented by the GMED project has been shown to be effective in spreading awareness of technologies for process and product upgrading. In the one region where vertical relationships between small-scale farmers and corporate buyers were established and maintained, farmers readily adopted the upgraded practices and benefited from integration into the value chain. The project also appears to have shifted market power in traditional mandis more in the direction of small-scale farmers. However, conditions in the global market and enabling environment constrained project effectiveness and prevented the market linkages component from reaching anticipated scale. Moreover, project effectiveness was limited by business decisions that GMED could not control. If these inherent risks can be managed effectively, then the general program approach represented by the GMED project offers a potentially effective way to integrate small-scale farmers into competitive value chains and facilitate economic growth and the generation of wealth in low-income communities.

# APPENDIX A. EVALUATION METHODS

## A. EVALUABILITY ASSESSMENT

An evaluability assessment (EA) was conducted in July 2005 as the first step in designing the effectiveness evaluation. The researchers interviewed a wide range of individuals in order to better understand the GMED project, to construct and verify causal models for each of the main project components and to discuss the planning, design and intended uses of the evaluation. In addition to designing the effectiveness evaluation, the research team also designed a monitoring and evaluation system for the project.

The evaluation team collaborated with project staff and project partners to develop causal models that clarified the links between project activities, outputs, outcomes and impacts within four major GMED project components: 1) municipal solid waste management, 2) fresh vegetables, 3) organic products and 4) rural financial services. The first three components were selected for evaluation. While municipal solid waste management and organic products were included in the baseline survey, the full effectiveness evaluation concentrated on the fresh vegetable component.<sup>31</sup>

At the time of the evaluability assessment, the GMED project had been in operation for approximately six months and the project interventions were still being finalized. During this time, GMED was in the process of conducting an assessment of the fresh vegetable supply chain. The lead firms to serve as GMED's project partners in the fresh vegetable component had not yet been selected. Therefore, the decision was made to delay the baseline survey until the geographic areas for the implementation of the fresh vegetables interventions could be selected.

## B. LONGITUDINAL SURVEY

### I. SAMPLE DESIGN

The quantitative component was based on longitudinal survey data collected from 712 small-scale vegetable farmers. These farmers participated in two rounds of interviews, which were conducted during the first quarters of 2007 and 2009. The sample was based on a two-stage, cluster design in which the first stage was the random selection of villages from a list of treatment and matched control villages. Sampling frames listing small-scale vegetable farmers were then developed for each of the selected villages. Farmers were randomly selected following a probability proportional to size (PPS) approach, resulting in a self-weighted sample. The distribution of the panel sample across clusters and villages is shown in table 6.

### 2. DATA COLLECTION

The same local research partner (Institute for Human Development, IHD) conducted both rounds of the survey. For details on the questionnaire, enumerator training and field methods, the reader is referred to the attachments. Enumerators were carefully trained and supervised, and they conducted interviews in the local languages. Adherence to quality control procedures during data collection and entry, along with extensive follow-up visits during the second round, resulted in an overall panel attrition rate of only ten percent. The panel attrition rate was ten percent or less for

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<sup>31</sup> The baseline survey collected data on municipal solid waste management (MSWM), fresh vegetables and organic products. GMED discontinued the organics products component in early 2007 and the MSWM component was concluded in December 2007, after exceeding all project targets. For more information on these two components, the reader is referred to the baseline report available at [www.microlinks.org](http://www.microlinks.org).

three of the four clusters and across both the treatment and control groups. Follow-up visits were less effective in the Malerkotla Cluster due to an impending election, resulting in a panel attrition rate there of 16 percent.

**Table 6. Distribution of Panel Sample by Cluster, Village and Treatment Group**

State	Cluster Name	Village	Treatment Households	Control Households	Total Number of Households
Andhra Pradesh	Medak		67	32	99
		Cheerasagar	45	0	
		Anna Sagar	22	0	
		Karkapa	0	32	
Maharashtra	Pune		86	62	148
		Chas	35	0	
		Kalawadi	51	0	
		Bata	0	42	
		Gharagaon	0	20	
	Kolhapur		258	129	387
		Kothali	38	0	
		Nandani	176	0	
		Shirdhan	18	0	
		Udgaon	26	0	
	Tung	0	59		
	Bavachi	0	70		
Punjab	Malerkotla		49	29	78
		Diler Garh	24	0	
		Jamal Pur	22	0	
		Narika Khurd	3	0	
		Narodi	0	29	
<b>TOTAL</b>			460	252	712

### 3. DATA ANALYSIS

Most of the data analysis was based on a 2X4 factorial arrangement of treatments, estimated as a logit model using maximum likelihood procedures within SAS. This approach provides statistical analysis for three types of differences:

- Differences between treatment and control groups (main effect)
- Differences between the four geographic clusters (main effect)
- Interactions between the treatment level and the clusters (interaction effect)

The interaction effect tests the null hypothesis that the difference in treatments is the same for all clusters. In some cases, where there were too few observations and/or the maximum likelihood approach failed to converge after a few iterations, the data were cross-tabulated separately (by cluster and by treatment) and tested with a chi-square statistic. The minimum confidence level for reporting differences between groups is 95 percent ( $p \leq .05$ ).

### C. PROCESS EVALUATION

A process evaluation was conducted in the fall of 2008, just prior to the qualitative field research and as a preparation for the second round of the survey. The purpose of the process evaluation was to provide information on whether project activities were accomplished, how well project activities were implemented, whether the target audience was reached, and how external factors influenced project delivery. Emphasis was placed on determining what outputs

related to vertical linkages and upgrading were produced by the project; how closely the project implementation followed the program model; and ultimately the implications of this for impact findings.

The first step in process evaluation was to conduct archival research by thoroughly reviewing project background documents, including quarterly and final reports and the research plan for the fresh vegetables component of this effectiveness assessment. This was followed by in-depth qualitative interviews with key project and partner personnel in December 2008 (see attachment 1, Process Evaluation Interview Transcripts). The interviews were used to populate a timeline of project activities as actually implemented. The transcripts were then reviewed by the research team and analyzed to understand the implications of project implementation for the findings of the assessment.

## **D. QUALITATIVE FIELD STUDY**

### **I. PROCESSES AND CAUSAL LINKS EXAMINED IN THE QUALITATIVE RESEARCH**

The qualitative field study was conducted in parallel to the quantitative research in March 2009 and was designed to provide insight into the processes by which the project was implemented, as well as the outputs, outcomes and impacts of both the GMED project and the program model. The following specific elements were examined:

- Factors that influence upgrading of small-scale fresh vegetable production in response to changing market demand. Types of technical assistance provided and means of provision.
- Factors that enhance or constrain market access within the fresh vegetable value chain, with a focus on producer linkages to buyers (lead firms, processors, agents, and others).
- Relationship building, including issues related to cooperation among producers and between producers and buyers within the fresh vegetable value chain. Linkages between average farmers and lead farmers.
- The role of vegetable production in household economic portfolios and how household-level decision processes, incentives or constraints affect value chain participation and upgrading.
- Effectiveness of the program model and its impacts at the farmer and value chain levels in terms of raising sales and profits of farmers, reducing poverty and increasing small-scale farmer integration into the fresh vegetable value chain. Satisfaction with the program model.
- Market structures created as a result of GMED operations and factors affecting their perceived sustainability, such as ongoing technical assistance, demonstration and extension work, participation in markets, diversification of market opportunities, and lasting horizontal linkages.

### **2. DATA COLLECTION METHODS**

The qualitative component was conducted in one or more treatment villages in each of the four clusters. The data were gathered through formal interviews, informal interviews, focus group discussions and extensive field observations. There were 28 formal interviews, conducted on the basis of a separate written interview protocol for each of the following four types of informants:

1. Lead Farmers: Farmers specifically identified and trained by GMED or ITC staff. New technologies and improved cultivation practices were demonstrated on their farms.
2. Average Farmers: Farmers involved in vegetable cultivation or with an interest in diversifying into such cultivation who usually had smaller land holdings than the lead farmers.

3. Extension Agents who were employed by either GMED or ITC.
4. Lead Buyers who were employed by ITC or other large corporate buyers involved in the emerging supermarket business.

The distribution of formal interviews across the four clusters is indicated in table 7. In addition to interviews with individuals, two focus group discussions were conducted with farmers, one in Nandani and one in Pune.

**Table 7. Distribution of Formal Interviews in Qualitative Component**

State/Cluster	Informants for In-depth Interviews
<b>Maharashtra</b>	
Kolhapur Cluster	1 head of Nandani Cooperative 3 average farmers in Nandani 3 lead farmers <sup>32</sup> in Nandani (these were also extensions agents)
Pune Cluster	1 lead buyer in Pune 1 extension agent, Pune 3 average farmers in Pune cluster 3 lead farmers in Pune cluster
<b>Andhra Pradesh</b>	
Medak Cluster	2 average farmers in Nawabpet 1 depot collection manager in Nawabpet 1 extension agent in Anna Sagar 1 lead buyer in Anna Sagar 2 lead farmers near Anna Sagar 2 average farmers near Anna Sagar
<b>Punjab</b>	
Malerkotla Cluster	1 lead farmer in Malerkotla cluster 2 average farmers in Malerkotla 1 representative of lead buyers in Malerkotla

Most of the farmer interviews were conducted at the farmer's fields. In Andhra Pradesh, interviews were conducted primarily in Telegu supported by Hindi (and some English). In Maharashtra and Punjab, interviews were conducted in formal Hindi and the local dialect. Interviews were digitally recorded and later transcribed into English. The focus group discussions were also conducted in the local languages, recorded and transcribed.

Considerable time was devoted to observing the functioning of various marketing channels, as well the innovative technologies and modern cultivation methods introduced by project. In addition to the above interviews and focus groups, discussions were held with stakeholders outside the informant groups in order to better understand operational issues inherent to the program model. In Andhra Pradesh the Procurement Manager of ITC Hyderabad, managers of two Choupal Fresh retail outlets<sup>33</sup> and the manager of the ITC Hyderabad Choupal Fresh warehouse were interviewed. The team met with the President of the Andhra Grape Growers Association to discuss the potential for creating horizontal linkages among fruit and vegetable farmers. In Pune, the team had a meeting with the manager of the last remaining ITC Choupal Fresh (which is planning to close) and the Procurement Manager for Reliance Fresh. In Punjab, the Manager of *Khet Se* (a fresh fruit and vegetable collaboration between the Tata Group and an Irish based company) and the Procurement Manager of Reliance Fresh were interviewed.

<sup>32</sup> Lead farmers were designated by the project to demonstrate new methods of production to other farmers. The title was changed to "model" farmers to reflect the manner in which they were perceived in the field.

<sup>33</sup> Choupal Fresh is a fresh food wholesale and retail business owned by ITC.



# APPENDIX B. FRESH VEGETABLE PROJECT ACTIVITIES

Outputs	Medak Cluster, Andhra Pradesh	Kolhapur Cluster, Maharashtra	Pune Cluster, Maharashtra	Malerkotla Cluster, Punjab
Training materials developed	<ul style="list-style-type: none"> <li>• Training aids for post-harvest techniques, pest controls and seedling production (early 2007)</li> <li>• Vegetable crop management guides for lead farmers and extension agents (mid-2007)</li> <li>• Rewriting GMED training materials to make them easier to translate into local languages (Summer 2007)</li> <li>• Video training materials on nursery and seedling production; soil preparation and formation of planting beds; installation of shade netting and drip irrigation/fertigation tape; vertical production facilities and techniques; and harvest and post harvest operations (Spring 2008)</li> <li>• Translation of technical bulletins on various vegetables (Spring 2008)</li> <li>• Translation of ACDI/VOCA's Farming as a Business curriculum from English to Hindi (Spring 2008)</li> </ul>			
Farmers trained in new production technologies, quality standards and post-harvest processes	131 affiliated farmers*	1,921 affiliated farmers* <sup>34</sup>	315 affiliated farmers*	299 affiliated farmers*
Extension agents trained in new production technologies, quality standards and post-harvest processes	<ul style="list-style-type: none"> <li>• Fall 2005: GMED began providing the services of 3 agricultural specialists to ITC</li> <li>• Early-to-mid-2006: GMED staff and consultants worked with ITC field staff in the production clusters to train the ITC personnel and strengthen the ability of lead farmers to transfer the practices to other farmers (281 farmers total in the 3 states)</li> </ul>			
	<p>Fall 2006: GMED conducted a half-day training in Hyderabad in crop planning and scheduling for ITC management and field personnel</p> <p>Early 2007: GMED provided weekly training sessions with ITC and extension agents on fertilization and pest control</p> <p>Summer 2007: GMED conducted crop planning and scheduling training for ITC Hyderabad staff</p>	<p>Early 2007: Training was provided to 3 Nandani Cooperative staff and 9 GMED extension agents in production and post-harvest practices</p> <p>Spring 2007: ITC and GMED introduced new technologies at Nandani cluster farms</p>	<p>Summer 2006: Post-harvest training for field personnel of Deepak Fertilizer</p> <p>Early 2007: GMED staff conducted a half-day workshop for ITC extension agents</p>	<p>Summer 2006: Post-harvest training conducted for ITC Chandigarh field personnel</p> <p>Fall 2007: By the end of the year, GMED had trained 35 ITC extension agents</p>
Demonstration plots established	<p>2006: Demonstration plots established</p> <p>October 2007: 5 new</p>	<p>Summer 2007: 2 Demonstration plots established</p>	<p>2006: Demonstration plots established</p>	<p>2006: Demonstration plots established</p> <p>Early 2007: 4 brinjal</p>

<sup>34</sup> Note: There were also 212 farmers in Kamlapur, Maharashtra state, a cluster that was not included in this study.

	demo plots established for exotic vegetables  Spring 2008: Demo plot installed in Anna Sagar	Fall 2007: 1 new demo plot established  March 2008: 1 new demo plot established (tomatoes)	Summer 2007: 3 demo plots established for exotic vegetables  Fall 2007: 6 demo plots established (includes 5 for exotic vegetables)	demo plots established
Collection centers established	Mid-2006: ITC collection center construction began		Summer 2005: GMED helps Godrej Agrovet establish one near Mumbai (Ranjini)  Mid-2006: ITC collection center construction began	Mid-2006: ITC collection center established at Chandigarh  Summer 2006: 4 ITC collection centers established at Jamalpur and Diler Garh, Narika, Sohain
Memoranda of understanding signed with buyers	November 2005: MOU with ITC	October 2007: MOU with Foodland signed	November 2005: MOU with ITC  Fall 2005: Agreement in principle with Godrej Agrovet	November 2005: MOU with ITC
Commitments made by farmers, farmers' groups, and buyers to comply with the specifications of new business models linking farmers to corporate buyers	Summer 2006: ITC procuring 2.5MT per day from AP clusters  Fall 2007: ITC procured 156MT of vegetables during the quarter  Spring 2008: 220 farmers supplying 10 ITC outlets in Hyderabad		Summer 2006: ITC procuring 5MT per day from Pune clusters	Summer 2006: ITC procuring 2.5MT per day from Punjab clusters  Spring 2007: Average ITC procurement 1MT per day  June 2007: ITC procurement ceases

Source: GMED project reports