ANALYSIS OF THE INTEGRATION OF MSES IN VALUE CHAINS:

TANZANIA RESEARCH PROTOCOL

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GLOSSARY

AIMVC Analysis of the Integration of MSEs in Value Chains

AMAP	Accelerated Microenterprise Advancement Project
BDS	Business Development Services
BRC	British Retail Consortium
EPA	United States Environmental Protection Agency
EU	European Union
EUREPGAP	Euro-Retailer Produce Working Group's Good Agricultural Practices
FDA	United States Food and Drug Administration
GEL	Gomba Estates, Ltd.
MSE	Micro- and Small Enterprise
RDS	Respondent Driven Sampling
SPS	Sanitary and Phyto-sanitary Standards
ULU	Ubiri Lushoto Fruit and Vegetable Cooperative Society
USAID	United States Agency for International Development

TABLE OF CONTENTS

I. INTRODUCTION 1

II. RESEARCH FRAMEWORK 2
A. HYPOTHESES 2
1. Vertical Relationships 2
2. Horizontal Relationships 2
3. Firm-Level Upgrading by MSEs 2
B. DEFINITIONS 2
1. General Value Chain Definitions 2
2. Definitions Specific to Tanzania and Horticulture 4

III. RESEARCH CONTEXT 8
A. INTRODUCTION 8
B. QUALITATIVE FINDINGS 8
C. TANZANIAN HIGH-VALUE EXPORT VEGETABLE VALUE CHAIN 10
1. Value Chain Map 10
2. Upgrading Opportunities 10
3. Governance and Vertical Relationships 13
4. Risks and Expected Returns 14

IV. DESCRIPTION OF THE EMPIRICAL APPROACH 16
A. PURPOSE AND CONTENT 16
1. Population 16
2. Overall Sample 16
B. SAMPLING STRATEGY 17
1. Member Sample 17
2. Non-Member Sample 18
3. Respondent Driven Sampling (RDS) 18
4. Previous Applications of RDS 19
5. Use of RDS to Generate Non-Member Samples 20
C. DATA CODING 26
D. PILOT TEST 26
E. DATA ENTRY AND ANALYSIS 27
F. LOGISTICS AND EXECUTION SCHEDULE 28

REFERENCE LIST 29

APPENDIX A: TANZANIA High value vegetable VALUE CHAIN MAP 30
APPENDIX B: DETAILED RESEARCH HYPOTHESIS 31
APPENDIX C: INSTRUCTION MANUAL FOR FIELD SURVEYORS 34
APPENDIX D: PRODUCER QUESTIONNAIRE 35

RESEARCH PROTOCOL FOR TANZANIA FIELD STUDY ANALYSIS OF THE INTEGRATION OF MSES IN VALUE CHAINS AMAP BDS KNOWLEDGE AND PRACTICE

I. INTRODUCTION

Many USAID programs have the two-fold objective of achieving improved economic growth, while at the same time reducing poverty. One strategy for promoting broad-based economic growth is to harness the growth potential of large numbers of micro and small enterprises (MSEs) and integrate them into productive value chains. The overall vision for the AMAP BDS Knowledge and Practice project is to promote the development of MSEs and to increase their participation in productive economic sectors at the local, national, regional, and/or global levels: "AMAP BDS is about creating wealth in poor communities and promoting economic growth by sustainably linking large numbers of MSEs into productive value chains."

The purpose of the Analysis of the Integration of MSEs in Value Chains (AIMVC) field studies is to better understand how MSEs are integrated into productive value chains and the effects of this integration on both MSEs and value chains. The outcome of this research will be important in developing strategies for promoting more effective linkages of MSEs into productive value chains. The primary focus of the research is to develop a better understanding of the following:

- The factors influencing MSE owners' decisions to participate in value chains and upgrade their businesses in ways that enhance their competitiveness (i.e., real and perceived opportunities, barriers, risks, benefits, and costs).
- The relationships between MSEs and other firms in the value chain, both vertically and horizontally.
- The effects of interfirm relationships on the structure and competitiveness of the value chain.

This focus has been translated into a set of research hypotheses, which are presented in the next section. In addition to contributing to knowledge about the integration of MSEs into value chains, the AIMVC research will also help to advance new methodological approaches to data collection and analysis, by developing and testing a sampling approach for reaching hard-to-locate populations. This sampling approach is discussed in more detail in the description of the empirical approach in section IV of this document.

II. RESEARCH FRAMEWORK

A. HYPOTHESES

The field research will test three groups of hypotheses. The first group relates to factors affecting vertical relationships between firms at different levels in the value chain. The second group relates to factors affecting horizontal relationships between firms at the same level of the value chain. The third group of hypotheses relates to factors affecting firm-level upgrading by MSEs. A basic statement of these research hypotheses is provided below. A more detailed version is included in appendix B. Conceptual definitions and definitions that are specific to the research context are provided in the following section B.

1. Vertical Relationships

- Risk in vertical relationships can be reduced by strengthening governance.
- Trust in vertical relationships can be increased by improving information.
- Lead firms will be more willing to form vertical relationships with MSEs if the transaction costs can be reduced.

2. Horizontal Relationships

- MSE owners will be more willing to form horizontal relationships if the transaction costs can be reduced.
- Trust in horizontal relationships can be increased through organizational innovation and improvements in human capital.
- Social capital plays an important role in influencing horizontal relationships between MSEs.

3. Firm-Level Upgrading by MSEs

- MSE owners base their upgrading decisions on their assessments of the risk-adjusted returns to upgrading.
- Upgrading can be encouraged by strengthening the linkages between firms.
- Lack of information is a critical barrier to upgrading.

B. DEFINITIONS

1. General Value Chain Definitions

Buyer Firms ("Buyers"): Firms that buy the product for resale, including firms that buy the product from MSE producers. Buyer firms may resell the product in national and/or international markets. These firms may also participate in activities at other levels of the value chain, including supplying raw materials and production.

Governance: The patterns of vertical relationships between firms in a value chain, which are characterized by a) the level of control that one firm exercises over another and b) the flow of information between firms. The three general types of governance, in order of increasing strength, are the following:

Market Relationships: Arms-length transactions with little information exchange between firms.

Network Relationships: Some firms in the chain exert a degree of influence or control over the operations of other firms, information flows between firms are more extensive, and suppliers supply products according to buyers' specifications.

Hierarchical Relationships: Value-added functions are vertically integrated under the ownership of a single firm.

Horizontal Relationships: Market and non-market interactions between firms operating at the same level of the value chain. Horizontal linkages among MSEs can take the form of formal or informal groups, as well as networks that are managed through a third party (e.g., lead firm, broker, trader). Similarly, cooperation among larger firms can be important for creating industry standards, developing marketing campaigns or lobbying.

Household Economic Portfolio: This is the synchronization of the household's full set of production, consumption, and investment activities, given the set of available resources and the house-hold's economic goals.

Input Suppliers: Firms that provide raw materials and inputs used in production.

Lead Firms: Firms that play central roles in the value chain and are involved in a significant percentage of total sector sales or value added. Because of their market share, they have an effective influence on governance patterns within the value chain and have incentives to invest in upgrading opportunities along the chain.

MSE Producers: Firms at the production level of the value chain with fewer than 25 full-time and part-time employees. MSE producers in the Tanzanian HVEV value chain are smallholder farmers. In order to be included in the population for this study, MSEs producers need to be either currently producing vegetables in the agro-climatic zones where HVEV can be grown or have produced and sold vegetables in these zones during the past twelve months.

Profits: Also known as net returns, these are the payments made to the firm for its products and/or services (revenues) minus the firm's cash and in-kind expenses (costs).

Retailers: Firms that sell the product to final consumers.

Risk-Adjusted Return: In the most narrow sense, this is the projected returns (profits) adjusted for the probability of losses associated with upgrading investments under conditions of uncertainty. In the broader sense, risk-adjusted return encompasses attributes in addition to profit and risk, which are weighted to reflect the importance of each attribute to the decision maker.

Risks: These are the chances of incurring losses not only in terms of profits, but also in terms of assets, household consumption flows, social capital, and business relationships.

Social capital: The institutions, relationships, attitudes, and values that govern interactions among people; norms and networks that facilitate collective action. A high level of social capital is generally seen as a positive asset, since it can lead to more productive communities through higher levels of trust and shared information, lower transaction costs, and greater networking. However, it is possible for social capital to divide a community and exclude outside groups.

Suppliers: Firms that sell the product to other firms.

Sustainability: This concept includes the implications of the decision for future income flows, continued market access, long-run opportunities, and future economic security.

Trust: Willingness to expose oneself to risk in a business agreement with another person or firm.

Transaction Costs: Non-price costs associated with a transaction, including the costs of gathering information, the costs of negotiating a contract, and the costs of enforcing the terms of a contract.

Upgrading: Innovation that increases value added. There are five specific categories of upgrading:

> **Process upgrading** is an increase in production efficiency, which results in either greater output for the same level of inputs or the same level of output from fewer inputs. Process upgrading reduces the cost of production and may be attributable to improved organization of the production process, such as better farm management, or by the use of an improved technology, such as the use of drip irrigation compared to furrow irrigation.
>
> **Product upgrading** is a qualitative improvement in the product that makes it more desirable to consumers, such as a more tasty or healthy vegetable. As used here, "quality" is defined very broadly to include any extrinsic, intrinsic, tangible, or intangible changes that result in the product being able to command a higher final price.
>
> **Functional upgrading** is the entry of a firm into a new, higher value-added level in the value chain. This moves the firm closer to the final consumer, requires the firm to take on new functions, and positions the firm to receive a higher unit price for the product.
>
> **Channel upgrading** is the entry of a firm into a pathway that leads to a new, higher value-added end market in the value chain, such as a pathway leading to local, national, regional, and/or global end market. Firms may operate in one or more market channels at the same time.

Value Chain: Describes the full range of services and activities that are required to bring a product from its conception to its end use, including activities such as design, production, marketing, distribution, and support to the final consumer. The activities that comprise a value chain can be contained within a single firm or divided among different firms. Value chain activities can be contained within a single geographical location or spread over wider areas.

Vertical Relationships: Market and non-market interactions between firms operating at different levels of the value chain. Relationships between MSE producers and their buyers are an important example of vertical relationships. Vertical linkages are critical for moving a product from inception to the market and for transferring benefits, learning and embedded technical, financial and business services from firms up the chain to firms down the chain or vice versa.

Wholesalers: Firms that do not produce the product and do not sell to the final consumer. In the most direct case, these firms buy from MSE producers and sell to retailers. Examples include exporters, distributors, brokers, and intermediaries.

2. Definitions Specific to Tanzania and Horticulture

BRC: British Retailer Consortium (BRC). The BRC is the lead trade association representing the whole range of retailers, from the large multiples and department stores through to independents. In 1998 the BRC developed and introduced the BRC Food Technical Standard to be used to evaluate manufacturers of retailers own brand food products. The majority of UK and Scandinavian retailers will only consider business with suppliers who have gained certification to the appropriate BRC Global Standard.

Brokers: Firms that operate at the wholesale level in the domestic market channel. Brokers receive products from suppliers on consignment and resell the products at the wholesale level (e.g., to wet market intermediaries) or at the retail level. Brokers pay the suppliers (usually farmers) after the products are sold and the brokers' costs plus fees are deducted. Unsold products are returned to suppliers. Brokers can be observed in Kariakoo market (Dar es Salaam), where farmers bring produce to brokers' drop-off points.

Certification: A validation process, usually performed by a third-party authorized certification individual or agency, indicating that specific practices are being followed with respect to SPS, organic production practices, labor practices, environmental practices, bioterrorism security measures, etc.

Channel "Natural" Irrigation: Gravity-based "natural" irrigation is used only in mountainous areas. Water flowing down the mountain is diverted into a system of channels that can be opened or blocked to flow into selected fields. When a farmer's field is receiving water, he or she uses a hoe to open and close temporary rivulets to reach all of the crops in the field. This is more efficient than furrow and pan irrigation, but still leads to high levels of soil and nutrient loss. Note that this type of irrigation requires group action. The group maintains the main channels and selects a "captain" whose job it is to select the irrigation schedule (who gets water on which days).

Dalali: Local term for an intermediary or broker.

Distributors: Firms that, as a sole or main business, sell to retail-level firms, including supermarkets, hotels, and restaurants. Distributors may buy from intermediaries, from brokers, or directly from farmers. Distributors usually provide retailers with a full range of fruit and vegetables, so they may supplement locally grown products by importing products from countries in the region, such as Kenya and South Africa.

Drip Irrigation: The most efficient irrigation method is drip irrigation. Once it is installed it does not require much labor input. It conserves water and results in very low soil and nutrient loss as well as reducing moisture-related plant diseases). Drip irrigation is very expensive to install.

EurepGAP: EurepGAP started in 1997 as an initiative of retailers belonging to the Euro-Retailer Produce Working Group (EUREP). It has subsequently evolved into an equal partnership of agricultural producers and their retail customers to develop widely accepted standards and procedures for the global certification of Good Agricultural Practices (GAP). EurepGAP was driven by the desire to reassure consumers. Following food safety scares such as BSE (mad cow disease), pesticide concerns and the rapid introduction of GM foods consumers throughout the world are asking how food is produced; and they need re-assuring that it is both safe and sustainable.

Exporters: Firms that sell to buyers outside of Tanzania.

Foreign Distributors: Firms located outside of Tanzania that buy from Tanzanian exporters or from European wholesalers and sell to supermarkets in the UK and Europe.

Furrow and Pan Irrigation: The most common type of irrigation used by smallholder commercial vegetable producers. It involves using a pan to manually throw water from irrigation ditches to crops. It has low efficiency due to high labor input and high evaporation levels.

Good Agricultural Practices (GAP): GAP is a guideline, generally established at the national level, to ensure a clean and safe working environment for all employees while eliminating the potential for contamination of food products. GAP addresses issues of site selection, adjacent land use, fertilizer usage, water sourcing and usage, pest control and pesticide monitoring, harvesting practices (including worker hygiene, packaging storage, field sanitation and product transportation) and cooler operations.

High-Value Export Vegetables (HVEV): For the purpose of this study, HVEV are defined as a group of vegetables that share similar production and market characteristics: snow peas, sugar snap peas, French green beans, baby corn, baby carrots, patty pan squashes, baby leeks, broccoli, cauliflower, and zucchini. These vegetables are typically grown in higher altitude, temperate (cool climate) zones and have export potential. Most of these vegetables are not traditionally consumed by the Tanzanian population.

A table listing the commonly grown Tanzanian vegetables is found on page 8, along with the names of the vegetables in Kiswahili. The HVEV are highlighted in blue. Many of the Kiswahili terms regularly used are a pigeon of the English name, as many of these vegetables are new to the area and do not have traditional names. This is especially true of the less traditional HVEV, for which smallholders commonly use the English names (e.g., snow peas, sugar snap peas).

Intermediaries: Firms that operate at the wholesale level. In contrast to brokers, intermediaries take ownership of the product at the time they receive it. Intermediaries may buy directly from farmers or from other intermediaries, such as from intermediaries located in local and regional wet markets. Intermediaries sell to other intermediaries, distributors, or firms at the retail level. Some intermediaries operate from fixed locations in wet markets.

Medium and Large Vegetable Farmers: Farmers who grow and sell vegetables, with a total cultivated area of more than 10 acres or 4 hectares.

Packing House: A plant for processing and packaging vegetables.

Producer Groups: Producers groups are associations, cooperatives, or clubs of producers that have a specific commercial mission such as aggregating for sales or transport, growing for specific retailers, achieving economies of scale, sharing best practices, financing, etc.

Sanitary and Phyto-Sanitary (SPS) Standards: Requirements and preferences related to protecting the health and safety of the consumer. These include the absence of harmful chemical residues and microbiological contaminants (e.g., E. coli). Some of the more important sanitary and phyto-sanitary standards for exports are the EUREPGAP standard, for export to the EU, and the BRC standards, for export to the UK.

Smallholder Commercial Vegetable Farmers: Farmers who grow and normally sell vegetables, with a total cultivated area of 10 acres (4 hectares) or less at any time (National Bureau of Statistics Tanzania 2002, table 5.10).

Wet Markets: Traditional market places, usually open-air, in which both wholesale and retail sales occur. At the wholesale level, farmers, brokers, and intermediaries sell their products to other intermediaries or to retail vendors. At the retail level, market vendors sell to final consumers. Wet markets can be found throughout Tanzania, with the larger markets near population centers or trade hubs. The largest wet market in Tanzania is Kariakoo market in Dar es Salaam. Also in Dar es Salaam are two smaller wet markets that specialize in high-value vegetables and cater to the foreign residents and resident minority populations (i.e., Indian, Chinese and European): Kisutu and Kinondoni TX.

List of Vegetables Grow in the Northern Highlands of Tanzania

English and Kiswahili Terms for Vegetables	
English Term	***Kiswahili Term***
Amaranths	Muchicha/Mnavu
Baby Carrots	Karoti changa
Baby Corn	Mahindi changa
Beans (dry)	Maharagwe
Beet Root	Viazi vya kungeza damu
Bell Peppers	Pili pili hoho
Broccoli	Brokoli
Brussel Sprout	
Cabbage	Kabeji
Cachucha Peppers	Pili pili mbuzi
Carrots	Karoti
Cauliflower	Kobi maua
Celery	Selari
Chinese vegetables	Chinese
Collards	Sukuma wiki
Corn	Mahindi
Cucumber	Tango
Eggplant (Brinjal)	Biringanya
French Green Beans	Maharage machanga
Garden Peas	Njegere
Green Beans	Uwalu / green beani / ngeleshi
Hot Peppers (long)	Pili pili kali
Leeks	Kitunguu / Liki
Lettuce	Saladi / Lettuci
Okra	Bamia
Onion	Kitunguu
Parsley	Paseli
Patti Pan Squashes	Maboga
Pigeon Peas	Mbaazi
Potatoes (Irish)	Viazi mviringo
Red cabbage	Kabeji nyekundu
Snow Peas	Njegere
Squash	Maboga
Sugar Snap Peas	Njegere
Sweet peppers	Pili pili tamu
Sweet potatoes	Viazi vitamu
Tomatoes	Nya nya
Turnips	Balungi
Zucchini/Baby Marrow	Mamunya

III. RESEARCH CONTEXT

A. INTRODUCTION

Tanzania is the second country to be studied under the AIMVC project. It is one of the poorest countries in the world and has a population of 38 million. The economy depends heavily on agriculture, which accounts for almost half of GDP, provides 85 percent of exports, and employs 80 percent of the work force. Topography and climatic conditions, however, limit cultivated crops to only 4 percent of the land area. Some 28 million Tanzanians live in rural areas, which is approximately 5 million rural households. Of these households, only one in five is likely to be growing vegetables with the purpose of selling them. Rural households engaged in the sale of cash crops are less likely to be poor than those engaged in food crop production (World Trade Organization 2005, vol. I p. 4).

The most lucrative cash crops are those grown for the export market. The Tanzanian value chain for high-value export vegetables (HVEV) is relatively small and undeveloped. There are few producers, a tiny domestic market, and only two exporters. On the other hand, there are approximately one million smallholders engaged in commercial vegetable production and many of these are located in the cooler highland areas, which are most suitable for growing HVEV. In addition, there is ample arable land and water for irrigation in the appropriate agro-climatic areas. This value chain has been identified in several recent donor studies as having high potential for development.

The survey research focuses on the barriers and opportunities for growth for MSEs in the horticultural sector, specifically looking at the potential for MSE upgrading and participation in the HVEV market. The survey research also looks at the effects of social capital and trust, information, and risk preferences on business relationships and decisions to upgrade. Preliminary fieldwork has provided considerable background information on the horticulture value chain, the firms in this value chain, and how the firms relate to each other. Some of this background information is presented in this section, including a value chain map for the sector and a discussion of upgrading opportunities, vertical relationships and horizontal relationships. In addition, a set of context-specific definitions is provided for the value chain in general and horticulture in particular.

B. QUALITATIVE FINDINGS

An initial qualitative assessment of the value chain was undertaken in December of 2005. The primary purpose of the activity was to develop a detailed understanding of the factors and conditions affecting smallholder producers within the context of the high-value vegetables value chain in Tanzania. The study team collected information through document review and qualitative field methods, including: individual interviews of value chain participants and experts; group interviews of smallholder vegetable producers; and direct observations of wet markets, supermarkets, packing houses, and smallholder farms.

During the field work, the following high-value vegetables with similar agro-climatic requirements and known export potential were emphasized:

Snow Peas	Zucchini	Patti Pan Squashes	Baby Carrots	Sugar Snap Peas
Baby Corn	Broccoli	French Green Beans	Baby Leeks	Cauliflower

As illustrated in the value chain map (appendix A), the Tanzanian HVEV value chain consists of two main market channels: 1) the smaller domestic market, which is located primarily in Dar es Salaam and includes hotels, supermarkets, and retail outlets and 2) the larger export market, which includes the UK and other EU countries.

The vegetables are grown by small, medium, and large (integrated) farmers, with almost all current production taking place in the Arusha-Moshi area. Firms in the value chain include input suppliers, producers, farmer associations, distributors, wet market wholesalers and retailers, hotels, supermarkets, two major exporters, international distributors, international wholesalers, and supermarkets in the EU.

Through extensive interviews with participants at all levels of the value chain, several field observations were made:

1. The total volume of high-value vegetables exported from this value chain is relatively small compared to other Sub-Saharan countries. There are only two exporting firms in Tanzania, compared to several hundred firms in Kenya. Current annual exports probably do not exceed 4,400 tons.
2. These high-value vegetables are not generally consumed by the Tanzanian population, with cauliflower and zucchini being possible exceptions. There is a small domestic demand from expatriate and minority (i.e., Indian, Chinese, European) populations in Dar es Salaam and from the hospitality industry. Although the exact value of annual domestic consumption is not known, it can be roughly estimated to be between 130 and 160 tons.
3. Tanzania has plentiful land and water for growing these vegetables. Appropriate agro-climatic zones can be found in the northern and southern highlands of Tanzania, including areas near Arusha, Moshi, Lushoto, Morogoro, and (possibly) Iringa. While these regions are served by good quality trunk roads, air cargo capacity from the Kilimanjaro and Dar airports is limited.
4. Currently, there are not many smallholders who grow these vegetables. Smallholders do not normally plant these vegetables unless they already have an agreement with a buyer. The majority who do grow these vegetables are linked to exporters, with a few linked to the domestic market. Only one of the two exporters, Gomba Estates Ltd. (GEL), currently buys from smallholders, having just begun to work with smallholders in 2005. As of December 2005, GEL was linked to about 275 smallholder households, with immediate plans to expand to about 800 households.
5. There are potentially a large number of smallholder vegetable producers who would be willing and able to grow these high-value vegetables. Approximately one million smallholders currently produce vegetables for commercial purposes, and many of them live in areas where HVEV can be grown. Farmers in these areas are generally interested in export markets and eager to enter into contract farming arrangements. Both farmers and extension agronomists indicate that it takes no more than one to two growing cycles for farmers to learn how to cultivate new types of vegetables.
6. Smallholder farmers are receptive to forming horizontal linkages for marketing, transportation, information and technology transfer, contracting, service provision, and shared labor. The field team learned of several existing linkage models, including 1) GEL's outgrower model; 2) Faida MaLi's market linkage facilitation model; 3) farmer association models used by ULU, Lishe Trust, and DAI PESA; and 4) Kenya's lead farmer-satellite farmer model.
7. In order for smallholders to produce for export markets, they will need to increase their compliance with costly sanitary and phyto-sanitary (SPS) standards. Because of the relatively small scale of their revenues, smallholders will have difficulty absorbing the full cost of obtaining EUREPGAP certification. These costs include high initial investment costs, plus annual maintenance and certification renewal costs (An expert informant estimated the annual certification costs to be between USD $1,500 and USD $5,000 per farm).

C. TANZANIAN HIGH-VALUE EXPORT VEGETABLE VALUE CHAIN

1. Value Chain Map

The value chain map for Tanzanian high-value export vegetables, which is provided in appendix A, indicates the four basic levels of the value chain: 1) input supply, 2) production, 3) wholesale, and 4) retail. The value chain consists of two main market channels: 1) the smaller domestic market, and 2) the larger export market, which sends to the UK and other EU countries. The vegetables are grown by small, medium, and large (integrated) farmers, with almost all current production taking place in the Arusha-Moshi and Lushoto areas. Firms in the value chain include input suppliers, producers (farmers), farmer associations, intermediaries, brokers, distributors, wet market wholesalers and retailers, hotels, supermarkets, two major exporters, international distributors, international wholesalers, and supermarkets in the EU.

The domestic market channel includes hotels, supermarkets, and wet market retail outlets, primarily in Dar es Salaam. Most of the vegetables arrive to the Kariakoo wet market and are distributed from there to hotels, supermarkets, or smaller specialty wet markets, such as Kisutu and Kinondoni TX markets. The products may reach the retail level through brokers, regional distributors, and intermediaries. Sometimes, farmers sell directly to supermarkets and hotels through their associations or they may sell directly to the retailers in wet markets.

The Tanzanian population does not generally consume these HVEV, with cauliflower and zucchini being possible exceptions. There is a small domestic demand from expatriate and minority populations (i.e., Indian, Chinese, European) in Dar es Salaam. There is also some demand from the hospitality industry, primarily tourist hotels and ethnic restaurants. Although the exact value of annual domestic consumption is not known, it can be roughly estimated to be between 130 and 160 tons.

In the second market channel, the HVEV are exported and sold in retail outlets in the United Kingdom and Europe. India, China, and the Middle East a growing export markets, but they remain primarily focused on other agricultural commodities such as cashews, coffee, and tea. Exporters may sell either through UK/EU distributors or through wholesalers. From interviews and export data collected in the qualitative study, the field team estimated that current annual exports do not exceed 4,400 tons. However, these exports may be underestimated due to sales to Kenyan intermediaries, which are then exported as Kenyan produce.

Exporters source their products from three different types of farms:

1. Exporters' own farm units, ranging from 50 to 100 hectares in size, which are vertically integrated into the export firm.
2. Medium and large outgrowers who grow vegetables under contract to the exporter.
3. Smallholder farmers who sell to exporters through some type of intermediary or group in order to reduce transaction costs. (At the time of the qualitative study, one of the two exporters was buying products from smallholders, with current links to several hundred smallholder producers and plans for immediate expansion.)

It does not appear that there are many smallholders who grow these vegetables, with the exact number probably less than 1,000 smallholders. The survey for this study will include existing HVEV growers as well as the smallholders with the potential to upgrade to HVEV. Tanzanian smallholders do not normally plant HVEV unless they already have a sales agreement with a buyer in either the domestic or export market.

2. Upgrading Opportunities

Upgrading is the process of adding value to a product. There are three types of upgrading that will be examined in this study: process upgrading, product upgrading, and functional upgrading.

a. Process Upgrading

Process upgrading involves improvements in the efficiency of the production process, which leads to greater production for the same amount of inputs (or the ability to produce the same amount of production using fewer inputs). Firm owners in the HVEV value chain identified three types of process that are needed to improve the efficiency of smallholder vegetable production:

- Use of improved inputs, including hybrid seeds and agrochemicals.
  Use of improved inputs is inhibited primarily by lack of capital, but there is also a low level of understanding about the value of improved seeds and about the proper handling of pesticides. The majority of HVEV seeds in Tanzania are imported, but they are very expensive for local farmers. Many seed distributors have difficulty planning three or four years in advance of demand, since the production of vegetable seeds requires two growing seasons. Seed availability within Tanzania can be poor for some types of vegetables, particularly for the HVEV. Additionally, farmers often do not know the cultivation practices associated with new types of seeds. Farmers may also lack training on the use of chemicals and pesticides and can often ruin crops with improper application. Fertilizer use is generally low. Associations play an important role in giving farmers an opportunity to share farming techniques and new varieties of crops.

- Use of more efficient irrigation methods.
  With rain-fed agriculture, production is seasonal. Farmers who have irrigation can produce vegetables on a year-round basis. The three types of irrigation commonly found are furrow and pan, natural or channel irrigation, and drip irrigation. A detailed description of these irrigation techniques can be found in the definitions in section II above. Pan irrigation, the process of throwing water onto crops from a pan, is the most widely practiced form of irrigation, as well as the most inefficient from the perspective of both labor and evaporation.

- Improved transportation and infrastructure.
  Transportation is a critical constraint in getting HVEV to the market. The majority of smallholder farmers that do not belong to an export association sell their produce to aggregators at the farm gate, or ride the bus or rent space in unrefrigerated trucks to take their produce to the Dar es Salaam or the Nairobi market and to bring produce to sell back from those markets. The smaller associations use unrefrigerated trucks to take produce to Dar overnight when it is cooler. Horticulture exporters (e.g., GEL, Serengeti Fresh, and Kilihortex Ltd.) fly produce out through Kilamanjaro International Airport (KIA) in Arusha. Cold storage and freight facilities are provided through Swissport. Swissport shipped approximately 2,000 tons of produce through KIA in 2005. However there are severe constraints since only one airline, KLM, flies directly to Europe and there is not enough freight capacity. Often produce needs to be sent by refrigerated trucked to Dar or Nairobi for flights to Europe. Both international airports at Dar and Nairobi have cold storage facilities, although the Dar facilities need additional capacity.

b. Product Upgrading

Product upgrading is the process of improving product quality or changing the product to meet specific market needs. During the qualitative study, several opportunities for product upgrading within the Tanzanian HVEV value chain were observed:

- Cultivation of higher value-added crops.
  A key type of product upgrading is for smallholders to begin cultivating HVEV for the first time. These crops can be sold at higher prices than the vegetables traditionally grown by smallholders (e.g., tomatoes, onions, cabbage, greens). However, the opportunities to market HVEV are limited. Like most farmers, Tanzanian farmers are risk averse, and will only change crops when they have a contract with a specific buyer rather than risk losing money in an uncertain market – particularly when it can take two to three growing seasons to learn to grow a crop properly. Local associations, such as FAIDA MaLi, encourage farmers to diversify crops so that they are not dependent on a single buyer.

- Adoption of sanitary and phyto-sanitary standards.
  An important issue for the expansion of the Tanzanian HVEV is the need to increase sanitary and phyto-sanitary (SPS) standards in order to be able to participate in the export market. Since the safety of a vegetable cannot be readily observed from visual inspection, the main ways to verify food safety in fresh produce is either through laboratory testing or through producer participation in some type of certification programs. Tanzania has a basic SPS legislative framework in place, but an updated framework with expanded and strengthened institutional structures is required. For some agricultural commodities Tanzania exporters have adopted a defensive posture, channeling commodities only to markets where standards are less stringent or not enforced.

  At present, there are few smallholders who are SPS certified according to EUREPGAP (EU) and BRC (UK) standards. Improvements in horticulture products to meet increasing SPS standards represent an important type of product upgrading. EUREPGAP started in 1997 as an initiative of retailers belonging to the Euro-Retailer Produce Working Group. These standards combine principles from Good Agricultural Practices (GAP), Integrated Crop Management (ICM), and Integrated Pest Management (IPM). EUREPGAP is concerned with practices on the farm; once the product leaves the farm, it comes under food packing and processing certification schemes. Compliance with EUREPGAP is not required by all importers; however, certain retailers in the UK and EU markets, such as Sainsbury's, require it.

  In order for Tanzanian smallholders to produce for export markets, they will need to increase their compliance with costly sanitary and phytosanitary (SPS) standards. Because of the relatively small scale of their revenues, smallholders have difficulty absorbing the full cost of obtaining EUREPGAP certification. These costs include high initial investment costs, plus annual maintenance and certification renewal costs. An expert informant estimated the annual certification costs to be between USD $1,500 and USD $5,000 per farm. Exporters employ personnel in both technical assistance and quality control departments who are responsible for working with smallholders, other medium/large size outgrowers and with packing house workers to meet standards. Traceability and record-keeping requirements associated with SPS certification create a "paper trail" documenting practices at every stage of the production and packaging process, including all the fertilizers, pesticides, and chemicals used during production. One of the difficulties in meeting the SPS standards is the lack of knowledge of how to select and use approved chemicals.

- Organic farming.
  There are important niche markets for organic products, especially in Europe. As with SPS certification, organic certification is expensive and there are third-party certification programs. The organic certification process can take several years. While awaiting certification, farmers must demonstrate that they are consistently following organic practices. The Lushoto area is gaining a reputation for organic farming in Tanzania. Many of the large farms producing coffee and tea have received organic certification.

Some farmers may use organic practices, even though they are not pursuing a formal certification process. With many farmers the high costs of chemical pesticides and fertilizers forces them to "default" into organic farming, for example by using locally grown garlic and chilies to control pests. There are middle-ground markets for these products that are "organically grown" but not "certified organic".

- Product quality, grading and standardization.
  Consistent product quality and standardization are important factors exporters, who must meet appearance and quality standards related to size, color, shape, level of damage, number of worms, etc. These standards are specified in contracts between importers and exporters. Exporters provide farmers and farmer associations with the product specifications. These specifications are enforced at the exporter's packing house, which will reject products that don't meet the standard. Sales to restaurants generally occur through intermediaries and are much more dependent on the flavor and ripeness of the product, since it will be prepared in the kitchen. Supermarkets, such as Shoprite, work with a group of farmers with whom they have long-term relationships. Their purchases are based on the quantity, size, freshness, and quality of the product, but they do not require extensive standardization.

c. Functional Upgrading

The elimination of an intermediary—either above or below on the value chain—is a stepping-stone to functional upgrading and higher profits. With the increasing SPS, exporters may prefer to work directly with producers, since it is easier to certify the origin and safety of the product. Associations, clubs, and cooperatives allow producers to functionally upgrade by allowing them to work directly with buyers/lead firms rather than selling at the farm gate. Associations, such as ULU and Lishe Trust, may purchase trucks to transport vegetables directly to markets, acting as distributors.

A less common type of functional upgrading, but one that we will investigate through the survey, is when an individual farmer becomes a distributor, broker, or intermediary by beginning to handle other farmers' crops. This is probably how some of the wet market intermediaries got their start, although this was not directly observed in the qualitative study. Several people who were interviewed commented that the HVEV value chain in Tanzania lacks sufficient firms at the intermediary level.

3. Governance and Vertical Relationships

The patterns of vertical relationships within the Tanzanian HVEV value chain differ by market channel. The export channel has few lead firms and is characterized by well-established network relationships between lead firms and mostly medium- and large-scale farms. On the other hand, firms within the domestic market channel operate mostly through arms-length market relationships with a few firms operating under more involved network relationships.

Export firms in the industry have established solid network relationships with medium- to large-scale outgrowers and one firm has recently began to develop a more structured relationship with smallholders. Supply contracts between exporters and the medium- to large-scale outgrowers clearly define the schedule of delivery, quality requirements, and price of the produce. Information flows within this relationship are also regularized. The export firms seem to exert a certain level of control through regular monitoring of the production practices and provision of technical assistance on EUREPGAP compliance issues. However, medium- to large-scale outgrowers have the flexibility at the end of each supply contract to pursue other market options. This creates an incentive for the exporter to diversify risk by identifying other supply sources, such as from smallholders.

Whereas the relationships between medium- to large-scale outgrowers and export firms are well established, the relationships between exporters and smallholders are relatively new. The strict requirements on product quality and traceability under EUREPGAP have tended to create a barrier to the entry of smallholders into the European export market. Their small scale of operation makes the cost of certification and compliance with EUREPGAP standards very high relative to farm-level profits. Moreover, exporters who work directly with large numbers of smallholders face high transaction costs unless organizational efficiencies can be created at the smallholder level both in terms of production practices and information management to ensure compliance with the requirements of the exporter. Currently, there is no clearly dominant governance structure for connecting smallholders to larger buyers.

In the domestic market, firms tend to operate primarily through market relationships with little information exchange and limited control by lead firms. Hotels and supermarkets may have formalized supply contracts with fresh produce distributors and these contracts dictate the quality of produce, delivery schedule, prices, and payment terms. On the other hand, supply contracts between distributors and their agents or even directly with farmers seem to be very informal. Even under the informal contracts, information on product quality and supply schedule seems to be communicated through well-defined channels. Farmers as well as market agents seem to have a good understanding of the requirements of their buyers and this is established through regular contact, mostly by telephone.

4. Risks and Expected Returns

Production of high-value fresh vegetables is highly dependent on climate and hence only a fraction of the total number of smallholder households can be involved in this sector. Where climatic conditions permit, smallholders view production of high-value vegetables as a key source of income. In most cases, high-value fresh vegetables are viewed as a cash crop since most households in Tanzania do not consume them. In Kilimanjaro, for example, farmers indicated that they began producing high-value vegetables as a way of enhancing their income after coffee prices fell.

The farmers who were interviewed in the qualitative phase of the research indicated that they were quite willing to take up production of a new crop, assuming that they can expect a high profit. Nevertheless, the adoption of a new crop entails various risks:

- Market risk.
  This is the risk that the farmer will not be able to sell his/her produce at a price that allows him or her to make a profit. Seasonal oversupply presents the biggest market risk and, hence, the ability to bring produce to market in the off-season becomes critical. It is also very important for farmers to have an assured market both in terms of quantity demanded and price. This makes forward contracts a very attractive option for farmers.

- Production risk.
  This is the risk of crop failure that may come about due to various reasons such as drought, disease, flooding, etc. The ability to irrigate a crop during the dry season is essential to reducing production risk and so is the availability and affordability of effective and permitted pesticides.

- Post-harvest losses.
  The perishability of high-value vegetables makes them especially susceptible to losses due to poor storage after harvest. Export markets and higher-end domestic markets demand high quality produce that can maintain an extended shelf-life. The inability of smallholders to afford cold storage facilities and the poor quality of transportation infrastructure increases the risk that the product will spoil prior to reaching the end market or be rejected due to compromised quality.

- Income and subsistence risk.
  If the household invests its resources into a cash crop that fails, this will negatively affect household income. In addition, if they convert land from subsistence crop production to cash crop production, then the failure of the cash crop could place the household's food consumption levels at risk.

Before making a decision on whether to adopt a new crop, producers need to be able to effectively assess the risks involved in the new activity as well as the costs of mitigating these risks. In most instances, smallholders lack adequate information, knowledge, and tools to make well-informed decisions.

IV. DESCRIPTION OF THE EMPIRICAL APPROACH

A. PURPOSE AND CONTENT

The survey will collect data from smallholder commercial vegetable producers, including those who grow HVEV and those who do not. The prospective respondents are owners or principal decision makers of MSEs in this value chain. The questionnaire will cover information on enterprise characteristics, marketing practices, contracting, the flow of information and services between firms, producer association activities and leadership, trust between firms, social capital, transaction costs, upgrading knowledge and practices, household income, and demographic information. The primary aim of the survey is to collect data to test the hypotheses in appendix B. The producer questionnaire is included as appendix D.

1. Population

The population for the study is smallholder commercial vegetable farmers ("farmers") in two areas of the Northern Highlands of Tanzania: 1) Arusha-Moshi and 2) Lushoto. In each of these two areas, there is a "member" sub-population and a "non-member" sub-population:

1. In the Arusha-Moshi area, "members" are farmers currently affiliated with GEL while "non-members" are farmers not currently affiliated with GEL.
2. In the Lushoto area, "members" are farmers currently affiliated with ULU or Lishe Trust, while "non-members" are farmers not currently affiliated with ULU or Lishe Trust.

The number of non-member farmers in each of the two regions is unknown. However, based on the 2003 census, there are probably more than 10,000 non-members in each region. The number of member farmers in each of the two regions is indicated in table 1.

Table 1. Number of Member Farmers in Arusha-Moshi and Lushoto Areas

Region	Approx. Number	Notes
Arusha-Moshi	706	• Members are organized into 27 clubs in 6 associations • This number does not count Midawe club 3 (suspended) or Kimnyaki club 6 (incomplete) • Approximately 400 of these are "experienced" members who have completed at least one season and approximately 300 are "inexperienced" members who have not completed one season
Lushoto	521	• 303 farmers on active member list for ULU • 218 on active member list for Lishe Trust

2. Overall Sample

A total of 1,978 smallholder vegetable farmers will be interviewed. The distribution of this overall sample is indicated in table 2. The member sample will be randomly selected from membership lists. The non-member sub-samples will be selected using a respondent driven sampling (RDS) approach in each of the two regions.

Table 2. Number of Respondent Interviews in the Four Sub-Samples

	Members	Non-members	Totals
Arusha	425	564	989
Lushoto	425	564	989
Totals	850	1128	1978

B. SAMPLING STRATEGY

1. Member Sample

The member sample refers to MSEs that belong to organized producer associations in two cultivation zones of the Northern Highlands: Arusha-Moshi and Lushoto. These cultivation zones have been chosen as the sites from which to sample as they have considerable potential to produce HVEV. In Arusha-Moshi, producers are organized by an exporter (GEL). In Lushoto, there are two self-organized producer associations: ULU and Lishe Trust. Note that respondents in both member and non-member samples may or may not be members of one or more other types of vegetable farmer groups (e.g., associations, clubs, cooperatives).

Approximately 425 group members will be chosen from each region based on the group's membership lists, giving a total of roughly 850 member responses. If a region has more than 425 members listed, a simple random sample of members or a stratified random sample will be used to select a sample of 425 respondents.

a. Member Sub-Sample in Lushoto Area

The member lists for ULU and Lishe Trust will be placed in sequential order and the members will be assigned a number from 1 to 521. A random sample of 425 members will be selected from the 521 names on the lists using arandom number selection table.

b. Member Sub-Sample in Arusha-Moshi Area

In the Arusha-Moshi area, there are 706 farmers currently affiliated with GEL. These farmers are organized into 27 clubs and six associations (see table 3). One of these clubs (club 4 of Enaboishu Association) participated in the pilot test of the questionnaire and therefore will be excluded from the survey. Since there are 50 farmers in this club, excluding them leaves 656 member farmers eligible for the survey.

A member sub-sample of 425 will be selected according to two groups:

1. Midawe Association: All 101 members in the four active clubs of the Midawe Association will be interviewed. Since these are the oldest clubs, their members have the most experience working with the exporter and have sold multiple harvests to the exporter.
2. Non-Midawe Associations: A sample of 324 members will be selected randomly from the 555 remaining members.

In order to select the sample of 324 non-Midawe members, the member lists from the remaining 22 clubs will be arranged in any sequential order, and the names on the lists will be numbered from 1 to 555. A random sample of 324 members will be selected from the 555 names on the lists using a random number selection table.

Table 3: Associations, Clubs and Members in Arusha-Moshi Member Sample

Association	Clubs	Members	Notes
Kimnyaki	5	120	A 6th club is not complete.
Enaboishu	5	150	Club #4 was used for the pilot test. It has 50 members.
Midawe	4	101	There were 5 clubs, but 1 club has been suspended.
Machame 1 (west)	6	149	
Machame 2 (east)	4	111	
Lyamungo	3	75	
Totals	27	706	

Note: 706 (total) less 50 (pilot test club) less 101 (Midawe members) group leaves 555

2. Non-Member Sample

The method of respondent-driven sampling (RDS) will be used to generate the non-member sample in each area. The non-member sample is composed of smallholder commercial vegetable farmers who do not belong to the three target producer associations (i.e., GEL affiliates, ULU, or Lishe Trust). MSEs in the member and non-member samples are expected to be comparable in terms of the agro-climate in which they work, the soil with which they work, and the agricultural infrastructure at their disposal (e.g., irrigation and transportation).

Comparisons between the member and non-member samples will permit testing of hypotheses about the extent to which opportunities to take advantage or different types of vertical linkages, and the benefits that derive from those opportunities, are correlated with membership in producer groups. The member and non-member samples will also be used to test hypotheses about horizontal linkages, especially the factors that encourage or discourage horizontal linkages, the benefits of those linkages, and the effects of horizontal linkages on incentives for upgrading

3. Respondent Driven Sampling (RDS)

RDS is a relatively new sampling method. Unlike other chain referral sampling methods, however, RDS has the potential to lead to a sample with known statistical properties. This potential has been acknowledged in the literature on the study of hidden populations, such as injection drug users, and the application of RDS continues to grow.

RDS sampling is essentially a hybrid of (a) chain-referral network sampling (also known as "snowball sampling" – according to which an initial set of respondents is surveyed and then used to identify peers who can subsequently be located and surveyed in a next wave of interviews, and so on….) and (b) a statistical model that adjusts for the non-randomness of the process generating the sample. The non-randomness is inherently associated with the choice of initial seeds and the selectivity associated with the referrals generated by the initial seeds.

The "fundamental theorem of RDS" asserts that, as the number of waves increases, the characteristics of the sample will tend to converge (stabilize), irrespective of the initial (presumably non-representative) seeds. Sample estimates of population parameters that converge across successive waves are referred to as "equilibrium estimates".

Three qualitative tests can be applied to determine whether equilibrium has been achieved for each characteristic examined. The first and most obvious is simply "eye-balling" the sample proportions and/or means as they progress through waves and observing whether there is a centering on certain values.

Second, the RDS Analysis Tool has an algorithm that can be used to estimate the equilibrium proportions and/or means, allowing us to see how close the later waves and the overall sample come to that estimated equilibrium. Finally, based on the wave-to-wave transition probabilities, we can estimate how many waves would be required for convergence to a stable equilibrium, which is operationally defined to occur when the estimated equilibrium proportion or mean does not change by more than 2 percent between successive waves. The overall picture can support an inference as to whether or not there are sufficient waves for each variable to reach equilibrium.

The RDS methodology yields a sample that can be used with information about the social network and the recruitment process to estimate the true population proportions and/or means. The theory behind these calculations is laid out in various scientific papers by Douglas Heckathorn and his colleagues (for citations, see Bloom et al. 2006). Note that population weights need to be used when estimating population proportions and/or means from the sample proportions and/or means. The RDS methodology yields a sample that can be used with regression analysis to construct estimates that are unbiased and consistent. Efficiency can also be achieved by fitting robust regressions and estimating robust standard errors.

The RDS method involves starting with an initial set of interviewees (seeds), who are given an incentive to be interviewed. These seeds are then given an additional incentive to recruit other respondents, who are then also given incentive to recruit more respondents. This process proceeds until completion of a predetermined number of waves. Using 1) the self-reported personal network size – in this case the number of other discrete MSE businesses involved in the relevant sub-sector and known by the respondent, and 2) the recruitment pattern of referrals linking respondents to whom referred them, it is possible to calculate unbiased estimates of population parameters and to gauge the representativeness of the final sample.

Chain-referral sampling procedures are generally biased by the initial choice of seeds. However, this problem does not plague RDS because, as the waves proceed, the sample becomes increasingly independent of the characteristics of the initial seeds. As long as there is a non-zero probability of each member of the target population being referred, given sufficient waves, an equilibrium distribution of respondent characteristics will be reached. The more diverse the set of initial seeds, the more rapidly the set of subjects generated by RDS will approach that equilibrium distribution.

One general concern worth addressing is that members of particular population subgroups have a strong tendency to recruit from within the group, a phenomenon referred to as "inbreeding". In the case of perfect inbreeding (e.g., in cases of extreme geographic isolation), social networks do not overlap and referrals will not necessarily yield samples of all population subgroups. To address this situation, one must partition the sample into two or more sub-samples, and allow each system to reach its own equilibrium distribution.

4. Previous Applications of RDS

The use of RDS is expanding because of its potential to produce representative results for populations that are difficult to sample. RDS has now been used in the US to study mission Indians, jazz musicians, intravenous drug users, and cocaine and crack users. The work on jazz musicians has been especially statistically rigorous, and demonstrates the statistical validity of RDS in estimating population characteristics and network sizes. RDS has also been applied internationally in Kenya where it was used to study the social network for health interventions among scavenging street children. RDS is especially useful in developing countries where even simple populations, such as small businesses, may be hard to locate due to the extent of the informal economy, and poor communication and transportation infrastructure.

While previous research is not extensive and does not approximate the scale of AMAP projects, there are some examples of work on which to draw. In particular, the first AMAP application of RDS in Guatemala, on which this Tanzania protocol is based, has provided insight for improvements upon the application of RDS. The Guatemala research explored characteristics of MSEs in the handicrafts and horticulture value chains and successfully provided an example of gathering information on the nature, determinants, and consequences of MSE value chain participation. The Tanzania field research will build upon lessons learned in Guatemala in a continued effort to develop a model for RDS that is closely suited to the study of MSEs in developing countries.

5. Use of RDS to Generate Non-Member Samples

a. Initial Seeds

Non-member seeds will be chosen by soliciting referrals from the leaders of the member groups. These individuals (the leaders) will be asked to identify currently active MSE producers in the HVEV value chain who are not members of the groups but who are similar to the members on a set of characteristics. The groups' membership lists will be used to screen the resulting referrals to ensure that all of the seeds are non-members.

Choosing a diverse set of initial seeds is especially important because seed diversity allows for accelerated convergence on the equilibrium distribution of producers. The final distribution of initial seeds will be selected in consultation between the AMAP research team and the local consulting firm.

There will be 12 initial seeds for the non-member sub-samples in each of the two regions. The initial seeds will be selected according to the guidelines provided in table 4. The purpose of these guidelines is to attain greater diversity in the initial wave in order to reduce the number of waves it takes for the RDS sample to approach the population equilibrium.

Table 4. Guidelines for Selecting Diverse Initial Seeds within One Region

Characteristic	Selection Guidelines
Sex	• 6 men • 6 women
Location	• Select 2 initial seeds from each of the 6 locations in a region. The 2 initial seeds should be located some distance from each other. • The 6 locations in each region are defined as follows: In Arusha-Moshi, the 6 locations are defined by the geographic reach of each of the 6 MIM-affiliated associations. In Lushoto, the entire geographic reach of the ULU and Lishe Trust membership should be divided into 6 locations that are roughly equivalent in terms of the total number of smallholder vegetable farmer populations in each location.
Language	If a location has more than 1 language group, then the 2 seeds should come from the top 2 languages spoken in that location (e.g., select 1 person who speaks the dominant language and 1 person who speaks the language of the largest minority group)

b. Number of Waves and Respondents

Eight waves with sufficient referrals (e.g., 2-3) to result in one or two completed referral surveys is recommended in order to establish the equilibrium distribution. A pilot test, moreover, will help clarify how long travel and interviews will take. This information will help estimate the amount of time required to reach an overall equilibrium distribution. The proposed sampling plan for non-members in one region, summarized in table 5, reflects the target number of waves and interviews estimated to maintain statistical integrity within the time and resource limitations of the field work.

The proposed sampling structure for each region will begin with 12 initial seeds in each region, for a total of 24 initial seeds. In an effort to generate a meaningful sample, the field surveys will include eight waves of interviews in each of the two regions. The target number of non-member interviews is 1128, or 564 in each region.

Table 5: Non-member Sampling Plan

Wave Number	Total Respondents in Wave	Referrals per Respondent	Cumulative Number of Respondents
0	12	2	12
1	24	2	36
2	48	2	84
3	96	1	180
4	96	1	276
5	96	1	372
6	96	1	468
7	96	--	564

c. Survey and Recruitment Incentives

Survey and recruitment incentives are a powerful way of attracting respondents and motivating them to provide accurate referrals. By offering respondents an incentive to participate in the interview, response rates will likely be higher. Further, offering referral incentives for recruiting other respondents mitigates the problem of respondents being reluctant to divulge information about their friends. Respondent recruiting also harnesses peer pressure and applies non-material rewards, such as peer approval, that may increase compliance. A friend or acquaintance will likely have more sway with a potential respondent than a researcher.

All participants in the survey will receive 5,000 Tanzanian shillings, which is roughly US$4, upon completion of the interview. This payment is in consideration of the length of the questionnaire (approximately two hours) and time lost from commercial activities to travel to the survey sites (for members) or to walk enumerators to referrals (for non-members). For verification, the interviewer and interviewee will then sign the same payment form, and the Team Leader will ensure that all payments and signatures are complete.

d. Recruitment Logistics

Upon completion of the interview, non-member respondents will be asked to provide referrals for three smallholder farmers who currently produce and sell vegetables. The interviewer will then record the complete referral contact information on a special page of the questionnaire.
Depending on the number of the wave, one or two of the referrals will be interviewed (see table 5 above).

The local survey firm will provide enumerators with a random selection method using a six -sided die for immediately prioritizing the referrals (i.e., ranking them as first, second, and third priority). After the referrals are ranked, the enumerator will be instructed to ask the respondent to bring the enumerator to meet the appropriate number of referrals according to top priority referral(s). If the top priority producer(s) can not be found, or does not agree to participate in the survey, then the next highest priority referral will be invited to participate. Interviews will not be conducted in the presence of referring producers.

To prioritize the referrals, the interviewer will conduct a randomization process. Each interviewer will be provided with a six-sided die. The interviewer will roll the die two times. With the first roll of the die, the interviewer will select the priority 1 referral:

- A roll of 1 or 2 makes the first referral Priority 1
- A roll of 2 or 3 makes the second referral Priority 1
- A roll of 3 or 4 makes the third referral Priority 1

The interviewer will then record the "adapted control number" for the priority 1 referral. The adapted control number consists of the current respondent's control number (found at the top of the survey page), followed by a hyphen and the numeral "1".

With the second roll of the die, the interviewer will select the priority 2 referral:

- A roll of 1 or 2 makes the first referral Priority 2
- A roll of 2 or 3 makes the second referral Priority 2
- A roll of 3 or 4 makes the third referral Priority 2

If the roll of the die again indicates the priority 1 referral, then the interviewer should continue to roll the die until one of the remaining two referrals is selected. The interviewer will then record the adapted control number for the priority 2 referral, using the current respondent's control number followed by a hyphen and the numeral "2". Next, the interviewer should record the adapted control number for the priority 3 referral.

After the referrals are ranked, the interviewer should ask the respondent to bring the interviewer to meet the appropriate number of referrals according to top priority referral(s). For waves one and two, the Priority 1 and 2 referrals will be interviewed. For waves 2 through 6, only Priority 1 referrals will be interviewed. If the top priority producer(s) cannot be found, or do not agree to participate in the survey, then the next highest priority referral will be invited to participate. Enumerators should conduct all interviews in private and not in the presence of referring producers.

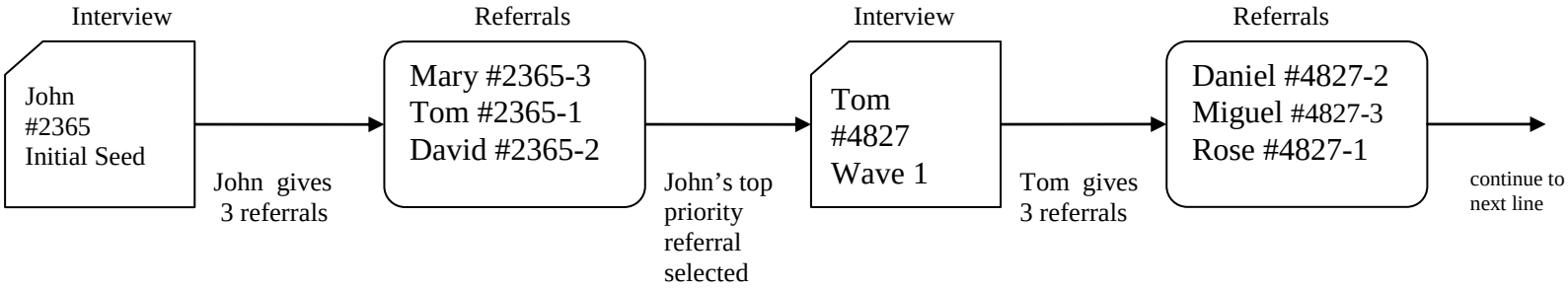
The figure on the next page illustrates how referrals are prioritized and adapted control numbers are assigned:

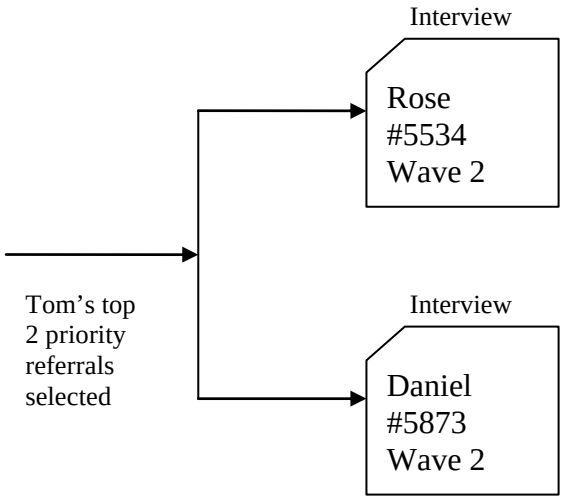
- John is an initial seed. The initial seeds are part of wave 0. John's control number is #2365.
- At the end of his interview, John provides referrals for three people: Mary, Tom, and David. The interviewer rolls the die and selects Tom as priority 1, David as priority 2, and Mary as priority 3. The adapted control numbers that are assigned to these referrals are based on John's control number, followed by a hyphen and the numeral 1, 2, or 3 to indicate the priority ranking of each referral.
- John takes the interviewer to meet Tom. When it is time to start wave 1, Tom receives a unique control number (#4827) and is interviewed during wave 1.
- At the end of his interview, Tom provides referrals for three people: Daniel, Miguel, and Rose. The interviewer rolls the die and selects Rose as priority 1, Daniel as priority 2, and Miguel as priority 3. The adapted control numbers that are assigned to these referrals are based on Tom's control number, plus the numeral 1, 2, or 3 to indicate priority.
- Tom takes the interviewer to meet Rose and Daniel. When it is time to start wave 2, the top two priority referrals for both Rose and Daniel are interviewed.

Interviews within one wave will all be completed before moving on to begin the interviews in the next wave. Control numbers are randomly assigned and based on the control number on a specific survey response form.

In summary, the procedure to be followed by enumerators is the following:

- Complete an interview and ask the respondent for three referrals.
- Pay respondent 5,000 Tanzanian shillings for the interview after the respondent signs a payment form.
- Verify that all payments are made and appropriate forms are complete.
- Prioritize the referrals based on a random selection process.
- Randomly select the appropriate number of referrals, depending on the wave number for subsequent interviewing.
- Accompany the respondent to meet the referrals and secure their agreement to be interviewed then or later.





Example of 3-Wave RDS
With 4 Interviews Completed

Wave	Respondent Name	Control Code	ACC on 1st page	ACC on next to last page
0	John	2365	none (QNA)	2365-1, 2365-2, 2365-3
1	Tom	4827	2365-1	4827-1, 4827-2, 4827-3
2	Rose	5534	4827-1	none (QNA)
2	Daniel	5873	4827-2	none (QNA)

ACC = "adapted control code"

In order to avoid repeat interviews of the same producer, survey teams will be assigned to work in specific geographic areas, with no overlap between teams. A team only interviews producers in its assigned area, and if a referral for a producer outside of its area is made, the information will be relayed to the relevant team. A member of this relevant team will then bring the referring producer to the referred producer. While this process may be time-consuming, it will minimize other problems that may arise if producers try to be interviewed more than once by different enumerators.

C. DATA CODING

To ease the entry of data into the RDS tool, unique and separate codes will be used for responses of "zero", "does not know", "refuses to answer", and "not applicable". "Not applicable" response should be used for members who have not produced vegetables during the most recent growing season.

As indicated above, respondents and referrals will be assigned unique identification numbers so that information on who refers whom can be tracked. This information will be used in the RDS tool, along with estimates of the respondent's self-reported network size.

D. PILOT TEST

The pilot test will assess the effectiveness of the questionnaires as well as the expediency of the RDS methodology.

Table 6. Sampling for Pilot Test

Wave Number	Total Respondents in Pilot Test	Referrals Used per Respondent	Cumulative Number of Respondents
1	2	2	2
2	4	2	6
3	8	-	14

Beginning with two producers in each sector, the RDS methodology will be pilot tested by completing three waves of referrals. The referral process during this simulation will be conducted in exactly the same fashion as what is planned for the final survey, including the mechanism for providing incentive payments to respondents. As indicated in table 6, the total number of producer interviews for the pilot test is 14 interviews.

The pilot test results will be analyzed to provide information in the following areas:

- Effectiveness of the referral process for obtaining contact information on producers
- How individuals respond to the surveys
- Typical duration of time to complete the survey and it appropriateness
- Appropriateness of the incentives
- Whether producer firm owners respond to the recruitment incentive
- Preliminary estimates on how much time each interview and each wave might take
- Preliminary information on the distribution of characteristics of the population, and how those characteristics might affect recruitment (esp. inbreeding, or the tendency for group members to select other members of a similar population sub-group)
- The appropriateness of the wording of the survey questions

Results of the pilot test will provide guidance on changes that need to be made to the questionnaire, the referral process, and the incentive payment system. The team will endeavor to choose diverse seeds for the pilot (different geographic areas, different characteristics).

E. DATA ENTRY AND ANALYSIS

Prior to field testing the producer survey and field manual for enumerators will be translated into Kiswahili and then back-translated into English to ensure understanding of definitions and clarity of directions. The local enumerators will collect survey information on paper documents, generally in Kiswahili, although they may use other local dialects.

Data formatting. Translation, data coding, and data entry will be carried out locally, in Tanzania, to ensure that local conditions, terminology, cultural references, etc. are adequately reflected. The data will be entered into an MS Excel spreadsheet and uploaded to a project web site on a weekly basis. The U.S. team will review the spreadsheets and provide quality control to ensure that the data have been properly recorded.

Data analysis. Demographic and descriptive data from the surveyed population will be compiled by the field team.

The U.S. team will analyze the descriptive data, including:

- Distribution of responses to each question
- Means
- Standard deviations
- Internal consistency of the data (cross-checking different questions that refer to the same details)
- Missing data (checking for randomness/non-randomness)
- Means across different horizontal waves and random walk
- Representativeness of each wave (using the RDS methodology described above)
- Overlap in referrals, which should be increasing with successive waves, and simple correlations
- Comparisons of the data across sub-sectors and across waves
- Test for the appropriateness of pooling across waves.

The analytic component will test the research hypotheses using multivariate regression techniques to identify the correlates and determinants of key outcome variables, using multiple regression if the key outcomes are continuous, and logistic regression if the key outcomes are discrete.

The regressions will include control variables representing the demographic and other characteristics such as:

- Age
- Gender
- Education
- Language fluency
- Personal income
- Assets
- Sub-sector
- Size of firm
- Geographic location

F. LOGISTICS AND EXECUTION SCHEDULE

Step 1: The AMAP research staff and local survey team will

- Translate and back translate survey instruments and survey guides into Kiswahili;
- Train field surveyors in interview and sampling procedures;
- Supervise survey staff in pilot testing producer survey instruments; and
- Revise and finalize instruments and sampling plans based on pilot tests.

Step 2: The local survey team will

- Develop a sample of 'seed' MSE producers; and
- Begin database design using final versions of the pilot tested survey instruments.

Step 3: The local survey team will

- Conduct the producer firm surveys beginning with seed firms and including up to seven subsequent waves, for a total of 1580 interviews;
- Carry out spot checks to validate the field survey work concurrent with the survey;
- Begin producer survey coding and data entry;
- Convert database to MS Excel spreadsheets for electronic delivery to Berger; and
- Upload data to live web site for AMAP team review.

Step 4: The local survey team will

- Conclude any outstanding producer firm surveys;
- Conclude survey form coding and continue data entry;
- Perform random back-checks to validate data entry; and
- Begin database checking and cleaning.

Step 5: The local survey team will

- Conclude survey data entry;
- Conclude database checking and cleaning;
- Send completed survey forms and electronic data files to Berger in the US.

Step 6: The AMAP research staff will

- Convert the field survey database from MS Excel spreadsheets for use with statistical analysis software;
- Conduct consistency and other qualitative tests on the field data responses; and
- Carry out the data analysis and prepared the analytical report.

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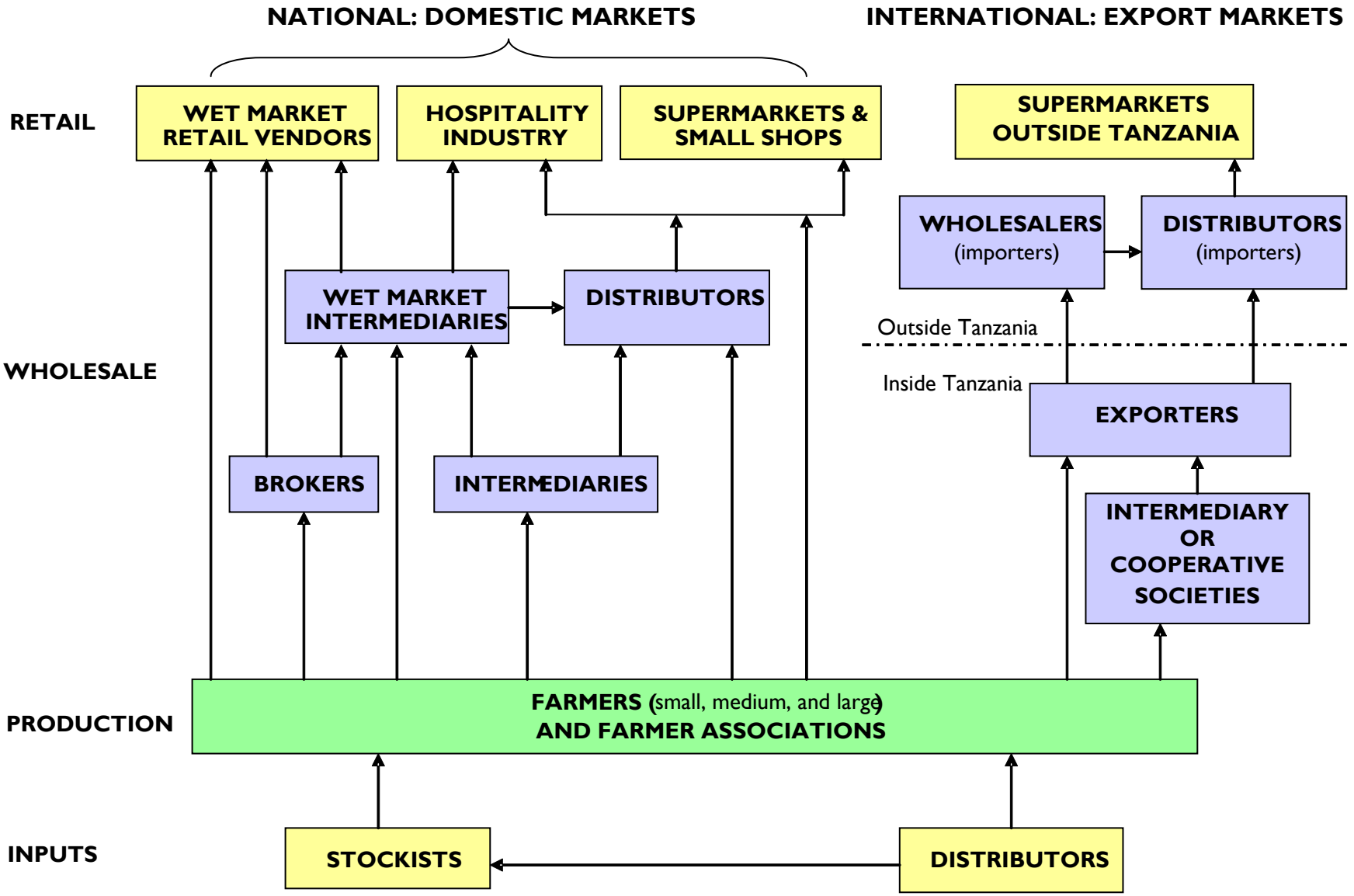
APPENDIX A: TANZANIA HIGH VALUE VEGETABLE VALUE CHAIN MAP



APPENDIX B: DETAILED RESEARCH HYPOTHESIS

The Clients and Markets research seeks to promote economic growth with poverty reduction by increasing opportunities for beneficial participation of MSEs in value chains. These hypotheses are designed to improve our understanding of how firm owners respond to the interaction of governance, risk, profits, information, transaction costs, and social capital. The hypotheses—which focus on vertical relationships, horizontal relationships, and upgrading—provide a framework for the Clients and Markets research agenda and are continually refined through field and desk studies.

The purpose of testing these hypotheses is to generate information for improving the effectiveness of interventions. The first three hypotheses focus on leverage points for enhancing vertical cooperation and coordination in order to create win-win relationships between MSEs and lead firms. The next three focus on factors affecting horizontal cooperation and coordination in order to improve the effectiveness of MSE groups. The last three focus on understanding the incentives and constraints to MSE upgrading, in order to intervene in ways that encourage MSE owners to upgrade their businesses and enhance their contributions to value chain productivity and competitiveness.

VERTICAL RELATIONSHIPS

1. Risk In Vertical Relationships Can Be Reduced By Strengthening Governance.

The risk to each firm that the counterpart firm in a vertical relationship will fail to meet its agreements (i.e., the risk of commitment failure) can be reduced by strengthening governance through alternative means, including

a. the development of linking social capital,
b. the development of stronger network types of governance,
c. increasing the formality of contracts, and
d. strengthening the legal enforcement of contracts.

2. Trust In Vertical Relationships Can Be Increased By Improving Information.

Trust between firms in vertical relationships can be increased by improving the information that firms have about each other in several ways, including

a. building information over time about the trustworthiness of counterpart firms through a series of increasingly larger "riskable steps",
b. increasing the face-to-face interaction between representatives of counterpart firms,
c. increasing transparency about distribution of rents in the value chain, and
d. increasing transparency about risks faced by firms in the value chain.

3. Lead Firms Will Be More Willing To Form Vertical Relationships With MSEs If The Transaction Costs Can Be Reduced.

Transaction costs are a major constraint to lead firms forming vertical relationships with MSEs, but the transaction costs that lead firms incur in working with large numbers of dispersed MSEs (i.e., the costs of communication, knowledge sharing, contract management, production coordination, etc.) can be reduced through the use of

a. commercial intermediation (i.e., private intermediaries),
b. organizational arrangements to coordinate MSE activities, and
c. cost-effective information and communication technology (ICT).

HORIZONTAL RELATIONSHIPS

4. MSE Owners Will Be More Willing To Form Horizontal Relationships If The Transaction Costs Can Be Reduced.

Transaction costs, especially the opportunity cost of time, are a major constraint to MSE owners forming horizontal relationships. There are several ways that these transaction costs can be reduced, including the use of

a. alternative organizational structures,
b. cost-effective information and communication technology (ICT), and
c. measures to improve trust (see hypothesis 5 below).

5. Trust In Horizontal Relationships Can Be Increased Through Organizational Innovation And Improvements In Human Capital.

Lack of trust can be a rational but critical barrier to the formation of horizontal relationships between MSEs. Trust in horizontal relationships can be improved by reducing the scope for opportunistic and fraudulent behavior in several ways, including through

a. organizational innovations that limit the power of leaders (e.g., rotating group leadership, member input to decisions, transparency),
b. formalized record keeping,
c. training in leadership and group management skills, and
d. increased human capital among all group members (i.e., literacy, numeracy, language skills, market knowledge).

6. Social Capital Plays An Important Role In Influencing Horizontal Relationships Between MSEs.

Social capital can have both positive and negative effects on the formation of horizontal relationships between MSEs:

a. in-born social capital reduces the transaction costs of forming horizontal relationships because firm owners are more likely to trust each other and less likely to behave opportunistically and
b. high levels of bonding social capital can reduce investments in acquired forms of capital, including both bridging social capital and physical capital.

FIRM-LEVEL UPGRADING BY MSES

7. MSE Owners Base Their Upgrading Decisions On Their Assessments Of The Risk-Adjusted Returns To Upgrading.

MSE owners make their upgrading decisions based on their estimates of risk-adjusted returns, which include expected returns (profits), variability of returns (risk), impacts on future opportunities (sustainability), and their individual resources and objectives (household economic portfolio). MSE owners will be less likely to upgrade their businesses if

a. there is no price premium for the upgraded product,
b. they must invest in assets with a high degree of asset specificity and they lack credible assurances of repeated future transactions,
c. they have relatively low household incomes and assets and the downside variability of returns includes negative or very low profits,
d. they lack access to required investment capital.

8. Upgrading Can Be Encouraged By Strengthening The Linkages Between Firms.

Vertical and horizontal linkages between firms help to improve the risk-adjusted returns to upgrading. MSE owners will be more likely to upgrade if

a. they have higher levels of acquired social capital (networking),
b. they are linked to lead firms through network types of governance structures rather than only through market-type linkages.
c. they observe successful upgrading among MSE owners with whom they share bonding social capital.

9. Lack of Information is a Critical Barrier To Upgrading.

MSE owners in developing countries often lack the information that would allow them to understand the possible advantages to upgrading. MSE owners will be less likely to upgrade if

a. they lack basic awareness of the existence of upgrading opportunities,
b. they lack the information needed to calculate risk-adjusted returns, and
c. the transaction costs to gathering upgrading information are high.

APPENDIX C: INSTRUCTION MANUAL FOR FIELD SURVEYORS

(Separate File)

APPENDIX D: PRODUCER QUESTIONNAIRE

(Separate File)