

Linking African Smallholders to High-Value Markets:

Practitioner Perspectives on Benefits, Constraints, and Interventions

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Abstract

This paper provides the results of an international survey of practitioners with experience in facilitating the participation of African smallholder farmers in supply chains for higher-value and/or differentiated agricultural products. It explores their perceptions about the constraints inhibiting and the impacts associated with this supply chain participation. It also examines their perceptions about the factors affecting the success of project and policy interventions in this area, about how this success is and should be measured, and about the appropriate roles for national governments, the private sector, and development assistance entities in facilitating

smallholder gains in this area. The results confirm a growing ‘consensus’ about institutional roles, yet suggest some ambiguity regarding the impacts of smallholder participation in higher-value supply chains and the appropriateness of the indicators most commonly used to gauge such impacts. The results also suggest a need to strengthen knowledge about both the ‘old’ and ‘new’ sets of constraints (and solutions) related to remunerative smallholder inclusion, in the form of the rising role of standards alongside more long-standing concerns about infrastructure and logistical links to markets.

This paper—Agriculture and Rural Development Department—is part of a larger effort in the department to promote broad-based agricultural growth and market development. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at sjaffee@worldbank.org.

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Linking African Smallholders to High-Value Markets: Practitioner Perspectives on Benefits, Constraints, and Interventions

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Introduction

As part of the wider discourse on pro-poor agricultural growth and development, there are on-going debates about the viability of smallholder production and the opportunities created by high-value markets (Weatherspoon *et al.*, 2001; Hazell, 2005; Pelupessy and Van Kempen, 2005; Humphrey, 2006). Proponents of small-scale farms highlight their potential competitive advantages over large-scale commercial production, predominantly through lower costs in accessing and managing family labor and superior local knowledge (Dorward, 1999; Lipton, 2005 Poulton *et al.*, 2005; Pingali *et al.*, 2005). They also emphasize how high-value markets offer lucrative opportunities for enhancing smallholder income as domestic markets for livestock and horticultural products exhibit particular dynamism (World Bank, 2007), and as non-traditional, higher-value foods have come to account for the majority of developing country agri-food exports (Jaffee and Sewadeh, 2006).

Conversely, skeptics argue that the higher-value market participation of smallholder farmers will be severely constrained by the requirements of more discerning consumers and supply chain 'gatekeepers' (Maxwell, 2004). As buyer demand for timely and reliable delivery of products that conform to exacting quality standards increases, small farmers are exposed to transaction costs that are high and for which economies of scale are significant. Thus, while smallholder participation in high value markets is not a new phenomenon (Williams and Karen, 1985; Glover and Kusterer, 1990), changes in these markets have brought about a need to rethink the scope for such participation in the future (Reardon *et al.*, 2004; Humphrey, 2006; Henson and Jaffee, 2006).

Over the past decade, many developing country governments and international development agencies have concluded that increased smallholder participation in higher-value agri-food markets is essential for meeting economic development and poverty reduction objectives. Consequently, a growing range of interventions have been designed and implemented to link smallholders both to higher-value domestic markets and non-traditional export markets (see for example Shepherd, 2007; Temu and Temu, 2005). These have involved a range of market intermediaries, from producer organizations and cooperatives to private sector exporters, with both 'top down' and 'bottom up' approaches proliferating.

While attempts have been made to characterize the plethora of interventions aimed at facilitating the participation of smallholders in high-value markets (see for example Page

and Slater, 2003; Shepherd, 2007) there is a lack of systematic comparisons of experiences with respect to when and where participation in high-value markets is beneficial to smallholders, the constraints that impede their participation and the effectiveness of alternative means for overcoming these constraints. There is also a lack of consensus on measures to be used in judging the 'success' of interventions such that it is possible to contrast between those that 'work' and those that do not. This paper attempts to throw some light on these issues. Specifically, it reports on the results of a survey of practitioners involved in schemes to better link African smallholders with higher-value markets. Before highlighting those results, we provide an overview of the existing literature.

Benefits and challenges of smallholder participation in higher-value markets

The existing literature on impacts of smallholder participation in high-value markets is diverse in terms of mode of investigation and primary focus. The contract farming literature sheds some light on the impact of smallholder participation in high-value markets (see for example Glover and Kusterer, 1990; Key and Runsten, 1999; MCCulloch and Ota, 2002; Humphrey *et al.*, 2004; Minten *et al.*, 2005; Maerterns and Swinnen, 2007), often comparing participant and non-participant farmers across a range of measures. Positive impacts of participation are generally associated with income generation, employment and improving access to credit and technical assistance (Glover and Kusterer, 1990; Grosh, 1994; Humphrey *et al.*, 2004). Other studies extend the analysis to include farm-level and/or regional spill-overs related to productivity of food crop production, food security and/or development of business service markets (see for example Kennedy and Cogill, 1987; Von Braun, *et al.*, 1989; Govereh and Jayne, 2003). Less tangible impacts, including social status and capacity development, are also reported (Reynolds *et al.*, 2004; Masakure and Henson, 2005).

The potential negative aspects of smallholder participation in high-value markets generally relate to the institutional characteristics of supply chains and wider socio-economic and environmental impacts. Thus, concerns are raised that patterns of specialization can lock smallholders into relationships that are more favorable to downstream buyers than to the farmers themselves (see for example Little and Watts, 1994; Singh, 2002). There are also concerns that the requirements of discerning buyers can act to exclude less endowed producers, with consequences for income disparities and more general social differentiation at the community level (Singh, 2002; Simmons, *et al.*, 2005; van der Meer, 2006). Such exclusion of poorer smallholders would limit the achievement of broader economic development objectives (Reardon and Barrett, 2000; Humphrey, 2006). There are also concerns that such arrangements do not present a viable long-term approach to poverty alleviation, as market leaders will only commit to

sourcing from a particular base of smallholders while it is profitable to do so, yet will quickly 'jump ship' to new suppliers if problems arise and/or the opportunity arises to reduce their procurement costs (Goss *et al.*, 2000; Kolk and van Tulder, 2006).

The scope for smallholders to participate in high-value markets reflects both their own ability to compete against alternative suppliers and the willingness of buyers to procure from them in the context of their particular regulatory and commercial requirements. One strand in the literature (exemplified by McCulloch and Ota, 2002; Simmons, *et al.*, 2005; Winter-Nelson and Temu, 2005; and Hernandez *et al.*, 2007) emphasizes that smallholder farms' limited access to key resources (including cultivable land, irrigation and financial resources) inhibits investment and farm productivity. A second strand emphasizes the role of transaction costs in inhibiting small farmer participation in alternative marketing channels, including high-value markets (Jaffee, 1995; Staal *et al.*, 1997; Key *et al.*, 2000; Pingali *et al.*, 2005; Winters *et al.*, 2005), suggesting that the stricter (and increasing) requirements of high-value markets place smallholders at a competitive disadvantage relative to larger farmers. These assessments suggest that the lack of infrastructure, key production assets, information and/or collective action act to constrain initial smallholder entry to high-value markets and threaten the sustainability of such participation over time.

It is reasonable to assume that downstream buyers in high-value markets will choose to procure from sources that meet their requirements at lowest cost, at manageable levels of risk. The lack of infrastructure and key assets that typify smallholder production can make it costly to meet exacting requirements and/or require that buyers have to take on certain transaction functions (Pingali *et al.*, 2005; Poulton *et al.*, 2006). With the restructuring of global value chains and more prominent governance role of agri-food standards (Henson and Jaffee, 2006; Humphrey, 2006), transactions are becoming more complex and there is a need for closer coordination of activity and traceability of products and raw materials within supply chains (Dolan and Humphrey, 2004; Altenburg, 2006; Ruben *et al.*, 2006). As a result, downstream buyers are looking to consolidate their supply base in favor of 'preferred suppliers'. These may be larger-scale producers (where they exists) unless there are offsetting reasons to continue procuring from smallholders (for example where a more decentralized supply base acts to mitigate climatic or pest/disease risks).

Assessing the 'success' of interventions aimed at the participation of smallholders in high-value markets

Attempts to assess the efficacy of alternative interventions aimed at facilitating smallholder participation in high-value markets are impeded by the lack of a common vocabulary with which to assess 'success' versus 'failure'. Key dichotomies influencing choice of indicators are, for instance, "deliverables or impacts," "technical indicators or poverty reduction indicators," "short-term gains or long-term change" and "short-term accountability or learning to do better" (Mebrahtu *et al.*, 2007). Further, while we may be able to agree on the measures that 'should' be used to assess the impact of interventions, often institutional constraints, especially related to project accountability (Mosse, 2004a; 2004b), limit the scope to apply these in practice.

Short-term indicators are easier to define and measure, since they are generally associated with activities and deliverables, for example in the form of services provided to beneficiaries (GDPRD, 2007). Medium-term indicators, in terms of outcomes (for example improvements in income, enhancement of productivity and value of exports) and long-term indicators in terms of impacts (for example reductions in the incidence of poverty, environmental sustainability and gender equality) are more difficult to define. Further, there can be significant attribution problems where there are multiple interventions (often by diverse agencies) and/or turbulent economic and/or social conditions. At the same time, however, it is presumably the ultimate impacts that are most relevant to any definition of 'success', while permitting measurement against country development objectives and/or poverty reduction targets (Reardon and Barrett, 2000; Morse, 2004; World Bank, 2006).

De Janvry and Sadoulet (2005) contend that successful agricultural and rural development interventions require multidimensional assessment of the well-being of the rural poor. This suggests the need to focus on improving access to assets and understanding the context in which these are used (for example participation in domestic and international markets) and, in turn, developing enhanced livelihoods strategies. The sustainable livelihoods framework has been employed by some donors and development agencies in this vain (Ellis, 2000). Indicators of well-being might include increases in income, reduction of poverty and vulnerability, environmental stress, and promotion of security and equality. This implies that interventions aimed at enhancing the participation of smallholders in high-value markets should, ideally, focus not only on indicators associated with targeted supply chains but also eventual impacts in terms of sustainable development.

Putting aside the lack of a common metric of 'success', it is important to recognize the range of factors influencing the efficacy of a particular intervention. While enhancing access to basic public and private assets is essential for participation in high-value markets (Poulton *et al.*, 2006), other factors that may strongly influence outcomes

include sectoral policies, entrepreneurial competence, coordination among stakeholders, and prior institutional development and technical upgrading (Wilk and Fensterseifer, 2003; GTZ, 2003; Poulton *et al.*, 2005; Ruben *et al.*, 2006). Further, close coordination of interventions with the private sector is becoming more critical, especially in the context of contemporary global value chains (Henson and Jaffee, 2006; Humphrey, 2006), where accurate and timely flows of information on market requirements are paramount.

Who should be involved in linking smallholders to high value markets?

Shifts in thinking about rural development over recent decades (Ellis and Biggs, 2001; De Janvry and Sadoulet, 2005; Reardon and Timmer, 2005), alongside the restructuring of global value chains (Dolan and Humphrey, 2004; Humphrey, 2006) have influenced the real and perceived role of particular stakeholders in bringing about the participation of smallholders in high-value markets. For example, structural adjustment programs over the mid-1980s to mid-1990 focused attention on the liberalization of agricultural markets and limiting interference by government. Subsequently, however, the critical role of institutions in development processes and, in this context, the establishment and operation of effective market linkages was recognized. This is resulting in a re-definition of legitimate roles for both the public and private sectors in linking smallholders to markets.

The current paradigm posits governments as ‘enablers’, creating the conditions that facilitate and encourage the private sector to structure its supply chains to involve smallholders. Thus, the focus is on the development of policies and institutional frameworks as well as providing infrastructure and support services to enable market development (GTZ, 2003). The private sector’s role is to invest in (soft as well as hard) supply chain infrastructure, develop service markets and/or transfer technical and market information to smallholders (Humphrey, 2006; Ruben *et al.*, 2006). In this context, external development agencies and project implementers contribute by improving the planning and accountability of interventions, focusing not only on technical implementation but also on enhancing the longer-term benefits for smallholders and their livelihoods (De Janvry and Sadoulet, 2005; Wenar, 2006).

Methods

The aim of this study was to elicit the experiences and perspectives of practitioners and researchers on interventions aims at facilitating African smallholder participation in

supply chains for higher-value (for example horticultural products, spices, nuts, dairy products, etc.) and/or differentiated (for example organic or fair trade) agricultural and food product markets. Hereafter, these are collectively referred to as 'higher-value supply chains'. The study focused on practitioner perceptions of: (i) the anticipated benefits/impacts of smallholder participation; (ii) the constraints that limit such participation; (iii) the indicators that actually are and those that should be used to assess project/policy impacts; (iv) key factors underpinning intervention success; and (v) the appropriate roles for various stakeholder groups.

The sampling frame consisted of 391 individuals working in bilateral and multilateral donor institutions, organizations providing technical assistance, agribusiness organizations, private agribusinesses, research institutions, and non-governmental organizations (NGOs). Defining the sample of practitioners was problematic given that no published list exists of people working in this area, including bilateral and multilateral donors, NGOs, research organizations etc. Thus, the research team compiled an initial list on the basis of an Internet search, review of the academic and grey literatures and consultation with colleagues. Respondent-driven sampling was then employed to widen the sample, whereby The identified individuals were then contacted and asked to suggest further practitioners, through respondent-driving sampling (Salganik and Heckathorn, 2004), whereby the identified respondents were asked to identify other practitioners for inclusion in the survey. While this technique could introduce biases into the sample, we would posit that this is offset by the fact that the initial listing of respondents included individuals from a wide range of organizations, cutting across the donor, academic/research, NGO and private sectors. It also served to offset any potential biases within the research team that might have influenced our own initial selection of respondents.

The survey was implemented over the period October to November 2006. All potential respondents were contacted by email, inviting participation and providing a link to an internet-based questionnaire. After a period of three weeks, a reminder was sent to all potential respondents by email. Out of the initial sampling frame of 391 individuals, 49 email addresses were non-operational, giving a valid sampling frame of 342. Of these individuals, 160 completed the questionnaire, with a response rate of 46.8 percent. The breakdown of these respondents by affiliation and geographical base is reported in Table 1.¹

¹ Overall, the survey provided a good cross-section of individuals, although with a lower representation from the private sector than would have been ideal. It is not possible, however, to judge the

Table 1. Number of respondents by affiliation:

Category	Frequency		
	Based in Sub-Saharan Africa	Not based in Sub-Saharan Africa	Total
Researcher	8 (5.0%)	32 (20.0%)	40 (25.0%)
NGO	17 (10.6%)	2 (1.3%)	19 (11.9%)
Donor	6 (3.8%)	14 (8.8%)	20 (12.5%)
Technical assistant provider	12 (7.5%)	30 (18.8%)	42 (26.2%)
Private agribusiness operator	7 (4.4%)	0 (0.0%)	7 (4.4%)
Agribusiness organization	16 (10.0%)	2 (1.3%)	18 (11.2%)
Public sector	10 (6.3%)	2 (1.3%)	12 (7.5%)
Other	2 (1.3%)	0 (0.0%)	2 (1.2%)
TOTAL	78 (48.8%)	82 (51.3%)	160 (100.0%)

The questionnaire predominantly employed five-point Likert scales to gather attitudinal data from respondents. Thus, for example, respondents were presented with a series of items and asked the degree to which they considered each to be important on a scale ranging from “very important” (1) to “very unimportant” (5). Given the large number of items presented to respondents, a five-point scale was employed to minimize fatigue. While a seven-point scale may have produced a greater degree of discrimination between respondents, there is evidence that five and seven-point scales have quite comparable characteristics in terms of the mean, variance and skewness of responses (Dawes, 2008). The resulting scale scores were treated as interval data and analyzed using principle components analysis (PCA) to identify whether, within any one question, responses provided multi-item measures of underlying constructs; that is that multiple items were closely correlated with one another and really represented a broader category that had not been directly observed (McDonald, 1985; Jackson, 1991). Having identified the underlying latent variables in each case, multi-item scales were derived from the items loading heavily on to each of the derived principle components and used

representativeness of the sample; we have no *a priori* information on the total number and institutional affiliation of practitioners engaged in linking small-scale producers to high-value markets.

to derive measures that could be compared across the derived constructs and, for any one construct, across respondents. The reliability and unidimensionality of each of the multi-item scales was tested and the scales pruned as appropriate.

Results

This section reports the survey results according to the five key research issues in turn.

Impacts of participation in higher-value supply chains

To elicit the judgments of respondents regarding the potential impacts of smallholder participation in higher-value supply chains, a list of 21 items was provided that had been compiled through a review of the literature and discussions among the research team. Respondents were asked to score each of these items on a five-point Likert scale from ‘very positive’ (1) to ‘very negative’ (5).²

Table 2 reports the potential impacts by ascending mean score. The most positive impacts were judged to be ‘access to improved technology’, ‘understanding of market requirements’, ‘level of technical/agronomic learning’, ‘access to technical assistance’ and ‘returns per unit of household labor’. Although, none of the presented impacts were rated on the negative side of the scaling (that is with a mean score above 3), the items with the highest mean scores were ‘level of financial risk’, ‘health risks to farm workers’, ‘environmental sustainability of the wider community’ and ‘environmental sustainability of the farm enterprise’, suggesting an ambiguity (‘neither positive nor negative’) in the perceptions of respondents as to whether smallholder participation in higher-value supply chains exposes them (and their communities) to higher levels of risk. As we will see below, indicators of risk exposure and risk management are rarely among the measures used to gauge project/policy impact.

Table 2. Ordered mean scores of the potential impacts on African smallholders of participating in higher-value supply chains:

Potential Impact	Mean	Standard Deviation
Access to improved technologies	1.736 ^a	0.319
Understanding of market requirements	1.763 ^a	0.637
Level of technical/agronomic learning	1.794 ^a	0.315

² As with all of the scaling questions in the survey, respondents were given the opportunity to provide additional potential factors/impacts through an open-ended question.

Access to technical assistance	1.819 ^{a,b}	0.372
Returns per unit of household labor	1.819 ^{a,b}	0.333
Access to inputs	1.894 ^b	0.356
Long-term agricultural income	1.894 ^b	0.418
Access to finance	1.906 ^{b,c}	0.352
Business management skills	1.906 ^c	0.352
Economic impacts on wider community	2.025 ^{c,d}	0.404
Ability to adapt to changes in market conditions	2.034 ^d	0.480
Short-term agricultural income	2.063 ^d	0.406
Ability to be involved in viable farmer-based organizations	2.106 ^d	0.306
Social standing in the community	2.238 ^e	0.389
Stability/predictability of income	2.275 ^e	0.483
Participation of women	2.301 ^e	0.467
Food security	2.319 ^e	0.421
Environmental sustainability of farming enterprise	2.469 ^f	0.475
Environmental sustainability of the wider community	2.547 ^f	0.509
Health risks to farm workers	2.699	0.360
Level of financial risk	2.965	0.401

Note: Mean scores denoted by the same letter are not significantly different from each other at the 5% level on the basis of a Wilcoxon signed rank test.

In order to make further sense of the individual item scores, the Likert scale data were subject to principle components analysis (PCA). A total of three underlying factors were identified that collectively accounted for 67.9 percent of the variation in scores (See Annex Table 1). The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.752 and Bartlett's test of sphericity was significant ($\chi^2 = 1763.25$ (66 df); $p = .000$), suggesting that the individual item scores factor well and that the factor solution is rigorous (Hair *et al.*, 1998; McDonald, 1985; Jackson, 1991).

Loadings on the first principal component (PC1) posit an association between participation in higher-value supply chains and enhanced **access to resources and knowledge**. This involves a cluster of impacts related to: 'understanding of market requirements', 'level of technical/agronomic learning', 'access to improved technologies', 'business managements skills', 'access to technical skills', 'enhanced ability to adapt to the changes in the markets' and 'access to finance and inputs'. This factor accounted for 36.4 percent of the variation of the sample.

Loadings for the second principal component (PC2) suggest an association between participation in higher-value supply chains and **economic and social gains**. This involves the cluster of impacts that includes: 'short-term agriculture income', 'long-term agricultural income', 'ability to be involved in viable farmer-based organizations', 'economic impacts on wider community', 'food security' and 'stability/predictability of income'. Some 21.5 percent of the variation of the sample is accounted for by PC2. The

third principal component (PC3) can best be described as being related to the **environmental and health impacts**, involving such impacts as: ‘environmental sustainability of the wider community’, ‘environmental sustainability of farming enterprise’, ‘health risks of farm workers’ and ‘participation of women’. Looking across these three principle components, it would appear that respondents judged the impact of participation in terms of the alleviation of constraints (PC1), on the one hand, and the direct (PC2) and indirect (PC3) impacts of participation on the other.³

Constraints inhibiting smallholder participation in higher-value supply chains

The questionnaire explored constraints to smallholder participation from two perspectives: (i) the ability of smallholders to participate in such supply chains; and (ii) the willingness of buyers to procure from smallholders given prevailing conditions and alternatives.

To capture the *supply side constraints*, respondents were first presented with a series of 21 potential factors constraining smallholder abilities to participate and asked to score each item on a five-point Likert scale from ‘very important’ (1) to ‘very unimportant’ (5). Following the scaling question, respondents were able to indicate further potential impacts through an open-ended question.

The constraints considered most important (Table 3) were all related to infrastructure and logistics (for example ‘weak/inadequate rural transport infrastructure’, ‘non-competitive/high cost transport services’, weak/inadequate rural marketing infrastructure’ and ‘lack of scale’) followed closely by a set of factors related to (weak) other support services (for example ‘weak/limited availability of technical advisory services’, ‘lack of access to competitively priced finance’ and ‘lack of pertinent information on prevailing standards’). In contrast, respondents downplayed the constraints typically associated with smallholder households (and asset-holdings) themselves, including ‘insufficient availability of family labour’, ‘insecure land tenure’, ‘fragmentation of household land holdings’, ‘risk management/food security’ concerns,

³ The results of the PCA suggest that there are three broad potential impacts underlying the scaling data presented in Table 1. In order to derive measures of these three impacts, multi-item scales were defined on the basis of the critical items loading on to the relevant principle component. All three of the scales were reliable, with the Cronbach α exceeding 0.81 in all cases (Spector, 1992; Aiken, 1996). According to the mean scores, access to resources and markets (1.853) was considered the most positive potential impact of participation in higher-value. Participation in such supply chains was also judged to have a positive economic and social impact (2.110). The environmental and health impacts, however, were judged to be ambiguous; the mean multi-item scale score was 2.506, corresponding to ‘neither positive nor negative’.

and ‘weak/absent farmer organizations’. Given that respondents suggested very few additional constraints, the list of items was considered to include all substantive supply-side constraints.

Table 3. Ordered mean scores for importance of constraints limiting African smallholder participation in higher-value supply chains:

Constraint	Mean	Standard Deviation
Weak/inadequate rural transport infrastructure	1.451	0.371
Non-competitive/high cost transport services	1.622	0.425
Weak/inadequate rural marketing infrastructure	1.713 ^{a,b}	0.401
Lack of scale	1.797 ^b	0.358
Weak/limited availability of technical advisory services	1.831 ^b	0.366
Lack of access to competitively priced finance	1.835 ^b	0.347
Lack of pertinent information on prevailing standards	1.872 ^b	0.353
Lack of timely access to improved inputs	1.881 ^c	0.386
Lack of farmer ‘quality’ consciousness	1.884 ^c	0.408
Lack of pertinent market information	1.894 ^c	0.369
Weak or high cost services of market intermediaries	1.919 ^c	0.369
Limited technical knowledge of farmers	1.937 ^c	0.307
High costs of standards certification	1.939 ^c	0.412
Limited commercial skills of farmers	1.985 ^{c,d}	0.332
Lack of business culture	1.989 ^{c,d}	0.311
Lack of/limited capacity for irrigation	2.044 ^{d,e}	0.414
Distrust/weak bargaining power vs commercial agribusiness entities	2.138 ^e	0.357
Weak/absent farmer organizations	2.152 ^{e,f}	0.358
Risk management concerns	2.247 ^f	0.403
Fragmentation of household land holdings	2.312 ^f	0.348
Insecure land tenure	2.361 ^f	0.412
Insufficient availability of household labor	2.858	0.399

Note: Mean scores denoted by the same letter are not significantly different from each other at the 5% level on the basis of a Wilcoxon Signed rank test.

Principle component analysis revealed four underlying constructs that collectively accounted for 72 percent of variation across the scaling items (Annex Table 2). The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.743 and Bartlett's test of sphericity was significant ($\chi^2 = 580.9$ (78 df); $p = .000$). The first factor accounted for 31.8 percent of the variation and can be characterised as **weakness of support services**, with heavy loadings for ‘weak/absent farmers’ organizations’, ‘high costs of standards certification’, ‘weak/limited availability of technical advisor services’, ‘weak bargaining powers of farmers versus commercial agribusiness entities’, ‘weak/inadequate rural transport infrastructure’ and ‘lack of pertinent market information’. The second principal component (PC2), accounting for 21.7 percent of the sample variation can be

called **prevailing farming structure**. Pertinent constraints included ‘fragmentation of household land holding’, ‘lack of scale’ and ‘insecure land tenure’ The third principle component (PC3) can be called **access to finance and risk management** and included the constraints of ‘lack of access to competitive priced finance’ and ‘risk management concerns’. The fourth and final principle component (PC4) was related to **producer knowledge** and had heavy loadings for ‘limited technical knowledge of farmers’ and ‘lack of farmer quality consciousness’.⁴

To capture *demand-side constraints*, respondents were presented with a list of 15 possible factors that might inhibit the willingness and/or ability of processing, export trading and/or modern retail distribution companies from sourcing higher-value products or raw materials from African smallholders. Again, respondents were asked to score each factor on a five-point Likert scale from ‘very important’ (1) to ‘very unimportant’ (5).

The constraints that are considered most important all related to logistics and supply chain management, including the specific constraints of: ‘weak/inadequate rural transport infrastructure’, ‘inability/high costs of product traceability’, ‘lack of scale among small-scale farmers’, ‘inability to enforce commercial contracts’ and ‘high transport costs for raw materials’ (Table 4). The next set of relatively important constraints also impact on the transaction costs potentially faced by buyers, associated with ‘weak communications’, ‘lack of reliable/timely information on production’, ‘inability to recover loans from farmers’, and ‘lack of confidence in regulatory enforcement related to pesticides and veterinary drugs’.

Table 4. Ordered mean scores for constraints inhibiting African processing, export trading and modern retail distribution companies from sourcing from smallholders:

Constraint	Mean	Standard Deviation
Weak/inadequate rural transport infrastructure	1.611	0.304

⁴ To obtain measures of the importance of each of these four underlying constraints to smaller participation, multi-item scales were derived from the individual item scores. Three of the four scales had high levels of reliability, all with a Cronbach α exceeding 0.75. The scale for prevailing farming structure had a α value of 0.67, indicating lower levels of reliability. Attempts to prune this scale did not produce a higher α value. The constraints to the participation of small-scale producers judged to be most important related to lack of producer knowledge (1.812) and weakness of support services (1.819), the mean scores of which were not significantly different ($p < .005$). Access to finance and risk management (2.337) and prevailing farming structure (2.791) were considered to be less important constraints.

Inability/high costs of product traceability	1.720	0.319
Lack of scale among small-scale farmers	1.836 ^a	0.328
Inability to enforce commercial contracts	1.855 ^a	0.362
High transport costs for raw materials	1.861 ^a	0.312
Weak communications infrastructure/facilities	1.971 ^b	0.323
Lack of reliable/timely information on production	2.024 ^b	0.331
Inability to recover loans from farmers	2.036 ^b	0.405
Lack of confidence in enforcement of regulations related to pesticides and veterinary drugs	2.045 ^b	0.414
High cost of grading and testing delivered products	2.165 ^c	0.336
Limited technical knowledge of farmers	2.179 ^{c,d}	0.371
Weak farmer organizations	2.180 ^{c,d}	0.329
Lack of trust in market intermediaries	2.280 ^d	0.365
Lack of/limited farmer irrigation capacity	2.442	0.354
Regulatory restrictions on direct sourcing from smallholders	2.853	0.432

Note: Mean scores denoted by the same letter are not significantly different from each other at the 5% level on the basis of a Wilcoxon signed rank test.

Three underlying factors were identified in the scaling responses through the application of principle component analysis. Collectively, these accounted for 64.1 percent of the variation across the items (Annex Table 3). The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.735 and Bartlett's test of Sphericity was significant ($\chi^2 = 439.9$ (55 df); $p = .000$). The first principle component (PC1) accounted for 34.8 percent of the variation and was associated with **access and cost of infrastructure**. The second principle component (PC2), accounting for 19.3 percent of the sample variation can be called **supply chain management**. The third and final principle component was associated with **food safety and quality control**.⁵

Indicators of the success of project or policy interventions

Respondents were presented with a list of 28 potential indicators of the 'success' of project or policy interventions aimed at facilitating smallholder participation in higher-value supply chains. They were asked to score each item according to frequency of use on a five-point Likert scale from 'very frequently' (1) to 'very infrequently' (5).

⁵ Measures of the importance of each of the three underlying constraints were derived from the associated multi-item scales. The Cronbach α exceeded 0.74 for two of the scales. The scale for supply chain management had a α value of 0.65, indicating lower levels of reliability. The constraints considered of greatest importance were food safety and quality controls (1.990) and access and cost of infrastructure (1.993), which were statistically insignificant ($p < .005$). Supply chain management (2.439) was considered to be of secondary importance.

The responses provided point to the relatively short-term time horizon of many development assistance efforts and to the difficulties of gauging deeper and longer term structural and capacity impacts (Table 5). For example, among the indicators most commonly used to measure project/policy success are the numbers of: (i) targeted farmers supplying the focal products; (ii) farmer groups formed; and (iii) farmers/groups that have been certified to a particular standard. Other commonly used indicators relate to changes in the quantities/value of farmer sales and country exports.

In contrast, indicators related to risk management (for example ‘farm worker health’, ‘inter-annual variability of farmer incomes’ and ‘improved natural resource management’) are much less commonly considered. It is therefore not surprising that respondents remain ambiguous on matters of farmer/community risk exposure. Also much less commonly measured are indicators of local capacity-building, whether among public sector organizations or (private) suppliers of technical and business advisory services. Given that the respondents also indicated that weak support services are among the leading constraints on the ability of smallholders to meet the requirements of higher-value supply chains, the relative lack of attention to the impact of interventions on service capacities is somewhat surprising.

As with the other themes, principle component analysis was employed to identify any underlying constructs in the scaling data. A total of four factors accounted for 79.5 percent of the sample variation (Annex Table 4). The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.687 and Bartlett's test of sphericity was significant ($\chi^2 = 987.28(136df)$; $p = .000$), suggesting a rigorous factor solution. The four principle components are associated with **managerial and marketing capacity** (accounting for 27.6 percent of sample variation), **productivity gains** (23.1 percent), **technical assistance support** (20.8 percent), and **number of participants** (8.8 percent) (See Annex Table 4).⁶

⁶ To derive measures of the frequency of use for the four broader indicators of success, multi-item scales were derived on the basis of the item loadings for each principle component. All of these scales were reliable; the Cronbach α exceeded 0.75 for all four of the scales. Respondents judged that the most frequently used measure of ‘success’ related to the number of recipients of the intervention (1.712). This was followed by measures of the technical assistance and support provided (2.291). Measures of productivity gains (2.899) and managerial and marketing capacity (3.013) were ranked third in terms of frequency of use and the scale values were statistically insignificant ($p < .005$) from one another. As highlighted earlier, the measures judged to be used least frequently was impacts on external (organizational) capacity (3.612).

Table 5. Ordered mean scores for indicators used to measure success of project or policy interventions linking smallholders to higher-value supply chains:

Indicator	Mean	Standard Deviation
Number of targeted farmers supplying the higher-value crop/livestock product	1.841 ^a	0.314
Quantities of technical assistance provided (for example number of people/groups trained, etc.)	1.844 ^a	0.341
Gross value of sales of smallholders from focal commodities	1.968 ^b	0.527
Number of farmer groups formed	1.973 ^{b,c}	0.331
Volume/value of exports or domestic sales	2.101 ^c	0.327
Measures of technical farm productivity (for example crop yields, animal productivity, etc.)	2.103 ^c	0.503
Number of farmers/groups certified for a particular standard	2.323 ^d	0.335
Trends in producer prices, share of value addition, etc.	2.354 ^d	0.310
Distribution of participation based on gender	2.467 ^{d,e}	0.315
Share of targeted commodity sold at higher grades or in targeted segment	2.497 ^{d,e,f}	0.364
Evidence of improved access to technical or business advisory services	2.583 ^{f,g}	0.299
Changes in measured rate of poverty among target farmers	2.606 ^{f,g}	0.310
Crop/livestock budgets showing change in income compared to 'traditional' crop/activity	2.670 ^{g,h}	0.328
Measures of agribusiness profitability	2.673 ^{g,h}	0.330
Evidence of increased viability and capacity of farmer organizations	2.697 ⁱ	0.463
Measures of technical performance related to compliance with standards (for example rejection rates, incidence of price discounts, etc.)	2.780 ^{i,j}	0.312
Returns to land and labour invested in focal commodities	2.987 ^{j,k}	0.466
Indicators of reduced transaction costs faced by agribusiness firms	3.029 ^{k,l}	0.463
Indicators of reduced transaction costs faced by farmers	3.051 ^l	0.495
Indicators of ability of farmers to continue supplying target markets in the medium and long term	3.111 ^{l,m}	0.517
Evidence of increased capacity/sustainability of local providers of technical/business advisory services	3.161 ^{l,m}	0.589
Indicators of intra-annual cash flow for farmers	3.190 ^m	0.415
Evidence of increased ability to respond to new market opportunities	3.213 ^{m,n}	0.404
Measures of improved natural resource management by farmers	3.219 ^{m,n}	0.459
Impacts on wider community (for example access to input, flows of knowledge, etc.)	3.278 ⁿ	0.331
Data on inter-annual variability of farmer incomes	3.320 ^o	0.355
Measures of improved farm worker health	3.603 ^o	0.410
Measure of public sector administrative/technical capacities	3.674 ^o	0.532

Note: Mean scores denoted by the same letter are not significantly different from each other at the 5% level on the basis of a Wilcoxon signed rank test

Respondents were then asked what indicators of success 'should' be tracked and measured in order to truly gauge the impact of project and policy interventions in this

area.⁷ The indicators most frequently mentioned were the ‘number of farmers able to supply/certified to required standards on a consistent basis’, ‘change in level/stability of farm income’, ‘change in household welfare/standards of living/livelihood/poverty’ and ‘long-term ability of smallholders to supply target markets’ (Table 6 below). Many of these indicators were judged by respondents to be used relatively infrequently in practice, and indeed did not even figure in the four broad indicators derived through principle components analysis. While just over one-third of respondents included the viability/strengthening of farmer organizations among the indicators that ‘should’ be gauged, very few included indicators associated with service provider or public sector capacities.

Factor influencing success of interventions

What factors most influence the performance or effectiveness of interventions in this area? Respondents were presented with a list of 30 potential factors, derived from research team discussions following a review of the literature. Respondents were asked to score each of these factors on a five-point Likert scale from ‘very important’ (1) to ‘very unimportant’ (5). Subsequently, they were provided with the opportunity to provide additional factors through an open-ended question.

The factors judged to have the greatest impact on intervention success all are closely related to project design and management, including ‘close collaboration with the private sector’, ‘flexible project design enabling modifications and redirections over time’, ‘technical expertise of project advisory service provider’, and ‘management of financial support to farmers’ (Table 7). In contrast, the collaborative involvement of government (either local or central agricultural ministry) was deemed to be least important for intervention success. This is not surprising given the current paradigm of government-as-enabler, but not direct market participant. It is somewhat surprising that several factors associated with prior experience (for example farmer experience with focus commodity or with producer organizations) and/or prior institutional capacities (for example strong industry organizations) were not rated among the leading ten to fifteen factors impacting intervention performance.

⁷ Each was asked to provide a ranked list of up to six indicators. The verbatim responses were coded by two members of the research team independently, with the aim of achieving a minimum level of inter-coder reliability of 80 percent. Where there was discrepancy in the coding of any item, the two research team members consulted and agreed on an appropriate categorization. The defined categories were assigned numerical values according to the ranking from first (1) to last (6). The elicited items were then ordered by their total rank score in order to obtain some ranking in terms of importance.

Table 6. Non-elicited primary indicators that should be used to judge success of interventions linking smallholders to higher-value supply chains:

Indicator	Frequency
Number of farmers able to supply/certified to required standards on consistent basis	142
Change in level/stability of farm income	122
Change in household welfare/standards of living/livelihood/poverty	118
Long-term ability of smallholders to supply target markets	106
Change in volume/value of sales/value-addition, etc.	80
Change in farm profitability/returns to land/labor	78
Level/stability of prices attained	63
Viability/strengthening of farmer organizations	56
Change in number of farmers supplying target market/linked to supply chain	53
Change in ability to understand and/or respond to market opportunities	46
Change in supply chain transaction costs	43
Degree to which commercial/technical skills enhanced	33
Views/attitudes of buyers regarding smallholders/buyer performance	30
Infrastructural/supply chain development	26
Change in smallholder competitiveness/bargaining power	26
Level of buyer/consumer demand for products of smallholders	23
Number/area of smallholders	23
Degree to which use of technology enhanced	20
Proportion of market supply/exports supplied by smallholders	17
Inclusiveness in terms of gender, poverty level, etc.	17
Impact on wider community	17
Development of support services/access to support services	17
Regularity of payments to smallholders	13
Donor return on investment	13
Replicability/ability to scale-up	10
Other	36

As previously, in order to identify underlying constructs across the 30 scale items, principle component analysis was employed. A total of six factors were identified that collectively accounted for 74.3 percent of the variation. The factor solution was judged to be rigorous on the basis of the Kaiser-Meyer-Olkin measure of sampling adequacy (0.749) and Bartlett's test of sphericity, which was significant ($\chi^2 = 931$ (171 df); $p = .000$). The six principle components are associated with **prevailing external conditions** (accounting for 34.1 percent of sample variation), **project management** (11.3 percent), **effective institutions** (9.2 percent), **role of the private sector** (7.0 percent) **level of farmer experience** (6.5 percent) and **ability to adapt to local conditions** (6.2 percent).⁸

⁸ Multi-item scales were derived for each of the six underlying factors influencing intervention success. Five of the scales had a Cronbach α exceeding 0.74. However, the scale corresponding to PC2 ('project management') required pruning to increase reliability. Namely, the item 'appropriate timing of intervention in the 'life-cycle' of an industry' was excluded. The pruned scale had a α value of 0.87. The factors judged to be most important influences on the success of interventions related to ability to adapt to local conditions (1.722), project management (1.756) and role of

Table 7. Ordered mean scores for factors contributing to the success of interventions linking smallholders to higher-value supply chains:

Factor	Mean Score	Standard Deviation
Project interventions made in close collaboration with the private sector	1.428	0.349
Flexible project design enabling modifications and redirections over time	1.556 ^a	0.303
Technical expertise of project advisory service provider	1.624 ^{a,b}	0.465
Appropriate management of financial support to farmers	1.673 ^b	0.390
Commercial expertise of project advisory service provider	1.717 ^c	0.402
Security situation in targeted production areas	1.780 ^c	0.468
National socio-political stability	1.827 ^c	0.336
Clear 'exit' and transition strategy beyond project interventions	1.832 ^c	0.401
Condition of rural roads during rainy season	1.839 ^c	0.376
Effective accountability and controls on corruption	1.858 ^d	0.329
Sharing of project intervention costs with benefiting firms	1.931 ^d	0.408
Agro-ecological conditions in targeted producer areas	1.940 ^d	0.385
Targeting farmers -prior experience in producing focal /similar commodity	1.950 ^d	0.473
Absence of adverse weather shock (i.e. drought)	1.964 ^d	0.297
Coherent ownership structure for farmer organizations	1.971 ^d	0.326
Project interventions initiated by the private sector	1.991 ^d	0.375
Positive trends in pertinent commodity prices	2.060 ^e	0.319
Appropriate timing of intervention in the 'life-cycle' of an industry	2.061 ^e	0.484
Targeting farmers with prior experience producing any commodity for a discerning, quality-focused market	2.067 ^e	0.507
Sharing of project intervention costs with benefiting farmers	2.069 ^e	0.402
Extended length of time for project implementation	2.161 ^e	0.343
Existence of strong industry organization in the targeted sectors	2.162 ^e	0.353
Prevailing currency exchange rates	2.168 ^e	0.376
Well-defined property rights	2.238 ^{e,f}	0.319
Requirement for financial contribution from farmers	2.252 ^{e,f,g}	0.353
Strong enforcement institutions	2.287 ^{f,g}	0.331
Prevailing local interest rates	2.342 ^{f,g}	0.364
Targeting farmers with prior positive experience of producer organizations	2.379 ^g	0.374
Collaborative involvement by local government authorities	2.408 ^g	0.316
Collaborative involvement by national ministry of agriculture	2.715	0.426

Note: Mean scores denoted by the same letter are not significantly different from each other at the 5% level using Wilcoxon signed rank test

the private sector (1.781). The mean values of these three scales were statistically insignificant ($p < .005$). Prevailing external conditions (2.151) and effective institutions (2.166) were considered of secondary importance and statistically insignificant from one another ($p < .005$). Contrary to *a priori* expectations, farmer experience (2.651) was considered to be the least important factor influencing the success of these interventions.

Institutional roles in facilitating smallholder participation

Finally, the survey asked respondents to consider the most important roles of a series of stakeholders in facilitating smallholder participation in higher-value supply chains. These stakeholders are: 1) national governments; 2) private agribusiness firms or organizations; 3) external development assistance agencies; and 4) project implementation teams or organizations. In each case, respondents were asked to indicate the three most important roles and their verbatim responses were coded as described above.

Overall, the results suggest a clear division of labor between national governments and the private sector, although more ambiguity in the division of roles between the latter and external agencies and project implementing teams (Table 8). Thus, government should be providing the required logistics and infrastructure (including road networks, air and sea ports, utilities and communications services), an enabling environment, and a coherent legal framework (especially relating to contract enforcement). According to respondents, private agribusinesses are not only the 'target market' for small-scale producers, but also central players in facilitating the ability of smallholders to meet their requirements, via technical support, providing access to finance and managing supply chain logistics.

Less than one in four of the respondents listed training and extension, research, or providing access to finance, among the roles that governments should play in facilitating smallholder participation in higher-value supply chains. These are traditionally areas deemed to have public good properties, experiencing market failure in an African context. The provision of training and access to finance are more widely reported by respondents as appropriate functions for private agribusinesses, external development assistance agencies, and project implementing teams.

The roles deemed appropriate for external development organizations and project implementation teams are partly to support governments and private agribusinesses in pursuing their own functions and partly in the realm of 'honest' broker between and among supply chain participants. These entities are also seen to have important roles in helping to identify and assess market opportunities (for farmers and firms) and sharing/promoting international 'good practice' in pertinent areas. Quite a few respondents signaled a role for donors and project implementers in capacity-building, although, as noted above, achievements in capacity-building are rarely monitored and measured.

Table 8. Most important roles for stakeholders in enabling smallholders to participate in higher-value supply chains:

Role	Frequency
National Government	
Development of logistics/infrastructure	76
Promote enabling environment	63
Legal framework/conditions for contract enforcement	52
Policy framework	48
Training/extension	39
Access to capital/finance	32
Macroeconomic management	31
Farm organization/group development	21
Law & order	19
Research	14
Other	42
Private Agribusiness Firms or Organizations	
Technical support/capacity-building	82
Creating market linkages	77
Access to fixed/working capital	58
Identification & dissemination of market opportunities	49
Compliance with food safety & quality standards	34
Input supply	33
Providing stable market demand & revenue	27
Relations with government	19
Other	32
External Development Assistance Agencies	
Linking smallholders and agribusinesses	69
Support to government/promoting policy reform	59
Training/capacity-building	57
Provision of fixed/working capital	55
Experience-sharing/promoting best practice	48
Linking government and private sector	36
Business development service creation/capacity-building	34
Market identification/creation	32
Advocacy for smallholders	20
Supporting infrastructural development	19
Supporting standards-setting, certification, etc.	17
Other	33
Project Implementation Teams or Organizations	
Linking/brokering smallholders and private sector	78
Training/capacity-building	61
Market identification, assessment, communication, etc.	59
Farmer mobilization, organization, etc.	46
Technical support	41
Promoting good practice	26
Project management, organization, planning, monitoring, etc.	23
Information source	21
Other	29

Conclusions

The potential and pitfalls of linking smallholder farmers to higher value markets are growing themes within economic research and policy planning associated with developing country agriculture. For example, the World Development Report (WDR) 2008 notes the potential of the “emerging new agriculture”. This is “led by private entrepreneurs in extensive value chains linking producers to consumers and including many entrepreneurial smallholders supported by their organizations”. Dynamic opportunities exist in domestic, regional, and international markets.

Yet, the WDR also identifies frequent constraints on smallholder participation in these more dynamic markets, emphasizing weaknesses in infrastructure, mismatches in delivery scale or scope when supplying modern procurement systems (that is of domestic supermarkets) and the challenges associated with compliance with emerging food safety and other standards (especially for exports). For the present study, respondent practitioners similarly downplayed production level constraints and emphasized the challenges of efficient transaction-making between (African) smallholder farmers and the downstream gate-keepers of higher value supply chains. Responses from these practitioners did, however, highlight one frequently constraining factor of production; that is, farmer knowledge about market opportunities and requirements and about effective and market-acceptable production techniques.

The existing literature provides numerous examples of where smallholder participation in higher value markets has been associated with higher levels of income and/or employment. However, without detailed and longer term studies examining patterns of participation and non-participation/exit, variability of outcomes over time, and a broader range of impacts, it is difficult to draw definitive conclusions. The respondents to our practitioner survey were most optimistic about the ‘learning’ benefits (e.g. acquisition of technical and business skills) from smallholder participation in higher value supply chains. They were also positively inclined regarding income gains and other economic impacts. With regard to environmental and health impacts there was greater ambivalence, with the sample as a whole having a neutral position, while a considerable minority noting potential adverse impacts.

The practitioner survey brings out an interesting contrast between the sets of indicators typically used to monitor and evaluate the efficacy of interventions to better link smallholders with higher value markets, and those indicators which respondents indicate ‘should’ be used in order to best gauge impacts. The most frequently used measures relate to ‘inputs’ (for example number of people trained; number of groups

formed) and selected short-term outcomes (for example volume and value of sales), rather than to longer term impacts or indicators of effective capacity. The potential sustainability of results, relationships, services, capacities, etc. does not seem to be commonly gauged. Pragmatic considerations of measurement ease and timeliness are seemingly determinate.

Survey respondents asserted that project design and management features are the lead determinants of the success or otherwise of interventions in this field. They downplayed other factors, including prevailing commodity market and macroeconomic conditions, the prior experience of farmers, and the pre-existing strength of pertinent industry organizations. The sample as a whole substantially discounted the importance of a collaborative and effective direct role for local or national government agencies. Whether these perspectives are borne out in practice or simply reflect the hopes and aspirations of the development community is an empirical issue that is in need of testing.

Finally, the survey respondents outlined a division of public and private sector responsibilities consistent with the current 'linking farmers to markets' paradigm. Thus, the roles of government are cast as providing the economic, political, and infrastructural conditions necessary for private investment. The private sector, in turn, is tasked with the responsibility for driving the integration of producers into higher value markets via commercial relationships and associated provision of market information, technical advice, and logistical and other services.

External development agencies and project implementers are tasked with supporting the efforts of governments and the private sector, while playing the potentially multi-faceted role of 'honest broker', between and among supply chain participants and government entities. In the "emerging new agriculture", intra-supply chain trust is critical, certain suppliers are deemed 'preferred', public/private partnerships are sought, and economizing on transaction costs is paramount. In such an environment, an effective 'honest broker' can be a valuable player.

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Annex Table 1. Results of principle components analysis of scaling data on potential impacts of smallholder participation in higher-value supply chains:

Potential Impact	PC1: Access to Resources & Knowledge	PC2: Economic & Social Gains	PC3: Environmental & Health Impacts
Understanding of market requirements	0.8240	-0.0240	0.1522
Level of technical/agronomic learning	0.7131	0.1021	-0.0308
Access to improved technologies	0.7001	0.2655	0.1373
Business management skills	0.6907	0.0009	0.3532
Access to technical assistance	0.6781	0.2931	0.0383
Ability to adapt to changes in market conditions	0.6388	0.1835	0.2064
Access to finance	0.6489	0.1828	0.2585
Access to inputs	0.5897	0.3529	0.0814
Short-term agricultural income	0.2001	0.7435	-0.1246
Long-term agricultural income	0.1797	0.7423	0.1305
Ability to be involved in viable farmer-based organizations	0.2107	0.6949	0.0508
Economic impacts on wider community	0.1493	0.6718	0.3983
Food security	0.0021	0.6329	0.2303
Stability/predictability of income	0.3095	0.6079	0.3572
Environmental sustainability of the wider community	0.2531	0.2540	0.7902
Environmental sustainability of farming enterprise	0.3928	0.2653	0.7686
Health risks to farm workers	0.2881	-0.1815	0.7677
Participation of women	-0.0948	0.3058	0.7336

Annex Table 2. Results of principle components analysis of scaling data on importance of constraints limiting African smallholder participation in higher-value supply chains:

Constraint	PC1: Weakness of Support Services	PC2: Prevailing Farming Structure	PC3: Access to Finance & Risk Management	PC4: Lack of Producer Knowledge
Weak/absent farmer organizations	0.8181	0.0275	0.2473	-0.0196
High costs of standards certification	0.7522	0.2007	0.0763	0.0051
Weak/limited availability of technical advisory services	0.6964	0.0663	-0.0448	0.4766
Weak bargaining power vs. commercial agribusiness entities	0.6632	0.2907	0.3676	-0.1168
Weak/inadequate rural transport infrastructure	0.6123	0.2529	0.4243	-0.0880
Lack of pertinent market information	0.5902	0.0351	0.4798	0.3658
Fragmentation of household land holdings	0.2054	0.7784	0.0446	-0.0187
Lack of scale	0.1512	0.6681	-0.1603	0.1658
Insecure land tenure	-0.0799	0.6597	0.1978	0.2288
Lack of access to competitively priced finance	0.1474	0.0053	0.7631	0.2495
Risk management concerns	0.1699	0.1022	0.6705	0.0653
Limited technical knowledge of farmers	0.0649	0.0092	0.1084	0.8552
Lack of farmer 'quality' consciousness	-0.0007	0.2426	0.1819	0.5997

Annex Table 3. Results of principle component analysis of scaling data on importance of constraints inhibiting African processing, export trading and modern retail distribution companies from sourcing from smallholders:

Issues	PC1: Access & Cost of Infrastructure	PC2: Supply Chain Management	PC3: Food Safety & Quality Controls
Weak/inadequate rural transport infrastructure	0.8533	-0.0750	0.1728
High transport costs for raw materials	0.7475	0.0842	0.1964
Lack of/limited farmer irrigation capacity	0.6346	0.0624	0.2619
Weak communications infrastructure/facilities	0.5910	0.4311	-0.0324
Inability to enforce commercial contracts	-0.0046	0.8441	0.0326
Inability to recover loans from farmers	-0.0477	0.7697	0.0826
Lack of trust in market intermediaries	0.2624	0.5273	0.3248
Inability/high costs of product traceability	0.0186	0.0976	0.8080
Lack of confidence in enforcement of regulations related to pesticides and veterinary drugs	0.2252	0.0381	0.7252
High cost of grading and testing delivered products	0.4078	0.1590	0.6388

Annex Table 4. Results of principle components analysis of scaling data for importance of indicators used to measure success of project or policy interventions linking smallholders to higher-value supply chains:

Issues	PC1: Managerial & Marketing Capacity	PC2: Productivity Gains	PC3: Technical Assistance and Support	PC4: Number of Recipients
Measures of reduced transaction costs faced by agribusiness firms	0.7711	0.0330	0.2124	0.0792
Indicators of reduced transaction costs faced by farmers	0.7667	0.0047	0.2005	0.1106
Indicators of ability of farmers to continue supplying target markets in the medium and long term	0.7564	0.2431	-0.0104	-0.0610
Evidence of increased viability and capacity of farmer organizations	0.7015	0.1201	0.2245	0.4135
Measures of improved natural resource management by farmers	0.6823	0.2100	-0.1367	-0.0815
Returns to land and labour invested in focal commodities	0.1793	0.7628	0.0984	-0.0904
Measures of technical farm productivity (eg. crop yields)	-0.0307	0.7211	0.1764	0.2393
Gross value of sales of smallholders from focal commodities	0.2239	0.5886	0.2104	0.3431
Evidence of improved access to technical or business advisory services	0.2106	0.1510	0.7631	0.0420
Quantities of technical assistance provided (for example of people/groups trained, etc.)	0.1281	0.0977	0.7497	0.1299
Measure of public sector administrative/technical capacities	0.1732	0.0145	0.7910	0.0228
Evidence of increased capacity of local providers of technical/business services	0.2982	-0.0302	0.7132	0.0112
Number of farmer groups formed	0.0228	-0.1334	0.2110	0.8351
Number of targeted farmers supplying the higher-value crop/livestock product	0.1877	0.3655	-0.0104	0.6866
Number of farmers/groups certified for a particular standard	-0.0512	0.0518	0.1009	0.7009
Distribution of participation based on gender	-0.3629	0.2929	0.1376	0.6126

Annex Table 5. Results of principle components analysis of scaling scores for importance of factors in success (or otherwise) of interventions linking smallholders to higher-value supply chains:

Factor	PC1: Prevailing External Conditions	PC2: Project Management	PC3: Effective Institutions	PC4: Role of Private Sector	PC5: Farmer Experience	PC6: Ability to Adapt to Local Conditions
Prevailing local interest rates	0.8522	0.0248	0.1384	0.1336	0.1423	-0.0187
Positive trends in pertinent commodity prices	0.6935	0.1464	0.1360	-0.0083	-0.3143	0.1722
National socio-political stability	0.6137	0.0572	0.1342	0.0345	-0.1275	0.3597
Commercial expertise of project advisory service provider	0.0144	0.8368	0.0467	-0.0470	0.0280	0.0128
Appropriate management of financial support to farmers', '	0.1092	0.6766	0.0739	-0.1971	0.0253	0.2459
Technical expertise of project advisory service provider	0.2770	0.6673	0.0059	0.0707	0.0399	-0.2210
Appropriate intervention timing in the 'life-cycle' of an industry	0.2446	0.4678	0.2220	0.3729	-0.1201	0.2790
Well-defined property rights	0.2213	-0.1220	0.8323	0.0812	-0.0297	0.0504
Coherent ownership structure for farmer organizations	0.0526	0.3121	0.7513	0.1936	0.1988	0.0158
Strong enforcement institutions	0.1902	0.2301	0.5421	0.0711	0.0384	0.2142
Project interventions initiated by the private sector	0.1490	-0.0559	0.0104	0.8610	-0.0576	0.1662
Project interventions in collaboration with the private sector	0.0162	-0.0624	0.2443	0.8080	0.0283	0.0487
Sharing of project intervention costs with benefiting firms	0.0056	-0.1242	0.2167	0.7431	0.0895	0.1342
Targeting farmers with prior positive experience of producer organizations	0.0737	-0.0345	0.1064	0.2082	0.8351	-0.0067
Targeting farmers with prior experience producing any commodity for a discerning, quality-focused market	-0.0815	0.0913	-0.0280	-0.2577	0.8305	0.0515
Targeting farmers with prior experience in producing focal or similar commodity	0.1342	-0.0893	0.1452	-0.1174	0.8134	0.1003
Agro-ecological conditions in targeted producer areas	0.3056	0.0099	-0.0534	-0.1170	0.1240	0.7334
Security situation in targeted production areas	-0.0337	-0.0669	0.1751	0.3092	-0.2898	0.6597
Flexible project design enabling modifications and redirections according to local conditions	0.0521	0.1667	0.1854	0.2762	0.2154	0.5303