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An Analysis of Organic Contract Farming Schemes in East Africa

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Introduction

As noted in a number of chapters in this volume, recent years have seen a substantial increase in African smallholder production to 'sustainability' standards. This reflects the dynamic growth of Northern markets for products certified to these standards and, in turn, the premium prices that this generates. All of the production concerned appears to be organized through a contemporary variant of contract farming. Like earlier African variants, this is donor-supported. But contracting for sustainability attributes is generally by private corporations rather than by government or public–private agencies and contracts are 'market based', in the sense that they tend to focus mainly on price and quality requirements rather than input supply, production calendars and so on.

Against this background, the chapter asks whether there are measurable economic benefits for farmers who participate in one variant of such schemes, namely those for certified organic produce. Secondly it asks whether, assuming such benefits can be established, these derive from initial differences in factor endowments or from factors integral to scheme participation, such as price premiums and access to different technologies. Thirdly, assuming that outcomes will not be identical across organic contract farming schemes, it poses the question of what scheme framework conditions are associated with optimization of farmers' economic benefits.

The chapter reports and analyses results from seven surveys of six organic contract farming schemes in East Africa (one surveyed twice) conducted between 2005 and 2009 by participants in the SAFE research programme. It is organized in seven succeeding sections. These review the relevant issues in contract farming and organic farming (second and third sections), provide an overview of the schemes surveyed (fourth section), describe in more detail the research questions addressed and methods used (fifth section) and present results (sixth section) and a discussion of them (seventh section).

The final section concludes. An appendix provides more detail in relation to the analytic methods employed.

Contract farming in Africa

Glover (1983; 1987) defines contract farming as an arrangement where a processor or exporter (or an agent combining these functions) purchases the harvest of independent farmers, on terms arranged in advanced and described in a contract. Such contracts are usually annual and in relation to a single crop. Typically, they also specify a given volume (minimum or maximum) to be delivered, crop quality requirements and price. Often there is provision by the processor or exporter of inputs and services. There is always reference to the contracting agent's right to reject produce, although the grounds referred to may be more or less narrowly defined. Glover and others distinguish this type of arrangement from similar contractual ones where farmers are not independent, such as sharecropping.

Contract farming in developing countries appeared first in the 1950s, in two main forms. Firstly, particularly in Asia and Latin America (and parts of West Africa), it emerged in the wake of the dissolution of plantation production for crops such as palm oil, rubber and cocoa. This occurred against a background of political independence and falling terms of trade for the crops themselves, and usually involved distribution of plantation land to former workers (Baumann, 2000, 11). A second form dating from this period, evident throughout Africa, was large state-sponsored rural development projects focussing upon a single export crop, established on land cleared for the purpose with farmers resettled from areas deemed to be overcrowded. These schemes normally had some private participation, either on the basis of a management contract or direct investment. But public investment usually dominated. Schemes were established for cultivating tea, sugar, tobacco, cotton, groundnuts and – less frequently – fresh produce. After the liberalization of export crop agriculture in Sub-Saharan Africa in the mid-1990s a number collapsed, while others were taken over by private companies. Most of the literature on contract farming in Africa published before 1995 reflects the experience of these schemes.

Since market liberalization, new 'second generation' contract farming schemes have continued to be organized in the horticulture sector (see IFAD, 2003 on Kenya and Zambia; Minten et al., 2007 on Madagascar; Maertens et al., 2007 on Senegal). These differ from earlier similar schemes in that they involve private companies making arrangements with already established farmers. However, they are identical in certain other respects, for example the often very detailed controls exercised over smallholder production. From around 2000, on the other hand, a further distinct generation of contract farming has also emerged, for production of traditional export crops to

international 'sustainability' standards. In East Africa today, schemes of this kind exist for coffee, tea and cocoa in relation to standards such as organic, UTZ CERTIFIED and Fairtrade.

Both 'second' and 'third' generation contract farming can be interpreted as providing solutions for processors or exporters to the problem of securing determinate crop volumes and qualities while confining associated production risks to the farmer. This contrasts to the earlier generation of public schemes which – while also confining production risk to farmers – were mostly aimed at securing continuous throughput for *in-situ* crop processing (cf. Binswanger and Rosenzweig, 1986).[1] In both its recent forms, contract farming also potentially reduces processors' or exporters' transaction costs in supplying inputs and technical services – by creating economies of scale in distribution and by allowing input credit to be recovered through deductions in price at the time of crop purchase. However, input supply, especially on credit, is much less common in the third generation schemes associated with traditional export crops and sustainability standards. This is a result both of the presence of a large potential supply base absent in the case of horticulture and of clear opportunities for farmers to side-sell inputs and outputs.[2] From the standpoint of the farmer therefore, this type of contract farming scheme can be mainly interpreted as providing secure access to markets and – where prices or premiums (or both) are stated in contracts – with a reduction in price risk.

Donors were heavily involved in the promotion of the first generation of contract farming schemes between the 1950s and the mid-1970s, but, with a few exceptions such as the Commonwealth Development Corporation, seemingly lost interest in these arrangements over the next two decades. Since around 1995, they have become active supporters again in Africa. This has been against the background of growing public recognition of deficiencies in the market liberalization paradigm, including input market failures and apparently low smallholder access to higher-value markets. Thus, donors have been attracted to contract farming because of its perceived capacity to solve problems of 'missing markets' – including restoring the link between smallholders and remunerative export markets. This is despite the fact that the first generation of these schemes were heavily criticized for excluding the poor, not least as a result of selection criteria deliberately aimed at screening out less educated farmers or farmers with fewer assets (cf. Buch-Hansen and Kieler, 1983; Kennedy and Cogill, 1987; Glover and Klusterer, 1990; Little, 1994).

Two recent ways in which contract farming inclusiveness has been pursued are integration of group marketing mechanisms (Coulter et al., 1999) and group certification and similar arrangements where schemes involve production to sustainability standards. A contemporary survey of contract farming in developing countries even goes as far as identifying a new 'Multipartite' model involving both intermediary agencies and group marketing

Table 4.1 First and third generation contract farming in Africa

	End market characteristics	Local market characteristics	Contracting company	Corporate strategy	Contract content
First generation	Bulk, thick	Monopsonistic; fully inter-locked	Large, publicly backed	Multi-stage control over farmers	Detailed, strong focus on pre-harvest
Third generation	Niche, thin	Semi-monopsonistic with some competition; sometimes inter-locked	Variable in size, donor-supported	Price incentives and strict QC	Limited coverage, focus on post-harvest

arrangements, in opposition to the supposedly classic 'Centralized model' (Eaton and Shepherd, 2001).

Arguably however, the presence of such mechanisms is not the most important difference between earlier models and recent 'third generation' ones as defined above. In contrasting 'first' and 'third' generation contract farming, differences in the nature of the end markets served, in local market conditions, in types of contracting companies and their corporate strategies and in the content of the contracts typically used are equally important. For these parameters, some stylized differences between the first and most recent generation of contract farming are presented in Table 4.1.

The difficulty in enforcing monopsony following liberalization in traditional export crop sectors, even under contract farming conditions, has been already referred to – as has its corollary of contracting companies' reluctance to supply inputs and services on credit. In addition, the markets that contracting companies in third generation schemes typically sell into are both specialized and subject to discontinuous patterns of demand. This has implications for their strategies in relation to farmers. Ideally, in order to minimize their risks of participating in these types of markets, companies need to achieve levels of product quality that command premiums in mainstream as well as specialized markets. Together with reluctance to undertake the investments necessary for detailed control of the production process (compounded by the small size of some contracting companies[3]) this leads to a concentration of interventions around the point of purchase – by enforcing quality control criteria and providing price incentives aimed at rewarding conformity to them. This is reflected in the typical content of contracts, which provide detail mostly in relation to what quality attributes attract premiums while – as regards production requirements – referring simply to whatever international standard is being followed.

It is not obvious how these unique features of third generation contract farming affect the selection issue. The fact that contracting companies in

such schemes are little involved in input provision suggests that they will have less incentive to select only farmers with greater resources. Another relevant factor concerns costs of certification, where this utilizes 'internal control schemes' (ICSs). Where ICSs are used, large economies of scale can be attained in farmer certification. Nonetheless, a relation still exists between scale of contracting and costs of farmer registration, so that some incentives for selection remain.

The economics of organic farming

Organic farming's distinctive features are its emphases on building soil fertility and controlling weeds, diseases and pests through rotations and encouragement and application of naturally occurring materials and organisms. Reliance on non-local inputs is reduced to a minimum and use of synthetic inputs is generally forbidden. Meeting the requirements of organic certification, on the other hand, mainly involves elimination of synthetic inputs rather than following a list of prescribed techniques. This reflects the fact that organic standards emerged in countries with widespread and heavy use of synthetic inputs. Here, yields would typically collapse in the absence of use of synthetics unless rotations and alternative soil fertilization methods were adopted. Hence there was no need to require these in standards.

Against this background, economic studies of organic agriculture in Northern countries focus mainly on trade-offs from replacement of synthetic-based practices by more labour-intensive techniques. Generally the literature finds that losses from lower yields and higher labour requirements are offset by reduced input costs and price premiums (for overviews of recent findings see Dmitri and Green (2006) for the US and Nieberg and Offerman (2003) for the EU). However, premiums are rather unstable and, at least in Europe, the profitability of organic farming also depends upon public support for the process of conversion (cf. Padel and Lampkin, 1994).

Only a handful of studies comparing organic with conventional farming in the tropics have been published (Lyngbaek et al., 2001; Bray et al., 2002; Damiani, 2002; Bacon, 2005; Van der Vossen, 2005; Eyhorn, 2007). Except of the study by Eyhorn, none report comprehensive farm budget-related survey data and most are based on sample sizes of 20 or fewer. A further limitation is that most of the report results from Latin America, where the conventional farming systems with which comparisons are made are relatively high-input ones. No studies are available from Africa, where chemical use amongst smallholders is much lower than in other tropical regions and has stagnated for some years (Kelly et al., 2005). As a result of the prevalence of low-input systems, most African smallholders can conform to the requirements for organic certification without making significant changes to their farming methods – and thus without incurring new costs (or savings).

On the other hand, public support of farming in Africa, including of organic farming, is almost entirely absent. Thus, while organic certification should be technically easy to obtain, in practice this occurs only in the context of donor financial support. Typically this is in the context of a smallholder contract farming package that also involves farmer training and in which certification is on the basis of an ICS -an apparatus for farmer registration, designation of internal inspectors and reconciling farmer sales against their production capacity. Training may include dissemination of specifically organic farming techniques, but contracting companies often chose to place greater emphasis on generic crop and field maintenance and post-harvest processing techniques. Thus, in addition to the classic confounding variable confronting the economic evaluation of contract farming schemes (selection), evaluation of organic contract farming schemes needs to take into account a second source of potential bias. This is that the farming methods utilized in these schemes need not necessarily be significantly more 'organic' than those used by 'conventional' African smallholders.

The organic contract farming schemes surveyed

This study reports the results from seven household surveys of six organic contract farming schemes (OCFSs) in Uganda and Tanzania, carried out between 2005 and 2009 (Table 4.2). All the schemes received technical assistance (TA) and financial support from a Swedish development assistance programme Export Promotion of Organic Produce from Africa (EPOPA), which ran from 1997 to 2008. EPOPA supported a total of 31 OCFSs in East Africa in this period, mainly in the form of developing ICSs, training company staff and field officers, setting up demonstration plots and quality management systems, commissioning market surveys and supporting attendance at international trade shows. Certification was also financed but only during the period of organic conversion (normally one year from registration where there was no history of chemical use). Other support was normally provided for a 3-year period. The companies supported by EPOPA typically received around US$100,000 worth of TA and financial support, of which about US$20,000 was allotted to ICS development and certification, after the fees received by the implementation agency were deducted (Agro Eco BV and Grolink, 2008).

In all areas where the schemes surveyed were located, chemical use was low or non-existent. Hence, organic conversion entailed farmers having to make few practical changes to farming systems. On the other hand, use of specifically organic farming practices prior to conversion was also quite rare, except for pineapple farmers' use of coffee husks for mulching and upland coffee farmers' use of soil conservation methods. It should also be noted that, in the areas surveyed, the crops that were certified were typically free of major plant health problems.

Table 4.2 Organic contract farming schemes surveyed, 2005–09

Crop(s)	Additional standards	Contracting company	Location	Date scheme started	Date of survey	N contracted farmers at survey date	Sample size, scheme members	Sample size, control group
Arabica coffee	–	Kawacom (U) Ltd	Mt Elgon, Uganda	2001	2006	3,870	112	48
Arabica coffee	Fairtrade	Gumutindo Cooperative	Mt Elgon, Uganda	2001	2006	2,134	102	50
Cocoa, vanilla	–	Esco (U) Ltd	Bundibugyo, Uganda	2001	2005	1,721	30	30
Cocoa, vanilla	–	Esco (U) Ltd	Bundibugyo, Uganda	2001	2009	6,950	90	82
Pineapple	–	Biofresh (U) Ltd	Luwero and Kayunga, Uganda	2004	2006	34	32	32
Black pepper	–	Tazop Ltd	Muheza, Tanzania	1999	2006	152	61	71
Chilli	–	Zangerm Ltd	Zanzibar, Tanzania	1995	2007	150	61	59

The OCFSs surveyed will now be briefly compared in relation to some of the characteristics of contemporary contract farming in Africa referred to earlier, that is with reference to the nature of local output markets, contracting firms and their strategies, and contract content and implementation. While all the schemes studied broadly share the stylized characteristics depicted for contemporary contract farming schemes in Table 4.1, some important differences in respect of these parameters were also evident.

Local output markets

Local output markets for crops produced in the schemes were generally dynamic. During periods of peak demand, between four and eight conventional buyers competed in each of the Kawacom, Gumutindo Cooperative, Esco (2005) and Biofresh scheme areas. Competition was partly on price but also in relation to product specification. Rival buyers were typically prepared to buy produce in a semi- or unprocessed state, or to offer farmers other incentives such as buying crop in the field and then harvesting it themselves.

In the Esco (2009) scheme area, there was not only competition from two or three conventional buyers but from another large international trading company that had registered over 3000 farmers in a geographically overlapping cocoa OCFS. Esco responded to this both by raising its prices and by buying cocoa throughout the year rather than only during traditional harvesting seasons when competition peaked.

The situation in respect of the two Tanzanian spice schemes was quite different. Although other traders were present in both areas, these did not appear to command significant resources and neither Zangerm nor Tazop faced serious local competition.

The contracting companies and their strategies

The contracting companies fell into three categories. Kawacom and Esco were Ugandan affiliates of multinational trading companies whose main businesses were in the conventional market and which had the resources to run large schemes in a professional way. Gumutindo Cooperative, though small relative to most Secondary Cooperative societies in East Africa historically, had a long-standing link to the largest UK Fairtrade organization, Twin Trading. Twin Trading provided 60 per cent of Gumutindo's annual crop finance requirements (enabling it to obtain the remainder on favourable terms) and in addition financed a cupping laboratory and training of a cupper. Gumutindo was also unusual in that its crop purchase and export marketing functions were hived off into a financially autonomous agency. The third category of company was made up by Biofresh, Tazop and Zangerm. All three were partnerships between local businesspeople and small-scale specialized organic distributors based in Germany or Switzerland. Their annual turnover was in a range between US$100,000 and US$150,000 only. In each case working capital was provided by the distributor.

Table 4.3 Descriptive statistics (means)

Row	Indicator	Unit	KAWACOM		GUMUTIN		ESCO 2005		ESCO 2009		BIOFRESH		TAZOP			ZANGERM		
			O	C	O	C	O	C	O	C	O	C	O	C		O	C	
1	Age, h/h head	years	46.3	47.1	44.1	46.5	48.9	40.1†	48.6	38.1§	40.8	37.0†	55.9	52.1		45.1	44.2	
2	h/h size	count	7.2	6.2†	6.5	6.4	10.0	7.5	8.0	7.9	8.9	7.3	6.3	5.0‡		8.0	6.5‡	
3	h/h labour §	count	6.0	5.0§	4.9	4.8	7.1	5.5†	6.1	5.6	6.4	5.0	2.0	1.9		3.6	2.9	
4	Whole farm size	hectare	1.1	1.0‡	5.3	4.7	2.4	2.1	2.5	2.5	3.6	3.2	2.8	1.8†		0.9	0.7‡	
5	Prod trees/ Plants	,000	0.65	0.31‡	0.52	0.44	1.25	1.20	1.35	1.33	29.64	28.47‡	0.71	0.38§		1.56	1.41	
6	No organic practices	% group	20.5	39.6†	15.0	42.0‡	30.0	86.7‡	56.0	61.0	16.0	18.0	96.7	100.0	NT	100.0	98.3	NT
7	2 or more organic pracs	% group	33.9	12.5‡	44.0	8.0‡	10.0	0.0‡	12.0	13.0	34.0	0.0‡	1.7	0.0	NT	0.0	0.0	NT
8	Total h/h revenue	,000 U/Tshs	1425	1236	1745	1499												
9	Total crop revenue	,000 U/Tshs	680	374†	1072	866	1438	961	2625	1117§	4152	3268†						
10	Total cert. crop(s) rev	,000 U/Tshs	566	177‡	836	497†	1320	930	2560	1032‡	3835	2653	328	203	NT	525	564	NT

Table 4.3 (Continued)

Row	Indicator	Unit	KAWACOM		GUMUTIN		ESCO 2005		ESCO 2009		BIOFRESH		TAZOP			ZANGERM		
			O	C	O	C	O	C	O	C	O	C	O	C		O	C	
11	Net cert crop(s) rev	,000 U/Tshs	519	155‡	712	400†	1149	582†	2427	882§	3527	1456*	246	113	NT	436	492	NT
12	Labour costs	,000 U/Tshs	33	18†	121	95*	132	288	135	139	154	458†	43	48		42	14†	
13	Equipment costs	,000 U/Tshs	14	7‡	14	10	21	34	50	38‡	142	715†	18	20		17	28‡	
14	Marketing costs	,000 U/Tshs	1	0‡	3	2*	18	26	16	12†	12	25	5	4		0	0	
15	Yield per hectare	kg.	836	630†	1681	1197	208	151					365	344		598	763*	
16	Yield per tree	kg.			0.8	0.7			0.7	0.5§								

Key: O: organic farmers, C: control group (* = P < 0.10; † = P < 0.05; ‡ = P < 0.01, § = P < 0.001). NT: significance not tested.
All tests of significance used Chi square except for Tazop and Zangerm schemes (*t*-tests).
Notes: Row 3. Data for all schemes except Tazop and Zangerm refers to N household members 6 years and over. Data for Tazop and Zangerm schemes refers to N household members 18–50. Rows 6–7. For list of organic practices see text. Rows 8–14. Results given in ,000 Ush for Kawacom, Gumutindo, Esco and Biofresh schemes and in ,000 Tsh for Tazop and Zangerm schemes.
Exchange rates: 2005 Ush 1000 = $0.56; 2006 Ush 1000 = $0.55; Tsh 1000 = $0.82; 2007 Tsh 1000 = $0.83; 2008 Ush 1000 = $0.59.

Apart from Gumutindo, all of the schemes were bought direct from farmers rather than through Primary Cooperative Societies or other intermediaries. Otherwise, different types of contracting company tended to follow distinct scheme management strategies. Kawacom in 2006 and Esco in 2009 were buying the entire organic crop available, while using trained field staff to provide extension programmes aimed mainly at yield enhancement and improved on-farm processing. Their goal was to achieve crop quality attributes that were marketable at a premium in conventional markets when organic markets were in surplus. In 2005, however, Esco had been mainly buying organic crop against specific orders and was employing fewer field staff pro rata, although it still aimed at securing superior crop quality attributes. At this time it sought to cover its overheads by adding certification of farmers' vanilla crop to that of cocoa, while also buying vanilla only against orders.[4] In essence, the Biofresh, Tazop and Zangerm schemes operated in this way too, although none certified a second crop as Esco did. These companies tended to purchase only part of scheme participants' production on an unpredictable basis, reflecting variable export orders.

Gumutindo Cooperative's strategy differed from both these models. While it also only bought organic crop against orders, its integration into Fairtrade networks meant that orders were received at the start of each season and that their fulfilment could therefore be allocated on a pro-rata basis between the Cooperative's five Primary Societies. So, while only about 45 per cent of scheme members' crop could be sold as organic in the survey year, there was still an element of predictability for farmers concerning how much could be sold and when.

Contract content and implementation

There was a high degree of similarity between schemes in the contracts applied. Contracting companies agreed to buy all qualifying crop, 'subject to quality'. In most cases quality criteria referred not only to conformity to organic production rules, but also to other provisions. For Kawacom and Gumutindo the latter comprised supply of coffee in 'parchment' form, that is, wet processed, fermented and sun dried. In addition, Gumutindo scheme members' coffee had to have a moisture content below 13 per cent and be free of foreign matter and black pods. Esco required in 2005 that cocoa be fully fermented, sun dried and free of mould. By 2009, 'fully fermented and sun dried' was re-stated as a requirement to have a moisture content below 8 per cent. In 2005, Esco had not required any special quality attributes for its vanilla, only to find that it had to write off a large part of the purchased crop due to low vanillin content. In 2009, therefore, it accepted only crop that was fully ripe. Biofresh's criteria included that pineapple weigh between 1.2 and 1.6 kg 'crown on', be cut with a knife leaving a stalk between 25–40 cm and be packed into cardboard cartons. The referred to pineapple weight

requirement had a different status from all other criteria stated here, since its attainment faced natural constraints. The average weight of the 'Sweet Cayenne' variety grown was more than 2 kg, even where farmers modified their crop spacing systems to eliminate very large fruit. As a result, only around a third of the pineapple grown by scheme members could potentially qualify for a premium. The two exceptions to requiring 'premium' quality attributes in addition to organic ones were Tazop, which required only that black pepper be delivered fresh, that is, unprocessed, and Zangerm. Like all conventional chilli buyers, Zangerm required that chilli be delivered after drying, but it did not provide a detailed specification.

Contracting companies all agreed to pay a premium for qualifying crop, although its magnitude was not stated in any contract. They also agreed to finance farmers' organic certification and provide them with unspecified technical assistance. In no case was there a written obligation to supply inputs, although most companies did so to a limited extent in schemes' first years. For their part, farmers were required to follow organic rules and in some cases other 'good agricultural practices'. In no case was there an obligation to sell all qualifying crop to the contracting company.

As indicated, only Kawacom and (in 2009) Esco bought all qualifying crop at the time of the surveys. The Esco cocoa and Biofresh pineapple premiums in 2005–06 were 30 per cent over the conventional prices for the same product specifications. The Esco vanilla premium at this time was 100 per cent. The coffee premiums offered by Kawacom and Gumutindo were around 15 per cent. Neither Tazop nor Zangerm offered a premium at all. By 2009, the Esco cocoa premium had fallen to around 15 per cent, although farmers who joined a company-sponsored savings society received one of 17.5 per cent. The Esco vanilla premium remained around 100 per cent.

While contracting companies observed commitments to supply TA to farmers rather unevenly, none could be said to provide it intensively. Either field staff imparted information through internal inspections, where all farmers were visited on their plots once or twice yearly, or they 'cascaded' information via 'contact farmers' who were responsible for relaying information to 50–100 scheme members through group training as well as conducting internal inspections. Outside of the schemes, on the other hand, there was virtually no provision of extension services.

Finally, considerable differences were evident between schemes in regard to enforcement of requirements on farmers. Roughly a quarter of original scheme members had been 'sanctioned' (de-registered) by 2006 in the case of Tazop and by 2009 in the case of Esco. Reasons for de-registration were not available for the Tazop scheme, but in the Esco scheme the commonest reason was non-sale to the scheme – despite this not having the formal status of a contractual requirement.

Research questions and methods

Research questions

On the basis of the considerations identified in the second and third sections above, three main research questions are investigated. Firstly, the extent to which positive selection into organic schemes has occurred is examined. 'Positive selection' is used here to denote a skewed outcome in the distribution of factor endowments between households participating in OCFSs and control groups, rather than the conscious use by a contracting company of one or more specific selection criteria.[5] A second question concerns the diffusion of organic farming practices amongst scheme members and control groups. To what extent are scheme members more likely to follow organic farming practices than control groups and what other factors (if any) are associated with their adoption? A third question concerns whether there are revenue effects of participation in OCFSs and, if so, from where these effects arise. In particular, what is the respective contribution of participation in contract farming as such, and of use of organic farming methods? Further, if there are revenue effects from contract farming regardless of adoption of organic farming methods, from what do these arise?

As noted, the issue of farmer selection already featured as a policy question in the first generation of literature on contract farming. Quite aside from this, there are methodological grounds for examining it, since in order to determine whether participation in contract farming has genuine revenue effects it is necessary to control for whatever selection bias into schemes can be established. The same goes for determining whether use of organic farming methods has any revenue effects, since unless biases influencing their uptake are controlled for it will not be possible to isolate their impact.

The issue of the revenue effects of contract farming is surprisingly less central in the existing literature (and policy discussion) than that of selection. Only four studies (Warning and Key, 2002; Simmons et al., 2005; Benfica et al., 2006; Maertens and Swinnen, 2006) deal with this question while controlling for selection of scheme participants – with findings pointing in no consistent direction. On the other hand, revenue issues were widely discussed, albeit mostly using before-and-after recall data and at best on the basis of descriptive statistics, in the pre-1995 literature (Buch-Hansen and Kieler, 1983; Glover, 1983, 1987; Kennedy and Cogill, 1987; Sithole and Boeren, 1989; Little 1992, 1994). A recurrent but often downplayed finding in this literature was of positive revenue effects from scheme participation. This finding was then qualified by the argument that such benefits tended to decline over time – a thesis termed 'agribusiness normalization' by Glover and Ghee (1992). The evidence for 'agribusiness normalization' tended to be sketchy. Comparison of the data from the two Esco surveys will be relevant to the assessment of this thesis.

Diffusion of explicit organic farming methods can be considered as a question of technological diffusion. Strangely, diffusion of farming technologies through contract farming also occupies a minor role in both the contemporary and earlier literature. Only one study, by Goveneh and Jayne (2003), examines the impact of technological diffusion through contract farming while controlling for selection into schemes. This study examines the relationship between commercialization of cotton production under contract farming conditions in Zimbabwe and output and productivity of scheme members' food crop production. Contrary to claims in the earlier literature that contract farming for cash crops poses dangers for food security, the authors show a positive impact of technologies used in cash crop commercialization, at least on food crop productivity. However, the study assumes the adoption of specific technologies as the mechanism by which this process occurs, rather than directly measuring either the extent of uptake or the consequences of using them. In that adoption of organic farming methods is measured directly, the results reported here make a new contribution to the literature.

While it should be underlined that no attempt is made to consider the totality of technology diffusion occurring within OCFSs, adoption of one other farm technology will also be considered in relation to the coffee and cocoa schemes surveyed. This is recommended post-harvest processing techniques. The price premium offered in these schemes could only be obtained for crop that had been subjected to these techniques. However, this implies that revenue attained and adoption of these techniques are endogenous, and that the latter cannot therefore be considered as an independent variable in the same way as use of organic farming practices. Use of such processing technologies will thus be considered in relation to the interpretation of the results on revenue rather than as an independent variable.

Survey methods

The surveys referred to in the fourth section collected data on household demographics and factor endowments (including farm area, area under the certified crop and tree or plant stock), farm expenditure, farm revenue and use of organic farm practices. In each case, except the Biofresh Pineapple scheme, they were based on two-stage random samples for both scheme participants and control groups. Scheme participants were randomly sampled in a number of villages or parishes chosen purposively to reflect the range of agro-ecological conditions in scheme areas. Sampling of scheme participants used lists provided by the contracting company. Sampling of control groups was performed randomly, from lists prepared by village leaders in villages or parishes nearby schemes, chosen to match the (range of) agro-ecological conditions represented in the sampling frame for scheme participants. In the case of the very small Biofresh pineapple scheme all members were surveyed

except two who had been sanctioned. The pineapple control group was sampled randomly from lists prepared by local leaders in two separate locations chosen to match the agro-ecological conditions represented in the sampling frame for scheme participants.

Variables and indicators

Farm revenue was considered in terms of net revenue from the crop(s) subject to certification in the respective OCFS. This operationalization was chosen in preference to total household revenue, gross household farm revenue or net household farm revenue since it was considered to be most sensitive to the changes likely to be induced by participation in OCFSs. On the other hand, it does not allow the capture of possible spill-over effects of participation on production of non-certified crops and it is less relevant to evaluation of more general household welfare benefits than say, use of a total household revenue measure. These issues are not, however, the main focus of this chapter.

Net revenue was defined as revenue from the crops concerned, less expenditure entailed by their production, processing and marketing. This was in turn defined as expenditure on purchase and transport of planting materials; purchase and transport of soil fertilization, mulching or plant health treatment materials; hire of farm labour, either in cash or in kind (including for crop processing); purchase or hire of farm equipment; and marketing costs. Revenue was operationalized in terms of value of crop sales and value of sales of planting material. Investment in and income from sale of land was not included in these calculations as such investments are normally financed from savings over long periods. Neither was expenditure of household labour measured, due to the greater difficulties of recall implied, as well as those associated with attributing accurate time values to tasks such as supervision and with devising a metric covering both adult and child labour.

Organic practices were operationalized in terms of a range of specific farm interventions recommended to members of OCFSs during inspections and training. In the subsequent analysis, non-use of synthetic inputs was treated as a condition qualifying such interventions to be recorded rather than an organic practice in itself. Lists of qualifying positive interventions varied slightly from scheme to scheme but all included use of organic fertilization methods, mulching, plant health treatment methods and soil conservation methods. Adoption of post-harvest processing methods was operationalized in terms of the proportion of sales of the certified crop qualifying for the premium attached to use of the processing method concerned.

Data analysis

A first stage of analysis using descriptive statistics will be presented in relation to each research question. For all schemes, except Tazop and Zangerm, a second stage of data analysis using econometric methods is also presented. Two null hypotheses (of no significant effects) will be tested with farmer revenue as the dependent variable and participation in OCFSs and use of organic farming practices as explanatory variables. In this process, regressions for participation (in the scheme and in organic practices) are undertaken, followed by regressions for the outcome variables under consideration. In the latter, potential sources of selection bias are taken into consideration. Further details of the empirical strategy are outlined in Appendix I.

Results

Selection into schemes

Survey results on selection into schemes are presented here in two stages. Firstly, descriptive statistics are reported on the factor endowments of scheme participants, relative to control groups. Farmers' age, and by implication experience, and size of household (and particularly count of household members of working age, that is, over 6 years) are technically demographic characteristics but also have the status of factor endowments. Only statistics collected in common across all schemes are reported. Secondly, Probit regressions are reported for the schemes where these have been carried out.

Three conclusions can be drawn from an examination of the descriptive statistics relevant to selection (Table 4.3, rows 1–5). Firstly, on all five indicators where comparisons are made, there are significant differences in favour of organic farmers in two or more of the six schemes. Secondly, there are no significant differences in factor endowments in favour of conventional farmers on any indicator in any scheme. Thirdly, while there are significant differences in favour of scheme members on at least two factors in four of the schemes, there is one scheme where no selection bias at all is evident (Gumutindo). Overall this suggests that selection according to factor endowment advantages is common but not invariable.

In the binomial Probit regressions used to model participation in the Kawacom, Gumutindo, Esco (both 2005 and 2009 surveys) and Biofresh schemes, several factor endowment variables additional to those referred to in Table 4.3 are included. The results are presented in Table 4.4, with exact descriptions of the indicators provided in notes to the table. The results support the earlier conclusion of common but not invariable positive selection (indicated by a statistically significant 'Constant' variable). There is evidence of a substantial and significant impact on selection from farm altitude, tree stock and construction materials in the Kawacom scheme, indicated by a statistically significant Beta. In the Esco scheme, stock of vanilla vines is similarly important in both surveys, as is (more modestly) farmer age. Certain other variables (notably extent of off-farm economic diversification)

Table 4.4 Profit models for scheme participation

Independent variable	KAWACOM		GUMUTINDO		ESCO (2005)		ESCO (2009)		BIOFRESH	
	Beta	Standard error	Beta	Standard error	Beta	Standard error	Beta	Standard error	Beta	Standard error
Farm size	0.06	0.19								
Farm size (log)			0.15	0.19	0.39	0.44	−0.34	0.34	−0.01	0.07
Trees/plants (N)	0.39†	0.16			0.00	0.00	0.03	0.02†		
Trees/plants (log)			0.02	0.14					0.00	0.00
Trees/plants (sq rt)					−0.08	0.06				
Van. vines (sq rt)					0.05†	0.03	0.24	0.04		
P/apples planted									0.00†	0.00
Farm altitude	5.79†	1.73	0.70	1.78			−0.01†	0.00		
Farm geog									−0.28	0.47
F-headed h/hs									−0.22	0.56
Farmer age	−0.02*	0.01	−0.02	0.01	0.05†	0.02	0.03	0.01	0.00	0.02
Farmer education	0.00	0.04	0.03	0.04			−0.00	0.36		
H/h size	0.07	0.06	−0.04	0.04						
H/h labour count					0.29†	0.10	0.01	0.06	0.04	0.08
Dependency ratio					1.67	1.50	−0.99	0.76		
Ratio off-farm rev	−0.63†	0.27	0.07	0.27						
% off-farm wkrs					0.19†	0.07				
H/hs w/out off-fm					3.91†	1.32				
Building material	0.47*	0.26	−0.42*	0.25					0.81*	0.46
Exp. school fees										
N cattle owned									0.00	0.00
N goats									0.12	0.08
N chickens							−0.09	0.07		
							−0.04	0.03		

Table 4.4 (Continued)

Independent variable	KAWACOM		GUMUTINDO		ESCO (2005)		ESCO (2009)		BIOFRESH	
	Beta	Standard error	Beta	Standard error	Beta	Standard error	Beta	Standard error	Beta	Standard error
Meat/fish cons pc									−0.03†	0.01
Savings soc/bank					−0.55	0.46	0.42	0.43		
Major assets							0.57*	0.30		
Constant	12.42‡	3.53	−2.48	3.95	−6.62‡	1.93	2.23	1.89		
Intercept									0.02	0.93
N	147		149		56		171		54	
Log-likelihood	−66.7		−91.11		−25.2		56.36		−26.9	
Pseudo R sq	0.23		0.03		0.35		0.52		0.46	
Chi-sq	40.7‡		6.52		31.0§		124.03§		see notes	

* = P < 0.1, † = P < 0.05; ‡ = P < 0.01, § = P < 0.001. Robust (Huber/White/Sandwich) standard errors given. Samples exclude missing observations and outliers, defined as households with net revenue from main crop +/ − 5 standard deviations from the sample mean. Calculations using Stata 8 except for Biofresh (SAS 9.1). Because of the use of SAS for the Biofresh analysis, it has not been possible to calculate a chi sq for this scheme.

Explanation of variables. Pineapples planted: N pineapples planted in 2005; Farm geog (pineapple only): whether farm was situated in Luwero or Kayunga district; H/h labour count: N household members aged > 6 years; Dependency ratio: N persons in household aged < 6 years; Ratio off-farm rev: ratio of non-farm revenue to total household revenue; % off-farm workers: off-farm workers as % of household adults; H/hs w/out off-fm: households without off-farm income sources or without persons employed off-farm; building material: whether farmhouse has brick walls; exp. school fees: household expenditure on school fees in 2005; meat/fish cons pc: meat and fish consumption per capita; savings soc/bank: household head is a member of a savings society or bank; Major assets: households own farm in another village, house in town; television/DVD player or generator.

contribute to selection in more than one scheme, but not in a consistent direction.

Use of organic farming practices

In a majority of OCFSs, scheme members followed significantly more organic farming practices than control groups (Table 4.3, rows 6–7), but in all these cases use of organic practices by scheme participants was moderate to low. In the cases where there was no significant difference between participants and the control group, use of organic farming practices was low or negligible for both groups. Although the samples used were different in each case, the two Esco surveys do not suggest increased adoption by scheme members over time. Thus, diffusion of organic farming technologies was generally weak.

In the Poisson regressions used to model the number of organic farming practices used in the Kawacom, Gumutindo, Esco (both 2005 and 2009 samples) and Biofresh schemes, scheme participation is shown to influence adoption in three cases (Table 4.5). However, neither in the Esco scheme, in 2009, nor in the Biofresh scheme is this the case. In the Biofresh scheme no variables appear to influence adoption significantly, while in the Esco scheme in the 2009 survey the only significant relationship identified is with chicken ownership – possibly relating to supply of manure that this provides.

Revenue effects of scheme participation

Survey results on revenue outcomes of scheme participation are again discussed in two stages. First, descriptive statistics are reported from all the surveys conducted comparing different components of revenue between scheme participants and control groups. Secondly, regression results on different components of revenue are reported for all of the surveys except those of the Tazop and Zangerm schemes.

Table 4.3 (rows 8–14) provides descriptive statistics showing scheme participants receiving significantly higher mean net revenues from certified crops than control groups, for all the schemes surveyed except those operated by Tazop and Zangerm. In neither of these two latter schemes was a test of significance performed on the results obtained (see below); in the Zangerm scheme it may be noted that the control group had higher mean net revenues than scheme participants. Revenue effects across schemes at the level of gross crop revenue and gross household revenue are also broadly in favour of scheme participants, but with less consistent significance.

In two of the schemes, where net revenue for participants was significantly higher than for non-members (Esco [anno 2005] and Biofresh), it appears that lower expenditure on labour by scheme members contributed to this outcome. The most plausible explanation for control groups' higher expenditure on labour in these schemes relates to differences in age of household heads between participants and non-participants (see Table 4.3, row 1).

Table 4.5 Poisson models for organic farming practices

Independent variable	KAWACOM		GUMUTINDO		ESCO (2005)		ESCO (2009)		BIOFRESH	
	Beta	Standard error	Beta	Standard error	Beta	Standard error	Beta	Standard error	Beta	Standard error
Farm size	0.02	0.09							−0.01	0.07
Farm size (log)			0.18	0.97*	0.28	0.44	−0.11	0.30		
Trees/plants (N)	−0.08	0.08			−0.00	0.00	−0.00	0.01	0.00	0.00
Trees/plants (log)			−0.30	0.65						
Trees/plants (sq rt)					0.03	0.05				
Van. vines (sq rt)					0.02	0.02	0.20	0.02		
P/apples planted									0.00	0.00
Farm altitude	−0.10	0.68	−0.15	1.0			0.00	0.00		
Farm geog									−0.17	0.28
F-headed h/hs									0.05	0.34
Farmer age	0.01	0.00	−0.00	0.00	0.01	0.01	−0.00	0.01	−0.01	0.00
Farmer education	0.01	0.02	−0.03	0.02			−0.36	0.32		
H/h size	0.01	0.03	0.04	0.02*						
H/h labour count					0.05	0.07	0.02	0.04	0.03	0.05
Dependency ratio					2.36*	1.42	0.74	0.62		
Ratio off-farm rev	−0.16	0.15	−0.05	0.15						
% off-farm wkrs					0.00	0.06				
H/hs w/out off-fm					0.32	1.15			0.00	0.29
Building material	0.01	0.12	0.01	0.14						
Exp. school fees									0.00	0.00
N cattle owned									0.05	0.03

Table 4.5 (Continued)

Independent variable	KAWACOM		GUMUTINDO		ESCO (2005)		ESCO (2009)		BIOFRESH	
	Beta	Standard error	Beta	Standard error	Beta	Standard error	Beta	Standard error	Beta	Standard error
N goats							0.08	0.04		
N chickens							0.05†	0.02		
Meat/fish cons pc									0.00	0.01
Savings soc/bank					0.21	0.55	0.30	0.21		
Major assets							−0.12	0.22		
Scheme participation	0.43†	0.19	0.74§	0.19	1.78‡	0.59	0.04	0.38	0.30	0.30
Inspections	−0.02	0.07	0.06	0.33*						
Constant	0.44	1.42	−0.49	0.62	−4.43†	1.89	−3.29	0.98§		
Intercept									0.32	0.61
N	147		149		56		171		54	
Log-likelihood	−231.6		−231.47		−45.0		−158.50		−49.6	
Pseudo R sq	0.02		0.10		0.25		0.11		0.37	
Chi-sq	9.9		60.14§		34.8§		57.32§		see notes	

* = P < 0.1, † = P < 0.05; ‡ = P < 0.01, § = P < 0.001. Robust (Huber/White/Sandwich) standard errors given. Samples exclude missing observations and outliers, defined as households with net revenue from main crop +/− 5 standard deviations from the sample mean. Calculations using Stata 8 except for Biofresh (SAS 9.1). Because of the use of SAS for the Biofresh analysis, it has not been possible to calculate a chi sq for this scheme.
Explanations of variables: see notes to Table 4.4.

These differences suggest the control groups were at an earlier stage of farm development than participants, where expenditure on land clearance, preparation, planting and (in the case of pineapple) spreading of coffee husks was being incurred. Thus, gross revenue from certified crops in these schemes is not significantly higher for participants than for non-members. The overall pattern is therefore one where scheme participants enjoy higher incomes than non-participants, though with some exceptions.

As indicated in the fifth section of the chapter, different approaches were adopted for determining the extent to which differences in revenue can be explained by scheme participation, or by (a combination of) other factors. In the case of the Tazop and Zangerm schemes, mean revenue outcomes were crudely controlled for scale of production by re-expressing them on a per hectare (under the certified crop) basis rather than in absolute terms. On this basis, net revenues of participants in the Tazop scheme are no longer higher than those of non-members. The mean net revenue of participants in the Zangerm scheme expressed on a per hectare basis is significantly *lower* than that of non-members.[6]

In relation to all other schemes, regression-based estimates using OLS and Heckman models (FIML or Two Step) are reported (Table 4.6). The results show, controlling for other variables, a positive relation between participation and net revenue from the crop(s) subject to certification that is significant and consistent across schemes. Only in the case of the Gumutindo scheme is a result found (in the FIML model only) which is not significant. However, in the case of this scheme there is no evidence of selection bias, so that the modest positive coefficient from the OLS can be considered meaningful.

With respect to organic practices, a significant positive relation to net certified crop revenue is found for more than one scheme or survey – namely, the Kawacom and Esco (anno 2005) schemes. However, the coefficient for this variable is rather low for the Kawacom scheme and, in regard to the Esco scheme, the relation is not found in the 2009 survey. Thus, looking across the results, it appears that it is scheme participation *per se* that is the main determinant of revenue from certified crops, conditional on other covariates. Use of organic farming techniques plays at best a modest role in some schemes.

Turning to the magnitude of the estimated revenue effects of scheme participation, that is, the treatment, these are hardly negligible. Taking the Kawacom, Esco (2005 survey) and Biofresh schemes, we find a 75 per cent increase in revenue for the Kawacom sample (scheme participants and non-participants combined), a 62 per cent increase for the Esco sample and a 46 per cent increase for the Biofresh sample. The average incremental treatment effect for use of organic practices was considerably lower in the Kawacom and Esco (2005 survey) schemes, at around 9 per cent and 30 per cent, respectively. In the Biofresh scheme there was no treatment

Table 4.6 Regression results for net revenue from certified crop(s)

	KAWACOM		GUMUTINDO		ESCO (2005)		ESCO (2009)		BIOFRESH	
	OLS Beta (Std error)	FIML Beta (Std error)	OLS Beta (Std error)	FIML Beta (Std error)	OLS Beta (Std error)	Heckman Beta (Std error)	OLS Beta (Std error)	FIML Beta (Std error)	OLS Beta (Std error)	Heckman Beta (Std error)
Independent variable										
Farm size (log)	0.12	0.11	0.02	0.37	−0.06	−0.10	0.44§	0.45§	0.06	0.05
	(0.09)	(0.09)	(0.10)	(0.11)	(0.30)	(0.31)	(0.12)	(0.12)	(0.05)	(0.05)
Trees/plants (log)	0.71‡	0.65‡	0.63§	0.63§			0.03§	0.02§	0.36*	0.48‡
	(0.08)	(0.08)	(0.67)	(0.77)			(0.06)	(0.01)	(0.17)	(0.14)
Trees/plants (sq root)					0.15‡	0.16†				
					(0.04)	(0.04)				
Van. vines (sq rt)					−0.01	−0.01	0.01	0.00		
					(0.01)	(0.02)	(0.01)	(0.01)		
Farm altitude	−2.27‡	−3.02‡	−2.37‡	−2.31*			−0.00	−0.00		
	(0.70)	(0.80)	(0.84)	(0.94)			(0.00)	(0.00)		
Farm geog									0.04	−0.01
									(0.20)	(0.19)
Farmer age	0.00	0.00	0.01*	0.01*	−0.01	−0.02+	−0.01	−0.01	0.00	0.00
	(0.02)	(0.02)	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Farmer education	0.02	0.02	0.03	0.02			−0.31	−0.31*		
	(0.02)	(0.02)	(0.02)	(0.02)			(0.13)	(0.12)		
H/h size	−0.02	−0.02	0.02	0.16			0.00	0.01		
	(0.02)	(0,02)	(0.02)	(0.02)			(0.01)	(0.01)		

Table 4.6 (Continued)

	KAWACOM		GUMUTINDO		ESCO (2005)		ESCO (2009)		BIOFRESH	
	OLS Beta (Std error)	FIML Beta (Std error)	OLS Beta (Std error)	FIML Beta (Std error)	OLS Beta (Std error)	Heckman Beta (Std error)	OLS Beta (Std error)	FIML Beta (Std error)	OLS Beta (Std error)	Heckman Beta (Std error)
H/h labour count					0.04	0.02			0.01	0.00
					(0.04)	(0.05)			(0.03)	(0.03)
% off-farm wkrs					0.01	0.01				
					(0.02)	(0.01)				
H/hs w/out off-fm									−0.26	−0.36+
									(0.21)	(0.20)
Organic practices (N)	0.09*	0.09*	0.04	0.04	0.28*	0.26*	0.07	0.07	0.18	0.21
	(0.05)	(0.05)	(0.05)	(0.05)	(0.15)	(0.15)	(0.07)	(0.06)	(0.24)	(0.24)
Scheme participation	0.78‡	1.31‡	0.28+	−0.05	0.67*	1.12*	1.09§	1.19§	0.49‡	0.94*
	(0.16)	(0.27)	(0.14)	(0.35)	(0.27)	(0.55)	(0.14)	(0.27)	(0.20)	(0.39)
Constant	10.85‡	12.30‡	13.62§	13.49§	9.41‡	9.36‡	12.84§	12.33§		
	(1.46)	(1.69)	(2.03)	(2.10)	(0.74)	(0.75)	(0.59)	(0.59)		
Intercept									10.63‡	9.48‡
									(1.66)	(1.37)
Lambda		−0.49*		0.21		−0.31		−0.07		−0.33
		(0.19)		(0.21)		(0.33)		(0.16)		(0.26)
N	147		149		56		168		52	
Log likelihood	−160.4	−225.4		−244.68				−220.91	−89.47	−123.72
F stat	24.66‡	205.8‡	29.72§	146.36§	13.2‡	11.3‡	31.28§	251.83§	32.83§	28.65§
R sq	0.61		0.52	–	0.66	0.66	0.62		0.48	0.56

Note: Lambda refers to Heckman's lambda (inverse Mills ratio) calculated from Heckman first stage selection regressions not reported here but available from authors. * = P < 0.1, † = P < 0.05; ‡ = P < 0.01, § = P < 0.001. Robust (Huber/White/Sandwich) standard errors given. Samples exclude missing observations and outliers, defined as households +/ − 5 standard deviations from the mean of the dependent variable. For explanations of variables see note to Table 4.5. Calculations using STATA 8, except for Biofresh (SAS 9.1).

effect for use of organic practices. While undue stress should not be placed on the precision of these results (since in all three surveys referred to, the Heckman/FIML scheme participation coefficient is significant only at the 90 or 95 per cent level), their direction broadly confirms the regression findings.

Interpretation

Discussion in this section will focus on the results obtained in regard to the two (null) hypotheses considered, namely, that there is a generally strong relation, broadly consistent across schemes, between membership of OCFSs and net revenue from certified crops. On the other hand, there is only a modest relation between adoption of organic farming practices and net revenue, which is not consistent across schemes.

Differences in net revenue from certified crops, controlling for other factors, are likely to reflect a combination of differences in prices received and in productivity. The two schemes where the coefficients for scheme membership as a determinant of net revenue are highest (and their standard errors lowest) are the Kawacom scheme and the Esco scheme (2009 survey). Referring back to the fourth section, it is worth noting that while the premiums offered by these schemes at time of survey were lower than in some other cases, they were in both instances available for all crop produced by scheme members, provided it met a clear quality specification. This could not be said of any of the other schemes surveyed, including the Esco scheme in 2005. Continuous availability of premium according to clear criteria can be considered as effectively reducing the disincentives attached to conducting the extra activities necessary to meet 'organic-plus' quality specifications. These disincentives relate to shrinkage of the crop as a result of processing, additional investments of time and/or money, as well as deferral of receipt of revenue while processing is undertaken. By the same argument, where premiums are not offered continuously for the entire crop, or not offered at all, disincentives will be correspondingly greater and extra activities will be more limited. In addition to these disincentives, engaging in processing for coffee and cocoa entails a price risk unless organic premiums are guaranteed on a continuous basis. While price premiums are also available in the conventional market for quality crop, these tend to be lower than organic ones and subject to greater fluctuation. A comparison of farmer processing behaviour as revealed in the surveys of the Esco scheme in 2005 and 2009 supports this argument. In 2005, when the premium was not available continuously, scheme members sold 24.6 per cent of their cocoa by weight in an unprocessed state. In 2009, when it was, they sold only 1.6 per cent of their cocoa by weight in this form.[7]

This argument is further substantiated by a review of the cumulative distribution of the proportions of the coffee crop fully processed by Kawacom scheme members and the control group. Figure 4.1 shows that only

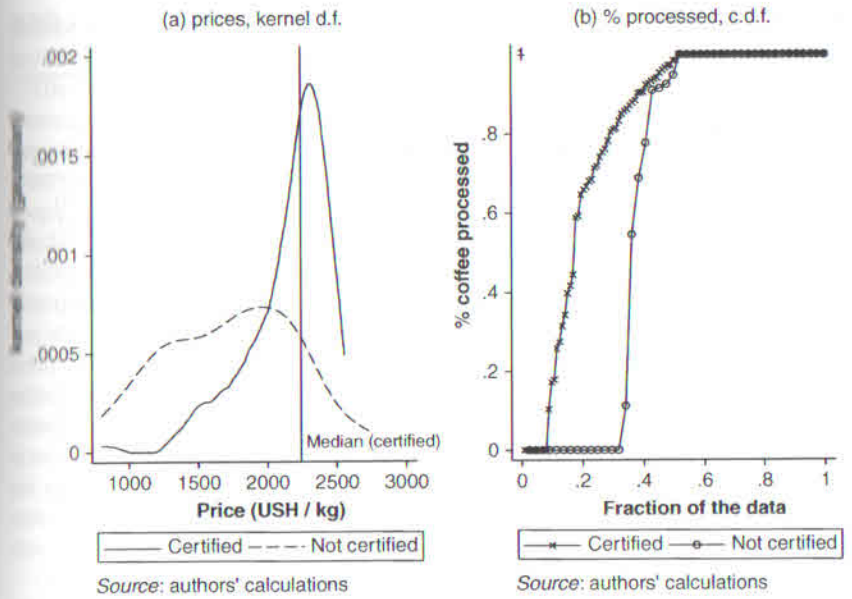

Figure 4.1 Distributions of (a) average prices received and (b) proportion of coffee crop processed for certified organic farmers and non-organic farmers

10 per cent of scheme members were processing no coffee. On the other hand, 30 per cent of the control group undertook no processing. The distribution of processing between the two groups is also quite different, with a smooth distribution for scheme members and a highly disjointed one for the control group (suggesting that in the control group, processing was confined to the larger producers).

The continuous availability of premiums in the Kawacom and Esco (anno 2009) schemes reflects a number of factors including the financial resources of these companies, their presence in the differentiated conventional as well as the organic market and relatively high levels of competition for crop around the scheme areas (see the fourth section). Other operators either lacked these resources, a presence in the differentiated conventional market, local competitors or all three.

Uptake of organic farming methods (cf. Table 4.3, rows 6–7) appears to have been lower and patchier than uptake of processing technologies such as fermentation in the schemes under consideration. This may relate to lower commitment to their diffusion on the part of contracting companies but it may also relate to farmers' assessment of benefits from their adoption in relationship, for example, to yields. Descriptive statistics comparing yields of scheme members and control groups were collected for all schemes except Biofresh (since crop on this scheme was sold by the piece rather

Table 4.7 Regression (FIML) results for yield per tree (log), Kawacom and Esco (2009 survey) schemes

Variable	KAWACOM		ESCO	
	Beta	Std error	Beta	Std error
Farm size (log)	0.12	0.08	0.20†	0.10
Trees/plants (log)			−0.28§	0.01
Trees/plants (N)	−0.40‡	0.06		
Van. vines (log)			−0.00	0.01
Farm altitude	−2.51‡	0.69	−0.00	0.00
Farmer age	0.00	0.00	−0.00	0.00
Farmer education	0.02	0.01	−0.32‡	0.11
H/h size	−0.03	0.02	0.01	0.01
Organic practices (N)	0.07	0.04	0.07	0.06
Scheme participation	1.01‡	0.23	0.54*	0.29
Constant	4.22‡	1.46	0.12	0.52
Lamda	−0.49†	0.19	0.08	0.18
N	147		171	
Log likelihood	−200.6		−202.14	
F stat	57.5§		62.64§	
R squ		0.37		

Note: Selection equations omitted but are available from authors. * = P < 0.1, † = P < 0.05; ‡ = P < 0.01, § = P < 0.001. Robust (Huber/White/Sandwich) standard errors given. Samples exclude missing observations and outliers, defined as households with net revenue from main crop +/−3.5 standard deviations from the sample mean of the dependent variable. Calculations using Stata 8.

than by weight) (Table 4.3, rows 15–16). Yield is significantly higher for scheme members only in relation to the Kawacom and Esco (anno 2009) surveys.

Regressions were run for yield in relation for these two schemes (Table 4.7). These show scheme membership having a large and very significant impact on yield in both schemes. The only other common significant impact is somewhat surprisingly a negative one from number of trees. Number of organic farming practices adopted does not have an impact that is significant in either scheme. Thus, both presumed components of higher net revenue (premium price and yield) derive primarily from contract farming *per se*.

Conclusion

This chapter reports results from household-level surveys of six OCFSs in East Africa, conducted in 2005–09 and including one scheme which was surveyed twice in this period. The surveys and subsequent analysis focused upon selection into schemes, revenue effects from scheme participation,

uptake of technologies by scheme participants and the impact of organic farming practices on revenue.

The results show that scheme participation is somewhat skewed towards farmers with superior factor endowments, although this tendency is not systematic across factor endowments or schemes. The most important selection biases relate to farmers' stocks of the trees or plants from which certified crops are produced, and to farm altitude (a factor also relevant to coffee productivity).

Scheme participants received significantly higher mean net revenues from certified crops than control groups in four of the six schemes. In one of the remaining schemes, the control group's mean revenue was higher when results were expressed in terms of net revenue per hectare. In the four schemes for which net revenue was higher for scheme members, net revenue was regressed against a number of exogenous variables. The results across these schemes show that, controlling for other factors, participation *per se* and tree and plant stock had the greatest impact on net revenues. The results for participation are slightly less consistent than for tree and plant stocks but the coefficients are generally higher.

Use of organic farming practices by scheme members was generally significantly higher than for the control group, and when this was regressed against a number of exogenous variables it was participation that proved to have the greatest impact on number of organic farming practices used. But use of organic farming practices even by scheme participants was at best moderate and in the case of the scheme surveyed twice (in 2005 and 2009) there is no evidence of increased adoption. The regression results for revenue show number of organic farming practices used having a modest impact on revenue, but only in some schemes. Regression results for yield also show use of organic farming practices having at best a weak impact.

'Treatment effects' for net revenue from certified crops were calculated using the results of three of the surveys. These show scheme participation to be associated with increases in revenue of between 46 per cent and 75 per cent by scheme. There were also treatment effects for number of organic practices used in two of the schemes, although these were again modest.

It is argued that the mechanism linking scheme participation with higher net revenue is the presence of predictable price premiums on a continuous basis. This reduces the risks that farmers run in conforming to the 'organic plus' quality requirements that are a necessary condition for selling to the contracting companies in most of the schemes. Where premiums were not offered on a continuous basis, scheme participation had a lower impact on revenue outcome, and in the two schemes where no premiums were offered there were no positive revenue effects. In turn, the schemes where premiums were offered on a continuous basis were those run by contracting companies with relatively substantial financial resources and a

presence in differentiated conventional as well as organic markets. These were also schemes where there was a relatively high level of competition for the certified crop from conventional buyers and in one case another large organic buyer. Where these conditions are present, Glover's 'agribusiness normalization' thesis appears to be refuted.

These results suggest that OCFSs, where price premiums are provided, generate measurable benefits for scheme participants. This holds true even when selection bias into schemes is controlled for. However, it is the contract farming rather than the organic element of OCFSs that is decisive in this respect. This underlines the importance of distinguishing between well-functioning and poorly functioning schemes. In a context of 'market-based' contract farming with loose and fairly narrow (rather than systematically interlocking) contracts, the preconditions for schemes to work well for both contracting companies and participants appear to relate to contracting company resources and market orientation, and to the presence of local competition.

Appendix: analytical strategy

As indicated in the text, one of the main difficulties involved in evaluating the effects of contract farming schemes refers to the possibility of selection bias. For detailed discussion of these issues see Blundell and Costa Dias (2000, 2002). This can arise if, for example, the most able or productive farmers select into the scheme based on knowledge of its potential benefits. Consequently, the counterfactual outcomes for these farmers, that is, their performance in the absence of the scheme cannot be correctly estimated from observations taken from the control group. Note that we refer to the treatment group as those participating in the policy intervention, which is the contract farming scheme of interest.

Excluding randomized evaluations based on pre- and post-intervention surveys, various techniques exist for dealing with this selection problem. The first assumes that selection into the scheme is 'strongly ignorable' conditional on observed covariates such as household characteristics and factor endowments. This means that treatment effects can be consistently estimated from the observed data, as long as a robust set of controls is included. The second approach is more conservative and uses (quasi) instrumental variables techniques as per the Heckman selection model (Heckman, 1979) to address unobserved selection bias.

Formally, consider the *observed* outcomes for farmer i under treatment and 'no treatment' states, given by y_{1i} and y_{01}, respectively:

$$y_{1i} = x_i'\beta_1 + u_{1i}$$
$$y_{0i} = x_i'\beta_0 + u_{0i}$$

where the vector $x' = (1x_1)$ defines a set of structural regressors affecting both the outcome and the decision to participate and u_i are error terms. These can be combined to give:

$$y_i = x_i'\beta + t_i\alpha + u_{0i} + t_i(u_{1i} - u_{0i}) = x_i'\beta + t_i\alpha + \varepsilon_i$$

where t_i is a dummy variable taking the value of 1 for treated households and zero otherwise. In the case of selection on observables, it is appropriate to estimate the equation by ordinary least squares (OLS). This is because the aggregate error term (ε_i) is independent of treatment status in expectation conditional on the vector x'. Heckman selection models do not make this assumption; rather, they estimate both a selection or participation equation *and* an outcome equation. This is either undertaken simultaneously, as per the Heckman FIML (full information maximum likelihood) estimator or in two separate stages (Two step). By doing so, a correction for selection bias is estimated and is indicated by the lambda term given in Table 4.6. Where this is insignificant, the OLS results can be taken as consistent.

As the precise nature of any selection bias in not known, empirically we proceed by estimating both OLS and Heckman models (see Table 4.6). To investigate the latter, however, as a first step we also estimate (stand alone) selection equations based on a binomial Probit model, in the case of contract farming, and a Poisson model in the case of the number of organic practices employed (Tables 4.4 and 4.5).

Note that the robustness of the Heckman model is assured both through the inclusion of instruments that do not appear in the outcome model and by additional tests. These include collinearity and heteroscedasticity tests. In no estimate do these give cause for concern.

Notes

1. For this reason, contracts in such schemes typically specified dates for planting and harvesting. Detailed inter-locking contracts of this kind are still present in a few locations in Africa but are more common in developing countries outside of Africa, with parastatals, international and nationally owned companies as contracting agents. For Asia see, for example, Simmons et al., (2005) on Indonesia.
2. Side-selling is noted as a problem of contract farming almost from the beginning of a specialized literature on the subject (cf Nyoro and Whittaker, 1986).
3. Some, if not all, of the donor programmes referred to target smaller locally owned companies for support, resulting in contracting companies having much more diverse levels of corporate resources than was the case in the earlier period.
4. Despite this, vanilla never became a major export crop in the Esco scheme. Although its cultivation remained much more common amongst scheme members than other cocoa farmers in the area, few farmers sold more than 20 kg of the crop annually. As vanilla prices remained fairly high, the reasons for this are unclear.
5. Of the schemes considered, probably only Kawacom was located with maximization of supply as an aim. Esco (U) Ltd's cocoa scheme was taken over from its original

designer after he had abandoned it (following activity in the area by insurgents). Biofresh's pineapple farmers were mostly members of a local NGO who canvassed an exporter through the Ugandan national organic movement NOGAMU, and were hence self-selecting. Gumutindo's participants were also self-selecting.

6. Members of the Tazop Black Pepper scheme had mean annual net revenues from the crop of Tsh 252,024 per hectare, as against Tsh 271,699 for non-members. The difference is not significant. Members of the Zangerm Chilli scheme had mean annual net revenues from the crop of Tsh 1,064,695 per hectare, as against Tsh 1,446,548 for non-members. This difference is significant at the $P < 0.001$ level (*t*-test).
7. The corresponding figures for the control groups were 52.1 per cent (2005) and 29.1 per cent (2009).