Export Vegetable Production in Kenya under the EurepGAP Standard: Is Large "More Beautiful" than Small?

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This paper defines three types of typical certified farms in Kenyan export production: smallholder farms, large-scale contracted farms, and exporter-owned farms. It assesses their economic performance, compares the financial cost of compliance with the EurepGAP standard, and analyses transaction costs. Results show that larger farms are not generally performing more efficiently compared to smallholders who implemented the EurepGAP standard. Despite higher monitoring costs as a result of the introduction of standards, smallholder vegetable producers remain an important source for the exporter companies.

The export of fresh fruits and vegetables from Kenya targets almost exclusively the European market, thus standards such as Euro-Retailer Produce Working Group for Good Agricultural Practice (EurepGAP[1]) present a challenge to the Kenyan horticulture sector. EurepGAP is a private standard that emerged from an initiative of UK retailers who recognized that the existing quality assurance system was not sufficient to satisfy consumer demand for food safety. "EurepGAP is an international quality system scheme that guarantees a safe production process for fresh fruits and vegetable products"; its "principles are based on not only food safety but also on environmental protection, occupational health, safety and welfare" (Galdos 2004, p.19). EurepGAP version 2.1 is limited to the production of fresh fruit and vegetable produce as well as flowers and ornamentals but will be extended to other agricultural products in the future. EurepGAP offers four types of certification, although only two of them are currently being applied in Kenya. Under Option 1, individual farmers apply for certification and under Option 2 a group of farmers applies for a group certificate. Options 3 and 4 address farmers certified for standards that are already benchmarked to EurepGAP. As compliance with the standard requires various investments in both long-term fixed structures such as a grading shed, charcoal cooler and pesticide storage, and changes in the use of variable inputs such as a switch to approved pesticides (Asfaw, Mithöfer, and Waibel forthcoming; Okello and Swinton 2006), smallholders generally opt for group rather than individual certification. Currently, Kenyan smallholders are mostly certified under Option 2, whereas medium- to large-scale farms choose Option 1 certification.

Vegetables are produced for different supply chains, as shown in Figure 1. Produce destined for the European market is mainly supplied through export companies, while the domestic market can be accessed through various channels depending on the distance from the producer to the targeted market. These channels vary from direct supply to the local rural market to up to five intermediaries when supplying the urban markets (Minot and Ngigi 2003).

Various studies on the effects of food safety standards on developing countries' agricultural sectors have been carried out. Some studies conclude that the attrition of poorer smallholder farms from the export market as a result of the stringent standards leads to increased poverty and vulnerability in rural communities, while the richer smallholder farms are able to meet these requirements (Okello 2005; Jaffee 2003; Dolan and Humphrey 2000). On the other hand, Maertens (2006), Humphrey (2003), and Manda (1997) conclude that an increase in employment at large farms offsets the income loss of smallholders, although the employment opportunities are mostly temporary or casual (Maertens 2006;

[1] This paper's research was conducted when EurepGAP, Version 2.1 (October 2004) was relevant. Since then, EurepGAP has been renamed to GLOBALGAP to better reflect its global presence and mandate. http://www.globalgap.org/cms/front_content.php?idcat=9&idart=182.

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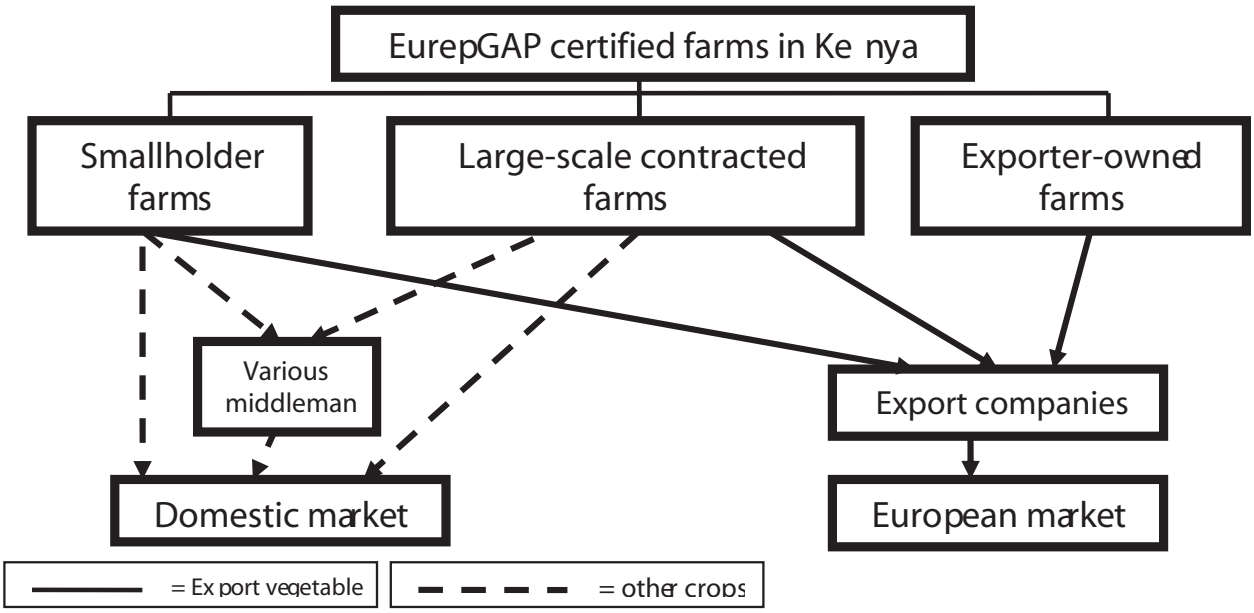

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Figure 1. Supply Chains of Eurepgap Certified Farms in Kenya.

Jaffee and Henson 2004). The different conclusions are subject to the scope of the studies—i.e., whether the study focused on large farms or smallholders. However, all studies agree that standards result in concentration of production.

This paper extends the discussion and compares the effects of standards on three different types of Kenyan farms producing export vegetables: smallholder, large-scale contracted, and exporter-owned farms. It contributes to and expands on the findings of Okello and Swinton (2006), who conclude that small-scale farmers can maintain participation in profitable export markets by forming farmer associations and thereby obtain export contracts and achieve economies of scale. The objectives are threefold: to assess the economic performance of the three different certified farm systems, to compare the financial cost of compliance with the EurepGAP standard as well as the risk involved in the certification investment, and to analyze the transaction costs based on the farm type.

The second section of this paper describes the methodology used for the analysis of the empirical data, the third section describes the survey design and data collection procedures, the fourth section presents the results, and they are discussed and conclusions are drawn in the last section.

Methodology

Identification of the Typical Farms

The methodology applied to compare the effects of the EurepGAP standard in Kenyan vegetable production is based on the concept of typical farm models (Hemme 2000). This concept follows a two-step procedure. In the first step an expert consultation is carried out in order to obtain an overview of a sector through the identification and quantification of a set of indicators. In the second step the indicators are validated by triangulation with information from available sources, including sector statistics, case study reports, additional communication with experts, and primary data through farm surveys.

In this study the concept was adapted to the Kenyan conditions. Horticultural experts were first consulted to obtain an overview of the sector. Then a sample of farms was selected and the farm-

ers interviewed to generate basic data for the typical farms. Three typical farm models were formulated. The technical parameters and the prices of the typical farms were identified and defined based on the mean or median of the survey data. Indicators for which survey data were approximately normally distributed are described by survey means, while indicators based on data with a different distribution are described by the median. Indicators included were land size, allocation of land to different crops and varieties, number of employees and wage rates, value of machinery and buildings, and the marketing channel. Extreme values of the primary data set were discussed with experts; in this case, mostly the agronomists employed by the sampled farms or exporter companies. Because of some extreme values, two indicators—cultivated land and number of workers employed for the large-scale contracted and exporter-owned farms—were based on the median. Finally, the typical farm models were validated with an expert consultation.

Net Revenue Estimation

All three types of typical farms pursue market-oriented rather than subsistence horticultural production and therefore aim at net revenue maximization. Thus, for this study, the net revenue, the crop portfolio, and cost structure are used as indicators to assess the farms' management decisions and performance.

In this paper, the annual net revenue function (Φ) for a vegetable farm is given by the sum over net revenue of all crops grown by the farm as a function of each crop's respective area in hectares (ha). Net revenue of each crop is calculated as revenue less variable cost, including opportunity cost of family labor in production:[2]

$$(1)\quad \Phi = \sum_{k}^{6} [((y_k p_k)a_k) - ((s_k a_k)\mathrm{p}_{s_k} + (c_k a_k)\mathrm{p}_c + (f_k a_k)\mathrm{p}_f + (\mathrm{i}_k a_k) + (\mathrm{l}_k a_k))]$$

where y is output, c is chemicals, and f is fertilizer, all measured in kg/ha per year; p is price (KSh/kg); l is labor and i is irrigation, both measured in KSh/ha per year; s is seed (kg/ha and year); a is covered area (ha); and *k* is a crop index where 1 is beans, 2 is peas, 3 is domestic vegetables, 4 is other major export vegetables, 5 is other minor export vegetables, and 6 is other export crops.

The net revenue function proposed for each of the typical farms defined through this study could vary as the fixed assets used on different farms effect on the variable costs. Other indicators—e.g., profit, which takes into account fixed assets—might be more suitable; however, due to unavailability of information on fixed costs during primary data collection, net revenue is used as an indicator instead of profit. One could expect higher fixed costs for the large-scale contracted and exporter-owned farms than for the smallholder farms. Nevertheless, this is unlikely to alter the results as scale effects decrease these costs on a per-unit basis.

The financial performance of the three farm types is analyzed only for bean production as this is the crop produced on all three types of farms and is the major Kenyan export crop.

Break-Even Analysis

Break-even points are computed based on the net revenue (Φ) and the EurepGAP compliance investments. We follow the concept applied by Fleischer, Waibel, and Walter-Echols (2002) in an analysis of extension systems in Egypt. Break-even points refer to the time it takes to achieve the minimum benefit that has to be realized to cover investment costs. In addition to the variable costs of production, the entrepreneurial wage is included to account for the opportunity costs of the farm owners' labor. It is calculated at the rate of the alternative wage employment for each farmer.

Based on Equation 1, net revenue of export production denoted by Φ_e is derived and the monthly net revenue to export vegetables is approximated by $\Phi_e/12$. For the two types of large-scale farm, which plant the main crops (beans and peas) on a weekly basis, this approximation is likely to represent the real distribution of the net revenue flows over the year. Smallholder farms have three planting seasons per year; in each season the total area allocated to vegetable export production is divided into smaller plots that are planted consecutively. Each month the entrepreneurial wage (F) is deducted and the recurring (R) and non-recurring (I) EurepGAP

[2] All monetary values are given in Kenyan Shilling (KSh). One US$ equaled about 74 Kenyan Shillings during the time of the survey.

investments are incorporated in month zero; thus the farm starts from a net revenue of −(I + R). The recurring costs are those that occur annually, and are incorporated for the first year. The break-even month (m) for the initial investment and the recurring cost of year zero is reached when the net revenue is at least 0.

$$(2)\quad -(\mathrm{I}+\mathrm{R})+\sum_{i=1}^{m}\left(\frac{\Phi_e}{12}-F\right)\geq 0 \text{ where m Z*}$$

$$\Rightarrow m \geq \frac{R+I}{\frac{\Phi_e}{12}-F} \text{ for } \frac{\Phi_e}{12}-F > 0.$$

$\Phi_e/12 - F$ illustrates that the planting of export vegetables has to generate positive revenues and holds for each farm type.

Transaction Cost Considerations

Transaction costs are important considerations in the analysis of imperfect markets. Coase (1937) defined transaction costs as the costs of exchange. As pointed out by Rao (2003), firm-level decisions with respect to own production and/or contracting out, as well as business decisions in terms of choice of activities under vertical and horizontal integration, need to be analyzed by considering such costs of exchange in addition to direct costs.

In the analysis of African vegetable producers, the transaction costs of both the vertical integration and production for exporter-owned or contracted large-scale farms are included. Two categories of transaction costs are considered: first, market-based costs such as time for information gathering, bargaining, contracting or monitoring, and enforcement of agreements; and second, managerial and administration costs that are a consequence of operating an organizational entity. Transaction costs can be difficult to quantify and especially to monetize since they are often coupled with a large number of different activities. For example, negotiations between business partners may just take longer as a result of implementing food safety standards. In this study, proxies such as the number of consultations with different market partners per signed contract, lengths of the supply chains, days spent finding new market partners, number of visits from contract partners to monitor the contract regulations, or the number of contract partners are used. The major impact of EurepGAP on transaction costs is expected to be associated with market-based activities. Exporters contracting smallholder-farms face additional costs of information gathering, in searching for certified farms or farmers willing to undergo training and certification. Furthermore, the standard increases transaction costs due to increased costs of monitoring of production to ensure compliance with the standard. Even parts of certification costs—e.g., costs of auditing—can be taken as transaction costs.

Additionally, differences in the internal administrative processes—e.g., linked with decision-making and hierarchal structures—result in increases in managerial and administration costs. In general, the more levels in the hierarchy, the higher the transaction costs. If workers are more integrated in processes, transaction costs might be reduced due to certification. In this study we also use the number of decision-making levels in the farm hierarchy as a proxy for transaction costs at the different farm types.

Furthermore, the time the manager must devote to preparing the farm for the auditing as well as the audit itself is part of the transaction costs associated with EurepGAP certification. However, the farmers or farm managers do not keep records of these tasks and were unable to provide estimates. Thus these costs were not included in the survey.

At the end of the value chain in horticultural export production, a EurepGAP certificate can help to reduce transaction costs because uncertainty about production practices is reduced and the market partners, including consumers in Europe, are in a better position to make an informed decision about from whom to purchase horticultural produce.

Survey Design and Data

The three typical farm models of this study are the large-scale exporter-owned, large-scale contracted, and smallholder farms. Initial informal meetings with representatives of export companies were conducted with the aim of creating a general understanding of the system of vegetable export production in Kenya and to introduce the aim of this survey. Furthermore, future strategies concerning the composition of supplies sourced from the different farm types were discussed. Finally, representatives

of the export companies were asked to identify some of their large producers to participate in this study. The large-scale contracted and exporter-owned farms were contacted via the exporters. All of the farms of these two types in the sample are linked to the seven biggest exporters in Kenya. Table 1 gives and overview of the total number of certified and sampled farms of all types.

Smallholder farms were selected by a multi-stage sampling procedure[3] by selecting districts, sub-locations, and smallholder vegetable producers. First, five districts were selected from the major vegetable producing provinces based on the intensity of export vegetable production, agro-ecology, types of crop produced, and accessibility. These districts represent the major export vegetable producing areas, which according to the current update on the number of smallholders producing for the vegetable export market by Mithöfer, Nang'ole, and Asfaw (forthcoming) cover approximately half of smallholder vegetable export producers. Second, 21 sub-locations were selected from these five districts based proportionately on the size of the export vegetable producer population. Third, a total of 439 households producing export vegetables were selected randomly for the interview (Asfaw, Mithöfer, and Waibel forthcoming). Of these, 49 are EurepGAP certified producers that were included in the present analysis.

[3] The sampling for the smallholder farms is described in detail in Asfaw, Mithöfer, and Waibel (forthcoming).

Data were collected during a single visit to the 18 contracted and eight exporter-owned large-scale farms between December 2005 and February 2006, whereas data from smallholders were collected in multiple visits during two planting seasons between September 2005 and August 2006.

Results and Discussion

Description of the Typical Farm Models through Selected Indicators

Descriptive results of selected indicators are shown in Table 2. One of the major differences between the two categories of large-scale farms is their location. The exporter-owned farms are concentrated in four different locations that are best suitable for vegetable production, while most of the contracted farms are located in places that are less favorable for vegetable production, with less irrigation infrastructure.

The total land size of the farm types varies tremendously, from 0.65 ha under production for the smallholders to 101 ha under production for the exporter-owned farm. Large-scale contracted farms are in-between, 27 ha on average. The number of crops grown, the number of employees, and the value of the farms' machinery vary accordingly, as does the share of land under export vegetable production.

Large-scale exporter-owned farms have more diversified crop portfolios in comparison to the

Table 1. Farm Categories and Numbers of Eurepgap Certified Farms.

Indicator	Smallholder Farms	Large-Scale Contracted Farms	Exporter-Owned Farms
Farm-size	< 2 ha	> 2 ha	> 2 ha
Number of EurepGAP certified farms in Kenya[a]	201[b]	34[c]	—[d]
Number of farms in sample	46	18	8

[a] According to e-mail contact with Foodplus, June 2006.
[b] The 201 farmers are organized into 10 farmer groups and certified under Option 2.
[c] The figure refers to large-scale contracted and exporter-owned farm combined. Both are certified under Option 1.
[d] The figure for the large-scale contracted farms includes the certified exporter-owned farms.

Table 2. The Three Farm Types.

Indicator	Unit	Exporter-Owned Farms[a]	Large-Scale Contracted Farms[a]	Smallholder Farms[b]
Export vegetable area	ha	101	14.2	0.31
Export crops	number	6	5	3
Export vegetable area	percent	100	54	48
Workers	number	340	77	1
Permanent workers	percent	49	31	0
Value of machinery	'000 KSh	7,500	4,000	25
EurepGAP certification	year	2003	2005	n.a.
Total certification costs	KSh/ha	11,011	85,958	117,217

Source: [a]own survey data; [b] smallholder survey and data are further described in Asfaw, Mithöfer, and Waibel (forthcoming). One US$ equaled about 74 Kenyan Shillings during the time of the survey.

large-scale contracted farms, as shown by the number of crops produced and the area allocated to each crop. Large-scale contracted farms produce few crops on relatively large areas, whereas the exporter-owned farms produce a higher number of crops and different varieties on smaller areas in order to guarantee a constant supply of all crops to the exporter-owner.

Certification costs as shown in Table 2 differ between the farm types due to the different levels of adherence to production standards before compliance with EurepGAP. Even before EurepGAP, large farms associated closely with exporters had management structures and infrastructure that made upgrading to the EurepGAP standard relatively simple and cheap in comparison to smaller farms. The typical exporter-owned farm is certified for multiple standards such as Ethical Trade Initiative (ETI), Tesco Nature's Choice (TNC), or fair-trade, which might further explain the relatively low costs of implementing EurepGAP.

Some individual exporter-owned and large-scale contracted farms are huge, with as much as 2900 ha under production, which is also reflected in the number of employees (850) with mean values higher than median values. As the consulted expert confirmed that the median values as more representative than the means, the former were used for the two indicators.

Table 3 shows differences in selected indicators characterizing production of beans, the lead crop. Across all types of inputs, the typical smallholder uses the lowest amount while the two types of large-scale farms have similar production costs for most inputs.

The high seed cost of the large-scale contracted farm is due to the large amount of seeds used and the high price of these seeds. The smallholder accrues lower seed costs and uses much less seed per ha per year, while the exporter-owned farm ranges at the bottom end of the seed costs and in the upper middle of the range for the amount of seed per ha per year.

The comparison of the labor costs in bean production of the farms is more complex, since the organizational structure of the smallholder farm is very different from that of the two large-scale farm types. The smallholder farm mostly depends on family labor; additional casual labor is mainly employed for harvesting and in some cases for pesticide application. For the purpose of this study, family labor is valued at its opportunity costs, represented by the wage rate in the nearest village, and is thus accounted for in the calculation of the labor costs. Another difference due to the huge variation in farm size is the administrative overhead. The exporter-owned farm and the large-scale contracted farm employ a high share of workers outside crop

Table 3. Input Use and Output of Bean Production by Farm Type.

Input/Output	Unit	Smallholder Farm	Large-Scale Contracted Farm	Exporter-Owned Farm
Seed	kg/ha and year	49	223	183
	KSh per kg	560	860	460
Labor	share of supervisors	0	18	26
	KSh per day	100	110	117
	workers per ha	n.a.	5.4	3.4
	’000 KSh/ha and year	77	319	307
Fertilizer	’000 KSh/ha and year	77	96	134
Chemicals	’000 KSh/ha and year	96	45	54
Irrigation	’000 KSh/ha and year	0	62	77
Output	kg/ha and year	15	25	30
	KSh per kg	38	44	48

Note: One US$ equaled about 74 Kenyan Shillings during the time of the survey ;
Source: own presentation.

production. Twenty-six percent of the employees of the exporter-owned farm are in administration, supervision, or management, while for the large-scale contracted farm this share is around 18 percent. In this study these costs are attributed to crop production according to the share of land allocated to each crop. The wage rate for casual workers also differs with the farm types. The smallholder farm pays the lowest rate, the large-scale contracted farm pays a higher wage, and the exporter-owned farm pays the highest wage. The large-scale farms of both types employ permanent workers who are not found on the smallholder farm and who receive higher wages. Based on these considerations, the labor costs in bean production are the highest for the large-scale contracted farm due to its more labor-intensive production as compared to the exporter-owned farm and to the additional administrative overhead as compared to the smallholder farm. Second is the exporter-owned farm, due to its high wage rates and the high administration costs. Labor cost is lowest for the smallholder farm, based on the low wage and the very low amount of administrative tasks.

As the results show, fertilizer costs per ha increase from smallholder to large-scale contracted to exporter-owned farm. Chemical costs are highest for the smallholder farm, more than twice as much as the large-scale contracted farm. The exporter-owned farm uses slightly more than the large-scale contracted farm.

Irrigation expenditures capture costs of using mechanical pumps or machinery. They are only relevant on the large-scale farms, as the typical smallholder irrigates manually, which is included in labor costs. No fees are charged for use of irrigation water. Irrigation expenditures for the two large-scale types are almost equal.

The output of beans per ha per year increases with the size of the typical farm types. The smallholder farm realizes only 50 percent of the outputs per ha per year of the exporter-owned farm, and the large-scale contracted farm ranges between these

two. Taking the previous discussion into account, this might be attributed to the difference in input use and intensification.

Profitability and Cost of Compliance with EurepGAP of the Typical Farms

Based on Equation 1 and the data in Figure 2, the net revenue per year (Φ) for all crops of the exporter-owned farm, the large-scale contracted farm, and the smallholder farm is 27.6 Million KSh, 5.5 Million KSh and 135,000 KSh, respectively. For the exporter-owned farm this figure represents the net revenue from export vegetable production, as they do not produce domestic crops. For the smallholder farms and the large-scale contracted farms this figure also includes revenues from domestic crops. Crops for the domestic market generate 80 percent of the net revenue per ha of the export crops on large-scale farms. The same proportion was assumed to be applicable for the smallholder farm, whose net revenue from export vegetable production is 78,000 KSh per year.

Figure 2 compares the three farm types in terms of financial performance and efficiency using a few simple indicators such as the revenue cost ratio.

The results show that the large-scale contracted farm incurs the highest cost per kg of bean production. Their revenue cost ratio is the lowest of all farm types. This is despite being the most productive in terms of output per ha and year and the receipt of higher prices for produce compared to

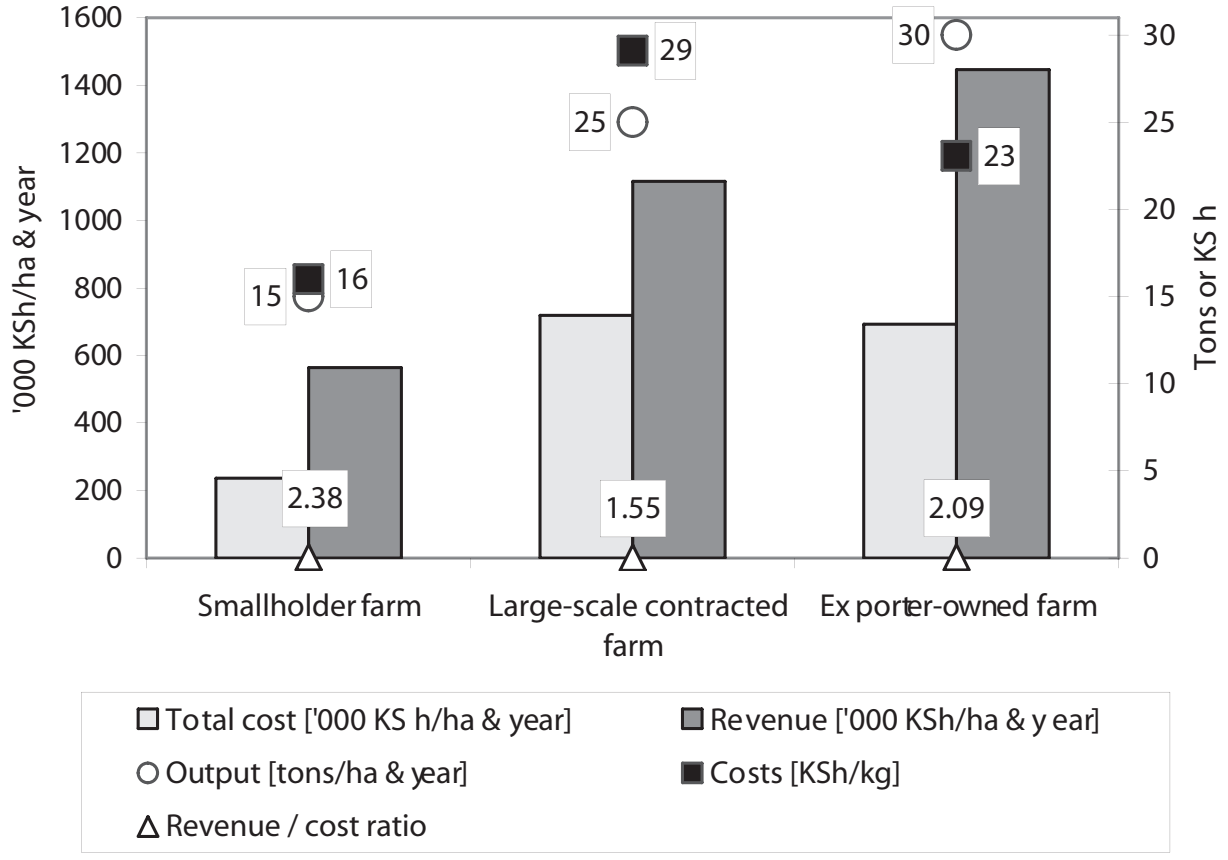

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Figure 2. Indicators of Bean Production by Farm Type.

the smallholder farm. Comparison of the revenue-cost ratio across the three typical farms shows that the smallholder farm performs best, although it has the lowest output per ha and year and receives the lowest price for its produce. Its low level of input use and costs more than compensate for low output and prices.

Benefits from Certification and Break-Even Analysis

Using Equation 2, the break-even period for the smallholder farm is 25 months after investment (mSH = 25), for the large-scale contracted farm it is 13 months (mCL = 13), and for the exporter-owned farm it is one month (mE = 1). Therefore the exporter-owned farm does not face a financial challenge from EurepGAP standard, as the investment is recovered almost immediately through the net revenue of one month. The contracted farms (large and small) take longer to break even and may have to take out loans to cover their investments. This may be difficult, especially for smallholders with their often limited access to credit.

As the area covered with export vegetables varies from 0.025 ha to 0.46 ha for the smallholder farms, from 2 ha to 178 ha in case of the large-scale farms, and from 30 to 303 ha for the exporter-owned farms, the break-even period can vary tremendously among farms of one type. Furthermore, both types of contracted farms still own land that is not cultivated and therefore they are able to increase the cultivated area within a reasonable timeframe without purchasing or renting in additional land. Thus a sensitivity analysis is conducted, which recalculates the break-even points depending on the area allocated to export vegetable production and the area currently not under cultivation. Incorporating a variable export-crop area in Equation 2 leads to

$$(3)\quad m(a) = \frac{(R+I)*a_e}{(\frac{\Phi * a_e}{12}) - F}.$$

Figure 3 illustrates the sensitivity analysis results for the smallholder farm shown by the break-even points as a function m of the acreage a allocated to export crops e. Additionally, the point ◊ indicates the situation of the typical farm operating on 0.31 ha, factoring in net revenue from export production only. Δ marks the break-even point including net revenue of the total crop portfolio of the farm.

The sensitivity analysis shows that the minimum area for a typical smallholder farm to produce profitable is $a > 0.24$ ha. Any area below this threshold results in a loss leading to a negative break-even period, indicated in the left part of the graph. When including the net revenue from all other crops grown by the farm in addition to the net revenue from export production, the break-even period is reached in approximately one-fourth the time. Table 4 compares results of the sensitivity analysis among the three farm types.

The comparison shows that the smallholder farm's break-even point is much more sensitive to changes in the area allocated to export vegetable production than that of the two large-scale farms. With an area decrease of five percent, the time to break even increases by 12 percent; with an area decrease of 20 percent it takes 5.5 times longer until the break-even point is reached. In the latter scenario the smallholder farm would take more than 11 years before it breaks even. Compounding this, factors other than land allocated to export production also affect the net revenue from production. For example, adverse climatic conditions can easily result in a similar effect to the worst-case scenario above; thus for the smallholders the investment in certification involves the largest risk. On the other hand, an increase in the export vegetable area would be accompanied by a disproportionately large shortening of the time frame until break-even. Here, an increase of just five percent (20 percent) of the acreage allocated to export vegetables results in a 12-percent (36 percent) decrease in break-even period.

Considering the opportunity cost of the farm manager (entrepreneur) as well as investment cost due to EurepGAP, for the large-scale contracted farm the lower limit for profitable export vegetable production is approximately 3.6 ha. By including the whole farm planting program, break-even is reached in half the time of the base case. Comparing this to the smallholder farm illustrates that the income of smallholder farms is more affected by changes in export production area and that currently smallholders depend to a larger extent on domestic crop production.

The contracted farms are closer to their optimal farm size than the smallholder farms, as shown by the less elastic response and smaller effect of

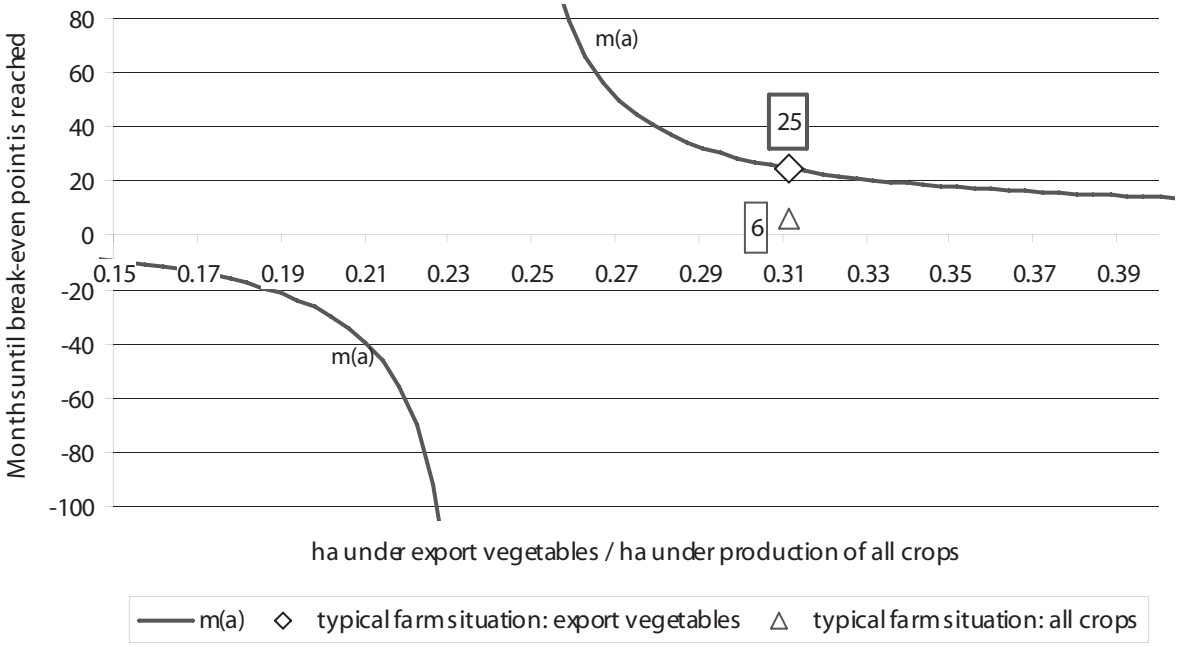

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Figure 3. Impact of Area Allocated to Export Production on the Time to Break Even in the Case of the Typical Smallholder Farm.

Table 4. Break-Even Points and Sensitivity Analysis Based on Bean Production by Farm Type.

Indicator	Unit	Smallholder Farm	Large-Scale Contracted Farm	Exporter-Owned Farm
Beans, break-even	month	25	13	1
Whole farm, break-even	month	6	6	1
Minimum profitable planting area of export crops (beans)	ha/ year	0.24	3.6	1.6
Change in export vegetable area		Change in break-even time (percent)		
–20 percent		+540	+12	0
–10 percent		+60	+5	0
+10 percent		–24	–4	0
+20 percent		–36	–8	0

Source: own presentation.

changes in acreage allocated to export production on the break-even period. The large-scale contracted farm works on a point of the curve that shows disproportionately low reactions in $m(a)$. Even a 20-percent decrease in export vegetable area leads to only a 12-percent increase in the break-even period. Hence the large-scale contracted farms' investment is less vulnerable to adverse climatic conditions and other changes that might occur. The same holds for an increase of land allocated to export production, which also leads to a disproportionately shorter period to reach break-even. Finally, the figures for the exporter-owned farms' break-even period show that the profit threshold of the exporter-owned farm is at 1.6 ha.[4] At the current level of production, the break-even point is almost inelastic to changes in the acreage. Here, a five-percent decrease in the area is accompanied by a change in the time frame of less than 0.5 percent and even a reduction of 50 percent leads to just a 1.7-percent increase in the period until break-even. Hence the exporter-owned farms do not incur much financial risk.

In Figure 3, the risk of not achieving break-even is determined for each farm by the distance of the current production to the vertical asymptote, which is the point where the entrepreneurial wage (F) is equal to the monthly net revenue from export vegetables ($\Phi_e/12$.). For the smallholders a decrease of acreage allocated to export production by only 24 percent would result in a loss, while area for the large-scale contracted farm would have to be reduced by 87 percent and for the exporter-owned farm by 99 percent to fall below the break-even point. This calculation shows that the smallholder farm faces the highest risk, but on the other hand has the greatest opportunity to improve its income situation by fully utilizing its production possibilities, e.g., by allocating more land to horticultural export production.[5]

[4] The exporter-owned minimum acreage is likely to be underestimated to a higher degree than that of the large-scale contracted farm as they work on a much higher level of sophistication and thus have a higher share of fixed costs, which would increase minimum acreage for profitable production.

[5] However, the decision about the acreage allocated to the export crop as well as the export crop choice is not necessarily the smallholder farmer's own choice but has to be agreed upon with the exporter. This is a complex decision, as additionally considerations of production risk and transaction costs have to be taken into account.

Transaction Cost Analysis

By definition, the total administrative and managerial transaction costs increase with farm size and the degree of diversification; thus costs are compared per kilogram of beans produced. The most obvious difference in the management structure of the different farm types is the number of levels in the decision-making hierarchy. The exporter-owned farm has a five-tier hierarchy with 13 percent of its employees as supervisors. The large-scale contracted farm operates with four steps in the hierarchy and 11.5 percent supervising staff. As the smallholder farm is a family business, with an average of one casual worker, the hierarchy consists of two levels and the farm owner directly supervises the worker.

However, in contrast to the large-scale farms, the smallholder farm is organized within a grower group and is not individually contracted by an exporter, which leads to other off-farm managerial transaction costs. The grower group has to establish a quality management system, including an internal auditing and monitoring scheme and a centralized management. The decision-making for the grower group is based on democratic principles and consequently becomes much more complex and time consuming compared to that of a single farm owner/manager. Overall, the two types of large-scale farms bear higher direct financial costs for the staff members managing the farm, while the smallholder farm bears higher transaction costs in terms of time for discussions and meetings of the group.

With respect to the market-based transaction costs, the smallholder farms and the large-scale contracted farms have a written contract fixed for 12 months with the exporter; however, the bargaining and negotiation time for its renewal differs. The large-scale contracted farm negotiates on average four hours per renewal of the contract, while in the case of the smallholder farm the exporter mostly dictates the contract conditions. This is also reflected in the prices the farms receive for their produce, as the smallholder farm receives a price 16 percent lower than that received by the contracted large farms. Although this implies less direct transaction costs for contract negotiation for the smallholders, they are in an inferior position compared to the large-scale contracted farm in terms of bargaining power.

The last cost that is included in the category of market-based transaction costs is the monitoring and enforcement of agreements. This cost item is analyzed from the export companies' point of view, as they have to ensure that the produce sent to Europe fulfils the requirements and is not rejected. The exporter typically spends three hours per week on each large-scale contracted farm to monitor production. The monitoring of smallholder groups is more complex since the production area is spread over all group members, an average of 30 per group. In this case, a technical staff member of the exporter is permanently based in the group's location to ensure close monitoring throughout the production period. This leads to an average time of 2.8 hours spent on each farm of one grower group. On the large-scale contracted farm with 13.8 ha under export vegetables, each ha is monitored about 12 minutes per week, while on a smallholder farm with 0.3 ha dedicated to beans each ha is monitored almost 8 hours per week. Thus areas cultivated by a smallholder group require much higher monitoring effort by the exporter than does the same production area cultivated by a single large-scale farm. Additionally, the output produced by smallholder farms is lower than that of large farms, so the monitoring time per unit of produce is not in favor of small-scale producers.

By factoring the cost for monitoring into the price paid for beans, a comparison between sourcing from small- versus large-scale farms from the exporter companies' perspective can be drawn. Staff time of supervisors is valued at their opportunity costs: technical field assistants employed by exporter companies for coordination of smallholder production have similar responsibilities and qualifications to the supervisors working on the exporter-owned farm. Thus the wage of the technical field assistants is assumed to be at least equal to that of the supervisor position of 313 KSh per day. Therefore the monitoring cost-adjusted price per kg of beans is

$$(4)\quad p_E = \frac{\frac{t*52}{8}*313 + p_f * y}{y}.$$

The output y in kg per ha per year and the price per kg paid to the farmer p_f gives the cost per kg of beans for the exporter. The monitoring time per ha per week measured in hours, t, is extrapolated to working days per year; the numerator gives the adjusted price for the annual production. The whole term represents the price for sourcing produce from each farm type and leads to a price of KSh 39 for beans produced by smallholder farms and KSh 44 for the same product produced by large-scale contracted farms. It turns out that even by adjusting the price paid for smallholder farms' production to include the high monitoring efforts, it still costs 11-percent less to acquire beans from a smallholder group than from a large-scale contracted farm, assuming that the monitoring system assures that produce is of equal quality between the two farm types.

Another factor that influences the costs of the exporter is the distance from Nairobi to the point of production. While the smallholder farms and the exporter-owned farms are rather concentrated in a few locations,[6][6 In case of the smallholder farms, this is due to the relatively low number of certified smallholder groups at the time of the survey. With increasing numbers of certified grower groups this may change and result in certified smallholder groups spread over more locations.] the large-scale contracted farms are distributed all over the research area. Nevertheless, this farm type's mean distance to Nairobi is the lowest at just 117 km, followed by the exporter-owned farm at 147 km. The most remote farms are the smallholder farms. In addition to the absolute distance to Nairobi, the distances between the individual farms where produce is collected and the road conditions also affect the collection costs of the export company. Typically, the exporter-owned and large-scale contracted farms are located along the main roads, while the smallholder farms are often found in areas with poor road conditions and are sometimes not accessible during the rainy season. Although large-scale contracted farms are much more scattered across the country than are smallholders, it takes collection from several smallholders to fill one truck, implying higher collection costs. Overall, these two factors influence the costs of sourcing from one or the other farm type, and overall judgment based on the present information is not possible.

All in all, the types of transaction costs and their scale vary among the farm types. A smallholder has to bear high non-financial transactions costs by becoming and being a member of a group, while

the large-scale contracted farm has high financial administration and supervision costs. Monitoring costs of smallholders are rather high, but taking lower prices for smallholder produce into account, exporter companies still source more cheaply from smallholders than from large-scale contracted farms. This is also reflected in the statements by some export companies that they do not intend to drop the smallholder groups because the combination of supply from all three types of farms best spreads the risk of production failure caused by unfavorable climatic conditions. Finally, sourcing from smallholders may result in marketing advantages, demonstrating corporate social responsibility and pro-poor company policies.

Summary and Conclusions

This paper compares the financial performance of typical Kenyan EurepGAP certified farms: large-scale exporter-owned farms, large-scale contracted farms, and smallholder farms. The latter work in a group and are certified and contracted as a group. The paper analyses the farms' crop portfolios, input uses and outputs of bean production, and revenue-cost ratios. Furthermore, the investments imposed by EurepGAP compliance are assessed in terms of break-even time and their imposed risk. Finally, the transaction costs for the different organizational structures among the three farm types are analyzed by using selected indicators.

The paper shows that efficiency in bean production as measured by the revenue-cost ratio does not increase with farm size. Overall, smallholders operate on a low input–low output level. The exporter-owned farm has the lowest investment costs per ha to attain EurepGAP compliance and reaches the break-even point within one month after certification. The contracted farm does not recover its investments in EurepGAP until Month 13. The smallholder farm breaks even after 25 months. The latter's success and time required to reach the break-even point is much more sensitive to changes in the area allocated to export crops, its performance, and its crop portfolio than is the case for the large farms. The risk encountered by the large-scale contracted farm is lower than that of the smallholder farm, and the exporter-owned farm faces almost no financial risk for the recovery of their investments in certification given the time to break even.

Export companies have to guarantee compliance of production to EurepGAP regulations and monitor contacted large-scale as well as smallholder farms very closely. Monitoring time per unit produced is by far the highest in the case of smallholder groups. This demonstrates the complexity for exporters when relying on produce from groups of small-scale farmers, which had been suggested by Okello and Swinton (2006). However, when including the monitoring costs in the price paid to the producers, it transpires that higher monitoring expenses are more than compensated by the lower price that smallholders receive for their produce. Considering the low price that smallholders receive, as well as their low bargaining power in contract negotiations, it is likely that even the costs of establishing reliable groups (at least those born by the exporter) are factored in by the exporter company. Additional benefits to the exporter are potential image advantages and the spreading of production risk across a wider area than would be possible with only large-scale farms.

Overall, this study does not support the notion that EurepGAP favors large-scale producers, since ranking of the performance of the three farm types varies depending on the indicator used. However, one can conclude that EurepGAP has increased the costs of monitoring the production process but the level of these costs varies among the farm types. The smallholder farms included in this analysis are early adopters of the standard. These producers benefited from donor support, and overall adoption of the standard had not reached a steady state (Asfaw, Mithöfer, and Waibel forthcoming). This means establishing the long-term impact of the production standards requires additional research.

The certification costs per ha are the highest for the smallholder farm, although the large-scale contracted farm faces almost similar costs. Their costs are eight or ten times higher than those of the exporter-owned farm. Therefore, the exporter-owned farm also faces the lowest risk involved in certification investment. Between the two contracted farms, the risk is far higher for the smallholder farm. Even slight changes in their crop portfolio or output affect their break-even time tremendously. Finally, the results show that even by incorporating the higher transaction costs involved in producing via smallholder groups it is still cheaper to source from smallholder groups than from large-scale con-

tracted farms. From the export company's point of view, sourcing from smallholder farms offers some advantages. Besides the cheaper produce, the distribution of the cultivation area reduces the risk of broad crop failures that might result in the exporter company being unable to meet the demands for the produce.

Finally, the analysis showed that an overall ranking for the performance of the farm types is not possible. The result depends on the indicator chosen. For example, considering the revenue-cost ratio, the smallholder farm performs best, while for output per ha the smallholders are lowest. In general, the analysis showed that a typical smallholder farm is able to successfully implement the standard although it has to bear a higher risk than large farms. However, the biggest challenge for export companies seems to be the establishment of reliable grower groups for the certification under Option 2. An in-depth study on this topic might lead to a better understanding of the issues involved in the linkages between the three farm types presented in this paper. A follow-up study is recommended in order to assess the impact of compliance with EurepGAP on the probability and profitability of adopting further standards such as TNC, ETI, or fair-trade. Such a study would facilitate the analysis of the exporter-owned farms' investments, which this study suggests the marginal costs of compliance with several standards would decrease. Additionally, a study at the exporter level could provide further insight into the distribution of the total certification costs, as well as the transaction costs for the different actors in the supply chain and other constraints faced by exporters.

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