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Smallholder Compliance with Private Standard Certification: The Case of GlobalGAP Adoption by Mango Producers in Peru

Sylvaine Lemeilleur

Economic Researcher, CIRAD, UMR MOISA, 73, Rue Breton, 34398, Montpellier, France.

Abstract

Our paper is a contribution to the literature exploring the patterns and determinants of smallholders' adoption of food standards. This case study focuses on the adoption of GlobalGAP by small-scale fresh mango producers in Peru. Based on primary data surveys, we find that a few smallholders comply with the standards because of the support received from exporters. The latter offers contract farming, including technical advice and the annual certification costs. Therefore, the paper underlines the key role of exporters in Peru as intermediaries and organizers in the way smallholders may participate in private standards in agrifood value chains.

Keywords: GlobalGAP, adoption, small-scale farmer, mangos, Peru

Corresponding author: Tel: +33 4 67 61 75 93
Email: S. Lemeilleur: sylvaine.lemeilleur@cirad.fr

Introduction

The last two decades have witnessed unprecedented changes in the agrofood sector through the proliferation of standards in international agricultural trade. After a period during which the states of developed countries actively implemented food safety standards (this has been exacerbated by a series of food scandals (Henson and Caswell 1999)), private food standards have rapidly penetrated agrofood markets (Reardon and Farina 2001). Expanding beyond their initial tiny market niche, they attend to rising consumer concerns regarding the conditions of production and trade of the goods they buy (Jaffee and Henson 2004). These voluntary standards on sustainable production generally combine a mixture of food safety, environmental, and social dimensions, while an inherent emphasis is given to product traceability. Consequently, standards not only affect the quality of final products, but also the whole organization of the supply chain (Reardon et al. 2000; Thorpe and Bennett 2004; Hammoudi et al. 2009). This significant change raises new opportunities and challenges for small export-oriented farmers in developing countries and has implications for agricultural development programs and policies.

The pattern of new standard adoption in developing countries has recently received much attention from economists. A wide range of empirical literature argues that standards may act as a barrier to market access for smallholders: the stringent conditions tend to lead to the exclusion of smallholders and the inclusion of larger farmers (Key and Runsten 1999; Dolan and Humphrey 2000; Escobal et al. 2000; Reardon et al. 2003; Augier et al. 2005; Vandermeer 2006; Unnevehr 2008; Fuchs et al. 2011). In fact, compliance with standards often requires considerable human, physical, financial, informational, and network resources. Lack of access to these resources and the certification costs are the most common factors explaining the non-compliance of smallholders with standards (Vorley and Fox 2004; Hatanaka et al. 2005; Henson and Jaffee 2006). On the contrary, some less pessimistic studies find positive effects, arguing that standards can be a catalyst for upgrade by improving farming techniques and product quality, thereby allowing them to participate in high-value added chains (Cocks et al. 2003; Henson and Jaffee 2008; Lee et al. 2010). Smallholders may be included in the high-standard market thanks to a contract-basis with the agro-exporters (Chemnitz 2007a; Chemnitz et al. 2007b; Maertens and Swinnen 2009; Minten et al. 2009; Asfaw et al. 2010a; Henson et al. 2011). Finally, since it didn't emerge any consensus among the different research works, it is becoming generally recognized that evidence is mixed (Henson and Jaffee 2008). Therefore, new debates arise over the degree to which compliance processes do indeed act to exclude smallholders (Henson and Humphrey 2009; Colen et al. 2012; Maertens et al. 2012) and with which conditions small farmers can really comply, pointing out both threshold capital requirements on the one hand and industry structure and institutional environment on the other hand that may greatly affect standard adoption by smallholders (Chemnitz et al. 2007b; Lee et al. 2010).

In this paper, we focus on the private GlobalGAP standard adoption by small-scale producers of fresh mangos in Peru. Fresh fruit production may greatly contribute to poverty reduction, thanks to the high labor intensive requirement and the high capita income generated (Lumpkin et al. 2005). However the opportunities of the fruit sector in developing countries can be restrained, here again, by the proliferation of standards (Vorley and Fox 2004), such as the GlobalGAP standard, which is the most important standard in export horticulture in the international produce market (Henson et al. 2011). Peru is an interesting case to study the effects and the determinants

enabling the standard adoption, because GlobalGAP has become "quasi" mandatory for the fresh mango exportation to the European Union (EU) since 2007 (Zoss and Pletziger 2007; Bain 2010; Souza and Amato Neto 2010). Actually, this standard is not mandated by law and thus remains 'voluntary', but the reality is that compliance with GlobalGAP has become an 'entry ticket' into EU (Campbell et al. 2006; Fox and Vorley 2006). Yet fresh mango is one of the major agricultural exports for Peru and two-thirds of mangos are exported to the EU.

Kleinwechter and Grethe (2006) have previously studied the adoption of the EurepGAP standard in the mango export sector in Peru in 2004-2005 (Kleinwechter and Grethe 2006). They have shown that the first major barrier to adoption is linked to accessing information about the standard. Since exporting enterprises were the most informed actors, the adoption of the standard is mostly found in their activities through vertical integration. According to the results of Kleinwechter and Grethe (2006), small-scale producers did not comply with EurepGAP certification in 2004-2005. Our research seven years later shows evidence that today, a slight percentage of smallholders comply with GlobalGAP as well.

Surveys with 228 small-scale mango producers were conducted from October 2010 to July 2011. Data was collected in the region of Piura, the main zone of mango production. Consistent with few others recent studies (Asfaw et al. 2009; Henson et al. 2011; Kersting and Wollni 2012), our findings show that the standard adopters comply with the standard thanks to the support of exporting companies through farming contracts, technical advice, and by paying the annual certification costs. Therefore, the inclusion of small-scale farmers ultimately depends on the compliance decision of exporters and their assistance to farmers in the compliance process.

The objective of this paper is thus a contribution to the current debate to what extend international standards may tend to exclude small-scale farmers from high-value food markets, and with which conditions some of them can eventually comply. We take underlying the fact that the role of intermediaries is essential to understanding the upstream decision to adopt private standards. Nonetheless, since the adoption of the standard by smallholders is very recent, it was not possible in this paper to measure whether the standard adoption allows really small-scale producers to be included in a more lucrative market.

The paper proceeds as follows: section two provides a background of mango production and trade in Peru and the evolving international trade towards standards; section three develops the empirical model and estimation strategy; section four describes the survey and data; section five presents and discusses the empirical findings; and section six concludes the paper.

Peruvian Fresh Mango Export Sector and Standards

Production and Trade

According to the World Bank definition, Peru is a low middle income country with a GDP of US$ 152.8 billion and per capita income of US$ 9,200 in 2010 (Worldfactbook 2010). In Peru, agriculture is still a source of economic development. It accounts for 8 percent of the GDP and provides 23 percent of direct and indirect employment (Inei 2008). Fresh mango is one of the major agricultural exports. Since 1985 with the first exports to the US, the sector has grown at

remarkable rates. Between 2000 and 2010, the cultivated areas increased from nearly 18,700 hectares to around 28,400 hectares and the production from 125,000 tons to 250,000 tons (Minag 2010). Peru exports around 30 percent of its national production (105,724 tons in 2009/2010) and is the fifth largest mango exporter in the world. Fresh mangos are by far the most important of exported mangos (87 percent of exported mango volumes in 2009, according to customs). Exports go to both the EU (65%) and US (35%) markets, but it is only since 2006 that the EU has surpassed the US as the main destination market (Figures 1 and 2)(Gerbaud 2010).

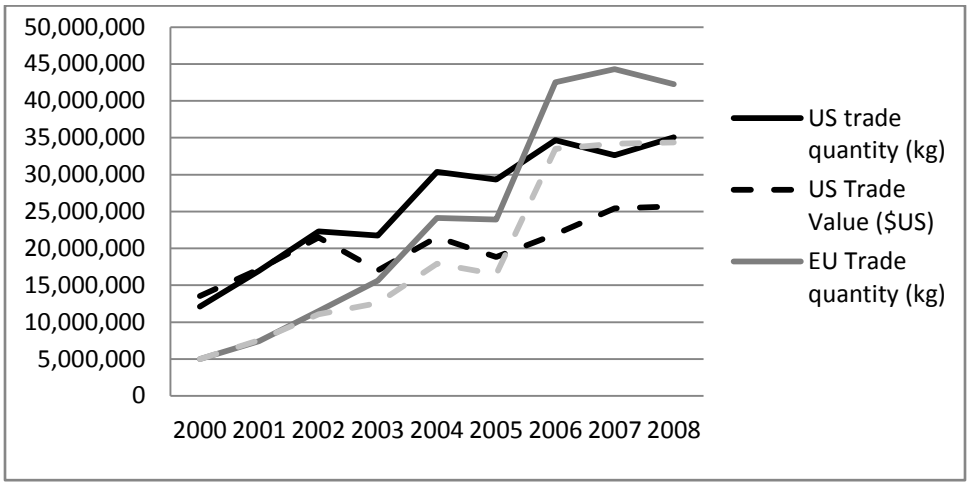

Figure 1. Evolution of Peruvian mango exports in the EU and the US (quantity and value) since 2000
Source. COMTRADE (2010).

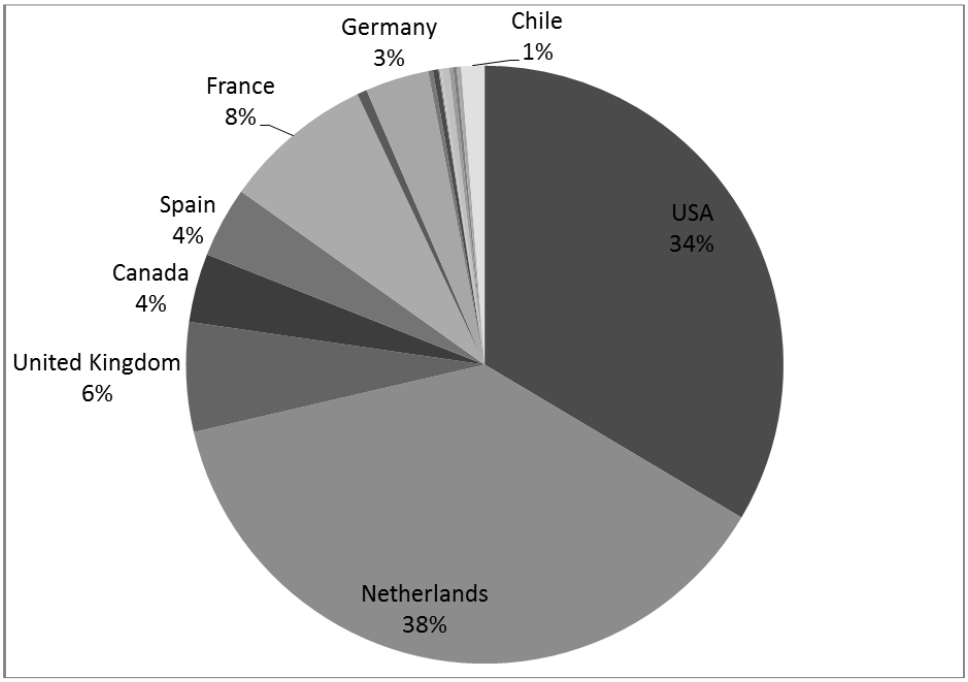

Figure 2. Export of Peruvian mangos in the world in 2010
Source. SENASA (2010).

For the EU market, Peru – the second largest supplier – competes with Brazil in November and December (Gerbaud 2010). Indeed the main mango harvested season is between November and March in the region of Piura where production is concentrated (around 70 percent of the national production and 90 percent of exported production). Varieties for domestic market (two thirds de the national production) and export market are nonetheless very segmented. The main mango varieties grown for the domestic market are the local variety Criollo, and the improved variety Edward. Improved varieties for export such as Kent (94.5 percent of export volumes) are not valued by the Peruvian consumers and Kent variety prices are substantially lower than those for the Edward or Criollo varieties on the domestic market. The domestic market alternative for Kent mango producers is thus not profitable; for them the international market is therefore the only lucrative market (Figure 3).

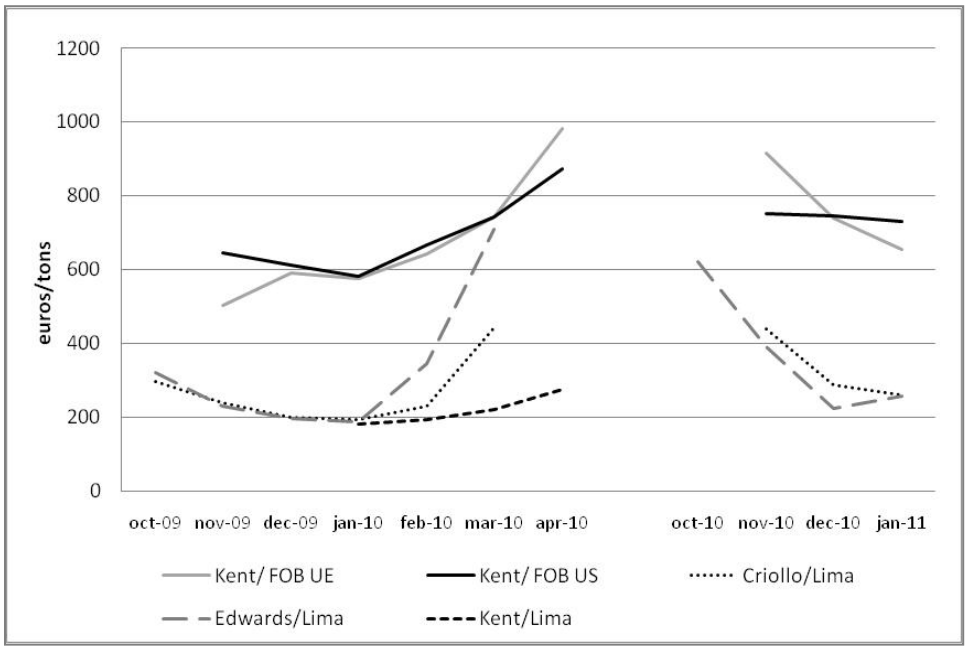

Figure 3. Mango prices according to varieties and targeted market (in euro/ton).
Source. According to the data from MINAG (2011).

On the other hand, the monthly FOB prices for exportation of Kent mangos to the EU and to the US are nearly similar for both markets (Figure 4). Nevertheless, there are some monthly or annual variations due to the other competitors for the targeted market (for instance, the EU market price was higher than the US price in November 2010 because of the shortage of Brazilian mangos on the international market, which was not the case in November 2009 (Gerbaud 2010).

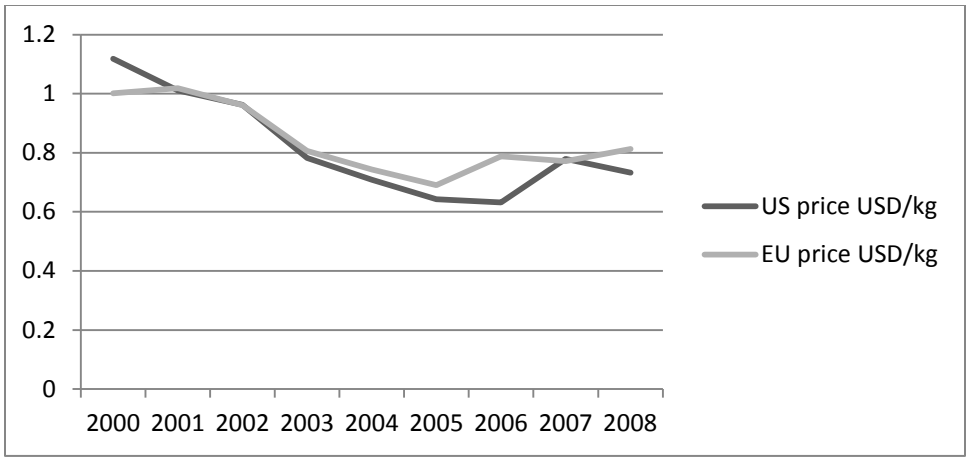

Figure 4. Evolution of Peruvian mangoes price in EU and US since 2000
Source. COMTRADE (2010).

Nonetheless, Peruvian mango growers face multiple inhibiting factors to export. The first constraint to accessing an outside market is a minimum volume required by the buyer (at least one container of 20 tons). This explains why small-scale producers (on average hardly producing 20 exportable tons) cannot export directly and work with exporters or form producer associations in order to get export market access. The second constraint is that the mango must meet commercial quality requirements (colour, appearance and size). The third constraint is that export-oriented producers require a phytosanitary certificate from the SENASA (Servicio Nacional de Sanidad Agraria del Peru) – the public agency in charge of eradication of the fruit fly. Lastly, the fourth constraint to accessing an outside market is due to the growing stringent non-tariff measures and private standards.

Non-Tariff Measures from the EU Market and Private Standards

For both the EU and the US markets, exports are required to respect the standard from Codex Alimentarius and maximum residual levels (MRL) for pesticides. Nevertheless, contrary to the US, the EU does not require hydrothermal treatments to kill fruit flies. Mangos exported to Europe are cleaned and then packed in 20 existing packing plants in Peru. Most of them are located in the Piura region. Barriers to trade in the EU are therefore much more relative to private standards: at the plant level, the HACCP is essential at the production level, organic certification has spread and GlobalGAP has become mandatory de facto since 2007 (Bain 2010; Souza et al. 2010; Zoss et al. 2007). Indeed, while European Retail Produce Good Agricultural Practices (EurepGAP) was developed by 13 European retailers, the Global Good Agricultural Practices (GlobalGAP) begin to have an expanding role as one of the major private standards in the international trade (Lee et al. 2010). Today, this standard is still not mandated by law and thus remains 'voluntary', but the reality is that compliance with GlobalGAP has become an 'entry ticket' into EU (Campbell et al. 2006; Fox et al. 2006).

As Chemnitz et al. (2007b) argue, the nature of the standard – namely the annual compliance cost, but also the type of capital required – may affect producers differently. The GlobalGAP

guideline ensures good agricultural practices focusing first on food-safety, but also a number of issues concerning environment quality (soil, water, and wildlife conservation), worker safety and hygiene, and traceability on the farm. The certificate includes some initial investments (such as toilets, canteens for workers, water taps, safety equipment, and storage facilities for agricultural inputs and outputs, respectively) that require substantial financial capital to upgrade the farm. It also entails annual costs for external inspection by a certification body. Finally, it requires that the producer knows how to read, write, and keep records – which means a high level of human capital.

Producers have two options to obtain certification under the standard: they can apply individually or apply collectively for a producer group certificate. Group certification is often the only possibility for small-scale farmers to become certified since it allows reducing individual cost of compliance.

In Peru, information on the GlobalGAP standard is relayed by government organizations, producer and exporter organizations, and NGOs. Concerning the cost of compliance, our interview results highlight a large variability of the compliance costs, ranging between 150 and US$ 833/ha[1]. This is influenced by the previous endowments in storage or other infrastructures and the technical level of the farm, but also by its size (since required infrastructure and technical levels are not size proportional). Some added costs are then spending for infrastructure maintenance. According to our first exploratory interviews with exporters, implementation costs remain the major constraint for farmers to adopt GlobalGAP standard. This is consistent with the Kersting and Wollni's findings (2012). In addition, the fixed cost of annual inspection in Peru is US$ 2,000/year. This is high, all the more so without a premium in the product price. The size of an individual enterprise is thus a major determinant of standard adoption. According to interviews with supply chain's experts from the Piura agricultural chamber, the minimum profitable size to individually implement GlobalGAP is around 20 ha.

Export-Oriented Stakeholders

In Peru, most of the mango producers are smallholders (less than 20 ha of total land, according to the national census categories): 85 percent of them have less than 20 ha of total land including 15 percent who have less than five ha. This repartition and the rather small size of mango producers in Peru are due to the agrarian reform of 1969. In 2009, 1,627 producers were allowed to export their mangos by SENASA. Among these producers, 75 percent are smallholders (less than 20 ha of total land), 20 percent are medium farmers (from 20 to 50 ha), and 5 percent are large-scale farmers (more than 50 ha). They account for 30 percent, 30 percent, and 40 percent of exported produce, respectively (according to the data of Senasa, 2010). The mango-producing sector is little organized in Peru. According to an expert, this could be explained by the fact that there are lots of small producers and the mango season is very short, around three months.
In 2009-2010, there were 106 fresh mango-exporting companies (Senasa, 2010). There is a rather medium concentration of exports in few exporting companies: the top 10 represent 46 percent of

[1] In spite of a large variability in their results, Kleinwechter and Grethe (2006) calculate a compliance cost of US$145 /ha/year on average and US$9.51 /ton/year, that is 3.8 percent of the mango farm gate price.

the total export volume. However, when compared to the figures from 2005-2006 (Fulponi, 2007), this concentration in the mango-exporting sector has decreased during these last five years, revealing a still very attractive and expandable market: in 2005 there were around 70 mango exporters in Peru and the top six represented 54 percent; moreover the top one accounted in 2006 for 22.1 percent of the total fresh mango export and in 2010 only for 10.2 percent. Otherwise, there are still few foreign exporter enterprises (it seems there are only two for the moment) but since the sector has been attractive for foreign investments few years ago, we found Peruvian enterprises with a part of foreign capital (from the US, Colombia, Costa Rica, and so forth). Beyond attractive, the sector shows also a relatively low entry barrier since the concentration in the mango-exporting sector has decreased these last five years and the sector actors complain about the high number of small and very volatile exporter firms (60 percent treat less than 500 tons per year) that enter the market for short run market opportunities. These sporadic exporters are called "golondrinos" (meaning "swallows"). These firms, not demanding on quality and safety norms are subjected to the most border rejections.

Large exporters often own packing or treatment plants and are generally targeting both the EU and US markets. They have easily enforced quality, traceability, and certified production – in particular GlobalGAP. Indeed, they mostly rely on their own production (from 50 to 250 ha) and still tend towards increased vertical integration, even though land has become very expensive nowadays[2]. However, there is large variability in mango production from year to year[3]. Thus, they generally complete their own production by purchasing from smaller farmers. Suzuki et al. (2011) also note, in their case study on pineapple exporters in Ghana, that this strategy is undertaken, at least in part, to shift quantity risks (Suzuki et al., 2011). Small-scale producers may thus have annual contracts (written or oral contracts, but hardly enforceable). Through these contracts, they steadily delegate harvests to the exporter (or a third party assigned to harvest on behalf of the packing plant), since it becomes very difficult to gather daily workers. In addition, in many cases, producers hardly have any access to credit to pay workers. A disadvantage to delegate harvests to the exporter is the high level of mangos discarded during the harvest – the discarded mango rate is on average 20 percent. Exporters are also in charge of carrying out transportation to the processing plant. Prices are rarely fixed and pay is often delayed. In some context, this type of contracts may be an option to assist small-scale farmers to achieve GlobalGAP certification (Asfaw et al., 2010b; Kersting and Wollni, 2012).

Empirical Model and Estimation Strategy

This paper questions to what extent international standards tend to exclude small-scale farmers from high-value food markets. The requirement of the GlobalGAP standard used in this case study can be considered an "external shock" to the EU export supply system. Indeed, while mango growers have seen a continuous positive growth in export dynamics since 2000, the new standard requirement may weaken many of them. We thus investigate the determinants of the adoption of GlobalGap by small-scale farmers. As Chemnitz et al. (2007) and Henson and Jaffee

[2] Escobal et al. found the same dynamic in the asparagus industry in Peru ten years ago (Escobal et al., 2000)

[3] For example, the 2008-2009 season was disastrous in terms of production (due to agronomic reasons). Numerous producers mention a reduction of around 50 percent of their production level.

(2008) have already highlighted, the ability to comply with standards will depend on several factors at the country, market, and firm levels, as well as the specific food standards. Here, we have taken an essentially microeconomic approach, focusing on the determinants of farmer standard adoption at the farm level. We have characterized the country, the market, and the specificity of the GlobalGAP standard as an element of context in the section above. In this given context, we want to assess how farm characteristics determine farmers' compliance with the GlobalGAP standard. We thus model the farmers' decision whether or not to comply with the GlobalGAP standard as a standard static adoption decision, where adoption is determined by the incentives[4] for and capabilities of farmers (Feder et al. 1985).

Regarding incentives, the GlobalGAP standard may offer farmers more demand reliability in terms of volume and/or allow higher prices. In our case study, the incentives are in part implicit to standard adoption and are further determined by farm characteristics themselves (size, bargaining power, and so forth). Therefore these factors will not be directly entered into the implementation model. Regarding capabilities, meeting the GlobalGAP standard requirement may imply the presence of or the investment in some physical as well as human capital. The GlobalGAP standard requirement is therefore hypothesized as determining a threshold capital requirement, which suppliers must have in order to benefit from the standard opportunity.
According to existing literature on the adoption of food quality standards, this threshold capital requirement may include physical capital (for examples, land, car, etc.), human capital (for examples, age, education, business experience), financial capital (for example, access to credit) and social and organizational capital (for example, group membership). Farmers with capital above this threshold capital requirement are expected to adopt the GlobalGAP standard if the incentives are there to continue to export for the EU market. Farmers with capital below this threshold capital requirement would be excluded from the GlobalGAP standard adoption and thus from the EU export chain.

We can refer to a conceptual reduced-form model defining standard adoption as follows:

For all *i*, we consider:

$$1) \quad GlobalGAP_i = \beta X_i + \varepsilon_i$$

GlobalGAP is a binary variable equal to one if the farmer $_i$ adopts the standard (and zero otherwise). X_i is a set of observed variables influencing the decision to adopt the GlobalGAP standard; other unobserved factors are summarized by the random variable ε_i.

We draw on the literature in order to derive hypotheses about the expected influences of the independent variables. It is worth mentioning that, for the estimation, we used lagged independent variables referring to the farm capital before the decision to adopt GlobalGAP or not (we used variables from 2006 since GlobalGAP has been become almost mandatory to export to

[4] Nonetheless, since the adoption of the standard by smallholders is very recent, it was not possible in this paper to measure whether the standard adoption allows really small-scale producers to be included in a more lucrative market.

the EU since 2007). These lagged independent variables are used to control whether the standard adoption is due to an initial threshold capital and, thus, to ensure independency of these variables. In addition, we use variables referring to the farmer relationships to other agents of the marketing channels.

First, we assume that the standard adoption will mainly be determined by the farm's capital, which represents internal farm resources and access to external resources.

To capture the influence of human capital, we include the general household characteristics such as:

- an educational level beyond primary school. A low-level of human capital, in particular management ability, is found in empirical studies as an obstacle to the implementation of high standards (Okello 2005; Reardon and Timmer 2007; Asfaw et al. 2010b; Kersting and Wollni 2012). Yet, the GlobalGAP standard requires farmers to keep in-depth records of all their practices on the farm; we thus expect that more educated farmers are more likely to adopt the standard.
- experience as a farmer. The GlobalGAP standard requires high level of food safety and quality; it is hypothesized that farmer who have accumulate qualifications and build knowledge on producing mango over the years, may adopt the standard more easily. We test the experience squared as well, because we expect that older farmers (more experienced) won't, on contrary, invest in new practices for mango production.

Moreover, we take the physical capital into account by introducing farm characteristics such as:

- land under Kent mangos in 2006. Many authors argue that some stallholder-specific fixed costs of standard certification tends to cost small farmers more than their larger peers with economies of scale and lower transaction costs (Jaffee et al. 2005; Henson and Humphrey 2009; Barrett et al. 2011). Therefore, we expect that farmers with large areas of Kent mangos in 2006 were more likely to adopt the standard. Moreover they have a high incentive to adopt GlobalGAP in order to maintain their access to the EU outlet for their high amount of mangos.
- specialization in mango production in 2006 (land under mangos compared to total farm land area). Again, we expect that farmers who are more specialized in mango production in 2006, meaning that they are more dependent on mango revenue, are more likely to adopt the standard in order to maintain their access to the EU outlet.
- age of the production trees under 10 years. The quantity and quality of mangos depend on the age of the trees. We introduce this variable, which could be seen as a fixed investment, since we suppose a potential effect on GlobalGAP adoption.
- owning a mobile phone in 2006. As mango harvests are delegated to the exporter, a high level of coordination and communication is needed. We suppose that farmers with mobile phones in 2006 were more likely to adopt GlobalGAP.
- owning a car in 2006. Farmers don't have to transport mangos, nonetheless this variable should be interpreted as a proxy for the high level of the farm capital and the farmer's wealth. Yet the GlobalGAP standard requires substantial financial capital to upgrade the farm. We suppose that wealthy farmers are more able to make initial investments and to

pay for GlobalGAP certification – with the risks included (if there is no return on investment) – than others. We also integrate variables describing organizational and social capital such as:

- belonging to a producer organization. As we mentioned in the last section, producers have two options to obtain certification under the standard: either by applying individually or by applying collectively for a producer group certificate. In the case of small farmers who hold less than 20 ha, the standard adoption at the individual level seems difficult due to the fixed costs of compliance. The other option is thus that farmers organize themselves within producer organizations so as to comply collectively with standards. Moreover, forming producer groups may reduce costs at various levels (lower cost for external inspection, shared investments, and so forth) (Okello 2005; Narrod et al. 2009; Asfaw et al. 2010a; Belton et al. 2011). One could expect more positive results from GlobalGAP adoption when farmers belong to producer organizations.
- having had contracts with exporter in 2006. Annual contracts reveal confidence between producers and exporters. Since standard compliance often leads to stronger vertical coordination through farming contracts (Chemnitz 2007a; Chemnitz et al. 2007b; Maertens and Swinnen 2009; Minten et al. 2009; Asfaw et al. 2010a; Henson et al. 2011; Kersting and Wollni 2012). We expect that farmers who used to having contracts before 2006 are more likely to enter in this kind of relationship and adopt GlobalGAP.

Second, we assume that some variables referring to the market access will also determine standard adoption, such as:

- the distance to the plant. We suppose that farmers located far from the exporter plant are less likely to adopt GlobalGAP because of higher levels of transaction costs between them and exporters (less information, less confidence, and so forth). Literature underlines irregular market access (due to insufficient infrastructures or coordination problems) as a major obstacle to participating in the competitive market (Fafchamps et al. 2007; Barrett et al. 2011). Nonetheless, in our case study, this is the exporter who harvests. Therefore this variable is an exogenous variable that is more linked to the exporter's decision than the producer's one. This is a proxy of transaction costs perceived by exporter himself. In case where this variable comes statistically significant, that may reveal a selection from exporter side[5].

Each of these explanatory variables is hypothesized to *ceteris paribus* influence the probability of standard adoption. We then estimate a probit regression model to test the hypothesis concerning the determinants of the adoption decision model defined above.

[5] Contrary to Kersting and Wollni (2012), we were not able to control for the potential selection bias. However they do not find evidence for a selection bias in their model and finally calculate a univariate probit model to estimate GlobalGAP adoption, such as we do in our case study.

Data and Descriptive Statistics

Survey and Data

This empirical study was led in the framework of the European NTM-Impact Project (www.ntm-impact.eu), whose objectives include the analysis of the impacts of non-tariff measures (NTMs) from high-income countries – governmental regulations and private standards – on developing countries. Between October 2010 and May 2011, we undertook a survey of 213 mango producers in the main mango region of Piura, where over 90 percent of exported mangos originate. We focus our analysis here on small farmers with less than 20 ha and who represent 20-30 percent of mango exports and 70-80 percent of all mango producers. We randomly selected 19 villages located in Piura region where exporters' plants are found. Within these villages, producer surveys were chosen randomly among the farmers growing Kent mangos (export-oriented) with holdings of less than 20 ha (that is small farmer for whom individual GlobalGAP certification might be unprofitable). Surveys were conducted on a face-to-face basis. The data collected through the questionnaire include: household and farm general characteristics, household assets, mango production and marketing behaviour, mango standard certifications (organic and GlobalGAP), other activities, changes and perceptions since GlobalGAP has been required by exporters. This sample of 213 farmers is representative of the total small farms in Piura. Following this first wave of surveys, we found only eight percent of the sample (18 observations) which has adopted the GlobalGAP standard. To investigate the statistically significance of the determinants of the GlobalGAP adoption, we need to increase the sample of standard adopters. For this reason, a second wave of surveys was thus conducted during July 2011 among small farmers who comply with GlobalGAP. A total of 15 farmers were interviewed in this second wave. At this stage, the selection process of the whole sample (238 producers) was not random.

In addition to the farmer surveys, additional semi-structured interviews were conducted with 10 exporters and other supply chain actors (promoting agencies, state actors, leaders of producer organizations, and so forth) to collect supplemental contextual data allowing better understanding of various aspects of the mango supply chain in Peru. Finally, this primary data was supplemented with price information.

Characteristics of Farmers and Marketing Behaviors

Within our whole sample, the average farm size is 8 ha, 3.3 ha of which is dedicated to mango production (of which 85 percent is Kent mangos). All producers grow varieties for the domestic market and personal consumption (an average of 15 percent of their total mango crop surface). Some small-scale producers also grow lemons (39%), cereals (21%), and cocoa (6%). Among respondents, 80 percent say that mangos are the most important product grown in terms of cash flow. Some small-scale producers are also day laborers at other farms (13%) or have off-farm income (14%). On average, they have grown mangos since 1997, but most of them started after 2000, when exportation rose dramatically. Their distance from the nearest exporter plant is around 14 km.

From the first wave of surveys, that is the random process that led to a representative sample of small farmers in the Piura region, 31 percent of farmers surveyed have heard about GlobalGAP

certification and only eight percent are GlobalGAP certified. GlobalGAP certified producers are scarce, as one could expect for smallholders.

Thanks to the second waves of surveys, we collected data for 33 GlobalGAP adopters. In this sample of GlobalGAP adopters, the average certification date is 2009 (from 2007 to 2010). The compliance cost is US$ 2,000 per year (without any variability among respondents). The certificate is sometimes paid by the producers themselves (8%), but mostly by the exporter (56%) or a producer organization (33%). Initial investments (such as toilets, canteens for workers, water taps) are more often paid for by the producers (91%) including 15 percent of farmers who have used credit from rural credit banks. Among respondents, 76 percent have decided to follow training courses for GlobalGAP implementation offered by the INCAGRO Peru project (an organization supported by the Peruvian Ministry of Agriculture and the World Bank to promote innovation in agriculture and partnership between public and private initiatives).

Table 1 compares producer characteristics according to standard adoption, using the student *t*-test and the Pearson's chi square test.

As presented in Table 1, the average total land size of GlobalGAP adopters is significantly lower than the non-adopters. However, the average size of land under Kent mangos is significantly higher than their counterparts. Regarding volumes in 2009, there are no significant differences among the groups. One of the main characteristics of GlobalGAP adopters is that they are more specialized in export-oriented mango production (77 percent of their total land area is under Kent mango production compared to 52 percent for the others). Finally, household characteristics show that GlobalGAP adopters are more likely to be a little younger and more educated than non-adopters. Experience and family size do not show any difference between the two groups.

Among variables related to market access, the distance is significantly lower for standard adopters. As we know that harvests are delegated to exporters, this could suggest that standard compliance may be more the result of an exporter's decision rather than that of the farmer. Other variables related to relationships with buyers, such as contracts and advance payments, differ significantly: we find that 66 percent of the producers who adopt GlobalGAP rely on written contracts. Contracts and advance payments attest to close relationships with the buyers. In the case of GlobalGAP adopters, farmers are also more likely to receive technical advice from the buyer compared to the control group. Nonetheless, standard adopters' buyers are not significantly more demanding in terms of commercial quality (color and weight) than those of their counterparts. Many empirical studies describe farming contracts as a key institutional arrangement in order to support smallholder participation in private standards (Jaffee and Henson 2004; Minten et al. 2009; Asfaw et al. 2010a; Barrett et al. 2011).

Table 1. Characteristics of adopters and non-adopters: summary characteristics and statistical differences.

	Non-globalGAP (n=195)	GlobalGAP (n= 33)
Farm characteristics		
Total land size	8.3	3.8***
Ratio of land size under Kent	0.52	0.77***
Volume of mangos 2009	25	21
Household characteristics		
Age	56.2	50.8*
Education level >primary school	0.45	0.66**
Experience	15.72	13.72
Children (<15 years)	1.6	1.8
Market access and relation w/ buyer		
Distance to plant	13.9	7.7***
Works only w/ 1 exporter	0.71	0.88*
Has written contract	0.12	0.66***
Technical advice	0.36	0.87***
Advance payment	0.14	0.69***
Month is important for buyer	0.11	0.12
Color is important for buyers	0.64	0.54
Weight is important for buyers	0.54	0.54

Statistical significance at the 0.01 (***), 0.05 (**), and 0.1 (*) level of probability

Results and Discussion

Based on maximum likelihood estimations, Table 2 presents the probit estimators of the conceptual model. In our dataset, individuals adopting GlobalGAP are oversampled so that the sample mean is more than the population mean. We calculate the average marginal effects (that is the average behaviour of individuals, (Bartus 2005)) that automatically adjust for any weight used during the estimation.

The high rate of pseudo-R^2 of the probit model indicates that there is probably a threshold level capital requirement, which farmers must have in order to adopt the GlobalGAP standard and enter in this high added-value chain.

Regarding human capital component, we found that *ceteris paribus* the number of years that the farmers have been growing mangos significantly increase the likelihood that they will adopt the standard. An extra year of experience would increase the probability of adoption by almost five percent. More-experienced farmers might be more aware of business opportunities and seem to move quicker towards new high-level quality requirements. The effect of an extra year becomes smaller the longer the farmer does this activity, as shown by the significance of the squared term.

This corroborates our hypothesis that older farmers won't invest in new practices for mango production.

Regarding physical capital component, we found no evidence that having more land area under Kent mangos increases the probability of adopting GlobalGAP. However, the specialization in mango production is positively correlated to the GlobalGAP adoption. This is as expected (marginal effect of almost 10 percent), since the farmer portfolio is reduced and these farmers are more likely to adopt standards in order to maintain their access to the EU outlet. The age of mango trees is also a determinant of GlobalGAP adoption. Trees aged five to ten years have better potential in terms of mango production quality and quantity than older trees, which explains a positive effect on GlobalGAP adoption. Finally, owning a mobile phone is a strongly positively determinant to explain standard adoption (marginal effect of 13.5 percent), whereas owning a car is not significant. Indeed, according to the organization of the chain (farmer delegate harvest to exporters), communication appears more essential than transport facilities. Having a mobile phone is thus a critical capital requirement for farmers who want to adopt the standard.

Table 2. Regression Estimation Results

Dependant Variable: GlobalGAP Adoption	**Coefficient**	**Marginal**
Human capital (Household characteristics)		
Education level >primary school	0.297	4.016
Experience as a farmer	0.369**	4.953
Experience as a farmer squared	-0.009*	-0.129
Physical capital (Farm characteristics)		
Land area under Kent mangos in 2006	-0.037	-0.501
Specialized in Kent mangos in 2006	0.736**	9.898
Mango trees between 5 and 10 years old	0.655*	9.340
Own a mobile phone in 2006	0.908***	13.524
Own a car in 2006	-0.599	-7.214
Social capital		
Belong to a producer organization	0.700**	10.352
Used to having contracts in 2006	1.058***	16.973
Financial capital		
Off-farm income in 2006	0.229	3.228
Market access		
Distance to the plant	-0.171***	-2.304
Constant	-3.735**	
Pseudo-R²	0.45	
N	201	

Statistical significance at the 0.01 (***), 0.05 (**), and 0.1 (*) level of probability

Regarding the social capital component, we found that farmers who are members of a producer organization are significantly (marginal effect of 10.35 percent) more likely to adopt GlobalGAP than their counterparts. In addition, when farmers have been used to having contracts, they are significantly more likely to adopt the standard (marginal effect of almost 17 percent).

Regarding access to external resources – namely financial capital through off-farm income – were not significant in predicting GlobalGAP adoption.

Finally, at the minimum, findings on the different types of capital suggest that certification is non-random and underlines the relevance of a threshold capital requirement (experience, specialization, young mangos trees, mobile phones, producer organizations) that accounts for endogenous selection.

Otherwise, we have assumed that some variables referring to market access, such as distance to the plant, will also ceteris paribus determine the standard of adoption. Estimation results show a strong negative correlation between the distance to the plant and the likelihood that the farmer will adopt the standard. An extra kilometre of distance to the plant would decrease the probability of adoption by 2.3 percent. Since it is the exporters who manage the harvest inside the mango farms and offer contract farming to small farmers for the GlobalGAP adoption, we think that the standard compliance may be more the result of an exporter's decision rather than that of the farmer. Standard implementation may increase transaction costs and agency costs (namely moral hazard) for exporters who will thus prefer nearby farmers. In a second stage, farmers choose whether or not to adopt the standard. According to these findings, exporters might select their GlobalGAP suppliers on the basis of these latter's distance to the plant and ability to become reliable suppliers over the long term (experienced, specialized, and used to respecting contracts). These farmers must also demonstrate their ability to deliver with short lead times (presence of mobile phone, distance to the plant). Moreover, adopters comply with the support from exporters most of time but also with the support of producer organizations. According to Barrett et al. (2011), membership in a farmer organization is an observable signal that helps the firms identify the best prospective suppliers because of the technical support, the economies of scale, the reduced transaction costs, and the group enforcement mechanisms.

Exporters play thus a key role as intermediaries and organizers in agrifood value chains, by deciding who and how suppliers will meet buyers' sophisticated demands. These results have been described in others cases (Kersting and Wollni 2012). Lee et al. (2010) argue that the influence of intermediaries on smallholders is particularly important in buyer-driven and producer-driven value chains. These cases are more beneficial to smallholders compared to bilateral oligopolies, where traders may be more vertically integrated.

Conclusion

This paper is a contribution to the debates on whether international standards tend to exclude small-scale farmers from high-value food markets. Drawing on a microeconomic approach, we investigated the determinants of small-scale farmers' adoption of GlobalGAP.

Data collected through a large number of surveys with small-scale export-oriented producers (228 surveys) show three main results: First, there is evidence that GlobalGAP adoption by smallholders exists, since eight percent of the representative sample is complying with GlobalGAP. Second, exporting companies support these farmers in complying with the standard through farming contracts, technical advice, and by paying the annual certification costs. This support allows small-scale producers to be included in the lucrative international market.

Therefore, while Kleinwechter and Grethe (2006) have shown previously that GlobalGAP-certified exporter companies tend to increase the vertical integration of the mango production, we observe nowadays that a mixed picture of their mango supply exists thanks to contract farming, allowing the integration of small-scale farmers into the high standard market. Consistent with other outcomes (Henson and Jaffee 2008; Lee et al. 2010), our results show that GlobalGAP standard doesn't act as a barrier for all the smallholders. Their inclusion depends thus on the exporter's support. Third, nonetheless, farmers who are integrating into this supply chain seem to be selected according to two characteristics: they are more specialized in mango production (more than 80 percent of their land) and they are located closer to the exporter plant. Exporters may thus decrease transaction costs by selecting productive farmers close to their plants.

This study aimed thus to contribute to the analysis of the conditions under which small-scale farmers are more likely to comply with a voluntary food standard. The latter is of interest to policymakers since Peruvian agriculture is a still source of economic development and represents a large source of employment. Adoption or not of growing international standards in different agricultural sectors is very important to analyse in order to develop adapted policy recommendations and support for farmers. However, the question is whether policymakers can do anything to facilitate the compliance of smallholders with new sustainable standards. While our results highlight that private firms may assist small capitally constrained and financially distressed farmers to adopt standard, we also agree with Cock et al.(2003), arguing that this assistance could be provided by third party facilitator, such as public aid agency. These authors have shown that the establishment of an integrated approach of assistance by public aid agency, covering product quality improvement program, product management, credit, leadership development, training in collective governance, and accountability, may allow groups in expanding ability of sustaining long term credible exchange relationships among producers and between producers' organisation and exporters. Furthermore, others authors have shown that donors and development countries' governments have identified the need for assistance and support of public-private partnerships with exporters (Humphrey 2008; Bignebat and Vagneron 2011; Kersting and Wollni 2012). For instance, to ensure to spread smallholders' compliance with international standards, the development of the public guidelines for good agricultural practices by product and the definition of a clear direction for technical assistance and support programs for small-scale farmers may be key elements of success (Jaffee and Henson 2004).

Finally, to pursue this analysis further, it would be interesting to measure the income and poverty effects of such high-standard trade (or even labour market effects) on small-scale farmers. Nonetheless, to do that, we would need to go back to the very date of standard adoption by farmers (it requires at least a whole year to register the short-term effects on price and income). In addition, more consideration must been given to analyse how industry structure and institutional environment of a given country affect the implementation of compliance with private standards.

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