UNDERSTANDING THE MARKETING CHAIN: A CASE STUDY OF CERTIFIED AND NON-CERTIFIED GRAPES AND MANGO FARMERS

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ABSTRACT: *The fresh fruit marketing system is increasingly focused on adding value and decreasing costs by streamlining distribution and understanding customer demands. This paper aims to understand the grapes and mango marketing chains and to evaluate the contractual arrangements between buyers and farmers. It also proposes an analysis of the type of governance used in this value chain regarding the characteristics of their transactions. A survey of 303 grapes and mango farmers was conducted in 2006 in the Juazeiro and Petrolina regions of the Sao Francisco Valley in Brazil. The results show that coordination in the supply chain of mango and grapes and the degree of vertical coordination is increasing through certification. Certified farmers, regardless of the fruit, have a shift from market-based global value chains governance to more explicit coordination.*

KEY WORDS: *mango, grapes, contract, marketing chain*

1. INTRODUCTION

Fruit and vegetable sectors are seen as sectors where small producers are able to participate due to their low demand on land and their high labour requirements. However, the concern is that small producers' participation in the international fruit and vegetable trade could be diminishing as a result of the increasing prevalence of food quality standards in the sector (Ponte & Gibbon, 2005).

Implementing certification and entering certified markets have complex impacts on the economic performance of a farm. Production costs, yields and producer prices may each be affected positively or negatively by certification and have to be analyzed together. Furthermore, initial investment costs are likely to be very farm-specific (FAO, 2004).

USAID (2005) argues that for some producers, standards may open new opportunities as they permit access to particular market segments. At the same time,

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the process of (re)distributing market shares is accompanied by marginalization and exclusion, as standards may impose prohibitively high barriers on certain producers in terms of short-run and long-run efforts needed for production under certification. This is particularly relevant since certification with private standards has become a major requirement for participation in the fruit and vegetable markets worldwide.

Since fruits are perishable, disastrous quality losses can occur at any stage in the marketing chain from grower to consumer and the total value of the product may be lost. Hence, every activity in the production and marketing chain of fruits must be precisely timed (Jensen & Rorabaugh, 2007). The White Paper on Food Safety of the EU (2000) highlights that food safety needs to be organized in a more coordinated and integrated way, i.e. along the chain (farm to table), across all food sectors, within and beyond the frontiers of the EU.

Brazil is the third largest fruit producer in the world after China (161 million tons) and India (58 million tons), growing more than 35 million tons of fresh fruit on an area of 1.8 million ha in 2004. Orange and banana production represents around 70% of both the total volume and of the land planted with fruits in the country. Grapes, mango and melon production makes up around 7% of the whole volume. The main fruits designated to international markets are apples, mangoes, melons and grapes, responsible for nearly 60% of the country's total revenue. However, comparing the total production and exports figures, it is found that the share of fresh exported fruits in 2004 amounted to only 2.4% of the total production in volume terms (IBRAF, 2005).

The European Union is the main importer of almost all kinds of fruits from Brazil. Almost all melons, grapes, apples and oranges were exported to the EU from 2003-2005. Also mango exports to the EU were significant with increasing shares between 2003-2005. Banana and cashew nuts exports are less important. In comparison with the EU, the United States did not import any melons, apples, oranges and bananas, but they imported mangoes [23%] and grapes [11%] with the latter showing increasing rates from 2003 to 2005. Putting the figures of the EU and the US together, it can be found that most of the Brazilian fruits' exports are designated to them (Aliceweb, 2007).

Grapes and mango exports have been the most successful cases, with around 260,000 tons and 550,000 tons each being cultivated. The regions of Petrolina and Juazeiro, which are part of the Sao Francisco river basin, is responsible for this export performance. This region produced 99% and 88% of the country's grapes and mango exports (IBRAF, 2004). VALEXPORT (2006) estimates that the sector generates a total of 240,000 jobs directly and 960,000 jobs indirectly in the region.

The objective of this study is to understand the marketing chains and to evaluate the contractual arrangements between buyers and farmers. The paper proceeds as follows: after this introductory section, recent studies will be reviewed in the second section. Section 3 presents the theoretical background and Section 4 presents the primary data base. Section 5 presents the results which will be followed by a final Section 6 with the main conclusions.

2. LITERATURE REVIEW

The rising competition in the fresh fruit industry and the need to meet norms and standards related to e.g. product characteristics, the production process and its impact on food safety and on the environment has meant a changing relationship between growers and buyers. The alternative strategies of buyers like supermarkets include formal and informal contracts directly with farmers and the establishment of their own distribution centres, which allow them greater leverage in forcing their quality and safety norms and standards (Farina, 2002). The compliance on the producers' side is driven by the demand of supermarkets on: varieties, production methods, post harvesting technologies, packaging and labelling specifications, and acceptable environmental impacts and working conditions. The global value chain analysis emphasizes that local producers learn significantly from global buyers on how to improve their production processes in order to attain consistent high quality and to increase the speed of response (Humphrey & Schmitz, 2002).

The banana market structure is for example very heterogeneous, depending on the producing and importing countries. The presence of diverse economic actors is also different among countries and regions at the several stages of the banana chain. Due to high perishability, bananas require a careful control of the growing, packaging, transport, ripening and distribution process. This leads to a highly vertically integrated banana sector, where large transnational companies tend to control from direct growing of bananas in producing countries, through ownership of specialized refrigerated shipping and ripening facilities to distribution networks in importing countries. An analysis of the banana marketing chain reveals that companies face the challenge of an increasing role that is being played by supermarkets and retail chains in the distribution of bananas in developed countries, mainly in the US and the EU. Supermarkets tend to build long-term relationships with preferred suppliers in order to guarantee a continuous supply at the required level of quality (United Nations Conference on Trade and Development UNCTAD, 2007).

In another study UNCTAD (2007a) develops the international citrus marketing chain. International trade in the fresh citrus fruits sector is characterized by a reduced degree of concentration of supply with a multitude of medium-sized firms providing the fruit. On the contrary, orange juice trade is highly concentrated. A small number of companies that operate in Brazil and Florida dominate the market. The major supplier of orange juice in the world is Brazil, followed by the US. The most significant players in the distribution channels for orange juice and fruit juices are the global retail chains, responsible for more than 80% of the total exports to Europe.

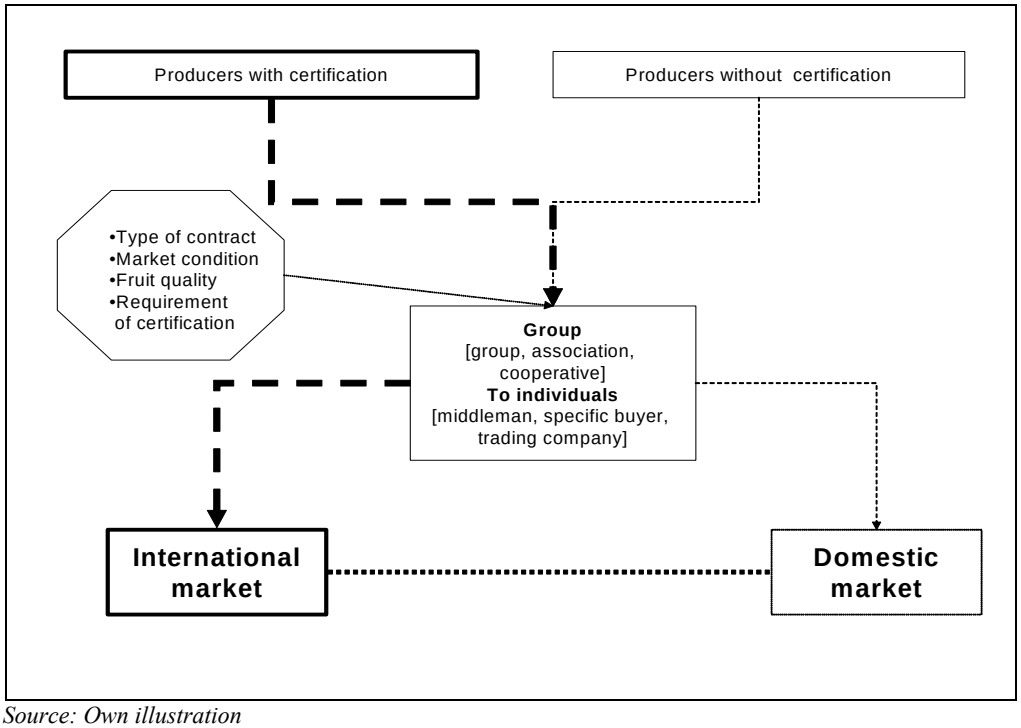
Cueller (2003) aims to identify challenges faced by retailers in different marketing specificities in the US market. The study reveals that the key issues in the marketing of imported fruits and vegetables among retailers are food safety assurance, transportation cost reduction and quality improvement. Further, the key issues in marketing include improving packaging, adding value to products and assuring food safety.

3. THEORETICAL BACKGROUND

3.1. Conceptual of the marketing chain

An analysis of marketing channels and upgrading strategies for fresh fruit shows how the development of niche markets for high-value produce creates new opportunities for developing countries' producers and exporters that can meet the required standards. New marketing channels have opened up as a result of a combination of changing consumer tastes and the increasing dominance of large retailers in the markets of industrialized countries. The identification of opportunities for adding value and the development of strategies to take advantage of them are based on an analysis of the changing governance structures of food value chains (UNCTAD, 2000).

The framework presented in Figure 1 aims to facilitate the understanding of the marketing chain process of non-certified and certified producers in the fruit sector. Certified farmers are more likely to have access to international markets and non-certified ones are more likely to sell the fruit production in the domestic market. Farmers can either trade with groups, associations and cooperatives or with individual buyers, who sell the fruit production in the domestic market.



Source: Own illustration

Figure 1. Conceptual framework on the marketing chain for certified and non-certified producers

However, farmers who expect to export, may trade their fruit in the domestic market in case of a non-favourable situation; such a situation is given if there is a lack of quality caused by bad-crop formation, disease or climate conditions. Non-certified farmers are also vulnerable to those factors. However, non-certified producers may also export directly or indirectly to international markets. Directly occurs when they export via a trading company and indirectly, when they sell the fruit production to the middleman who repack and export.

Entering new export markets could be considered a major challenge for many firms in developing countries. New skills and knowledge are demanded, mainly related to bureaucratic procedures, national standards and procedures, marketing channels and consumers' tastes. Upgrading could facilitate and promote competitiveness to access those markets.

The value chain literature focuses on the role of global buyers and chain governance in defining upgrading opportunities. Humphrey & Schmitz (2000) use the concept of upgrading to refer to three different shifts that firms might undertake. First, process upgrading: firms can upgrade either through transforming inputs into outputs more efficiently by re-organizing the production system or introducing superior technology; second, product upgrading: firms can upgrade by moving into more sophisticated product lines and third, functional upgrading: firms can upgrade by higher value added. Kaplinsky & Morris (2002) added a fourth case, intersectional upgrading: where firms can upgrade by moving out of a chain into a new one.

3.2. Value chain approach

The concept of governance "[…] is central to the global value chain approach […] the concept is used to refer to the inter-firm relationships and institutional mechanisms through which non-market co-ordination of activities in the chain takes place. This coordination is achieved through the setting and enforcement of product and process parameters to be met by actors in which developing country producers typically operate" (Humphrey & Schmitz, 2001:3). The authors use the concept of governance "to express that some firms in the chain set and/or enforce the parameters under which others in the chain operate. A chain without governance would be a string of market relations" (2001:4).

The determinants of governance presented by Humphrey & Schmitz (2000:6) are: arm's length market relations [buyer and supplier do not define the product; no long term relationship and the buyers' and producers' risks are low]; networks [the buyer and supplier define the product specifications together; the buyers' risk is minimized because of the suppliers' high level of competence]; quasi-hierarchy [high degree of control from buyers over suppliers; the former define the product] and hierarchy [buyers control the supplier production process]. The authors suggest that quasi-hierarchy is more likely to occur where global value chains frequently link producers in developing countries and retailers in developed countries.

Similarly, Keesing & Lall (1992) argue that producers in developing countries are expected to meet requirements that frequently do not apply to their domestic market. For instance, this creates a gap between the capabilities required for the

domestic market and those required for the international one. This gap is widened when the buyers require consistent quality and supply, creating two reasons for quasi-hierarchical governance. The first refers to monitoring and control which might be required to ensure that products and processes meet the required standards. The second reason, in case the gap needs to be closed quickly, is that buyers will need to invest in a few selected suppliers and help them to upgrade. Mostly buyers have a higher interest in suppliers according to their relationships.

Gereffi, Humphrey & Sturgeon (2005:83) propose a more complete typology of value chain governance, divided into five types: (i) markets: market linkages can persist over time with repeated transactions - the cost of shifting the partner is low for both; (ii) modular value chains: suppliers make the products according to the customers' specifications, detailed more or less by the former; (iii) relational value chains: complex interactions among buyers and sellers, often creating mutual dependence and a high level of asset specificity; (iv) captive value chains: small suppliers are transactional dependent on larger buyers, characterized by a high degree of monitoring and control by lead firms, and finally (v) hierarchy: characterized by vertical integration.

In the same study, the authors develop a theory of value chain governance based on three factors: (i) the complexity of information and knowledge required to sustain a particular transaction with respect to product and process specifications, (ii) the extension in which knowledge and information are codified and transmitted efficiently, and (iii) the capabilities of actual and potential suppliers regarding the requirements of the transaction.

4. DATA AND METHODS

A survey of 303 farmers was conducted between July and October 2006 in the Sao Francisco Valley, on the surroundings of Petrolina (state of Pernambuco) and Juazeiro (state of Bahia) in Brazil. The two-stage stratified sampling technique was applied as outlined by Levy & Lemeshow (1999). The first stratum included small[1] (<12 ha), medium (>13 and <49) and large producers (>50 ha) in both regions. The final step involved the identification of producers with certification, the ones without certification and those in the process of becoming certified. A total of 18 strata were identified (Table 1).

To ensure that this sample population could yield significant results from econometric analysis, a statistical power analysis was made to determine the sample size, whereby expected effect size, i.e. expected differences of means of two populations or the alternative hypothesis, can be detected with a certain power and significant level. This approach requires information on population means (μ) and standard deviation (σ) based on lists of producers. The sample size of each stratum was calculated using the program Russlenth[2].

[1] Definition of land size according to SEBRAE of Petrolina
[2] Available on the website: http://www.cs.uiowa.edu/~rlenth/Power/ (Accessed on August 2006)

Table 1. Population and sample sizes of the producers in Juazeiro and Petrolina

Type of producer		Population			Sample size		
Farm's land size	Certification	Juazeiro Farmers	Petrolina Farmers	Total population	Jua/Petro Farmers	%	Total sample size
Small	Without	587	2799	2212	90	39.0	120
	In process	30	149	119	30	13.0	59
	With	0	91	91	30	13.0	30
Medium	Without	4	58	54	30	13.0	34
	In process	4	67	63	30	13.0	34
	With	0	20	20	20	8.7	20
Large	Without	1	1	0	0	0.0	1
	In process	0	1	1	1	0.4	1
	With	4	24	20	0	0.0	4
Total		630	3210	2580	231	100	303

Source: Own compilation based on the list of producers

5. DISCUSSIONS AND RESULTS

A total of 155 mango and grapes surveyed farmers (51%) have no certification, those in process comprise 94 (31%) and those who are already certified comprise 54 (18%). Some descriptive results are presented, followed by discussions on the marketing chains.

5.1. Descriptive statistics

A. Socio-economic factors. The survey collected data regarding socio-economic characteristics of mango and grapes producers, including age, gender and level of education. With respect to age, it was found that the producers are on average 49 years old. It was expected that the ones who have adopted certification would be younger than the non-certified producers since they might be more open to new technologies or practices (D'Souza et al., 1993). However, there is hardly a difference between the two groups: certified producers were on average 48.8, while non-certified ones were 50.5 years old. Thus, the expected result is not supported by the data. Similarly, it was expected, that producers who are certified would have more years of schooling and long-term experiences in growing fruits than the non-certified ones. However, the results show that on average certified and non-certified producers have both 7.7 years of schooling. The farmers in process have the highest level of education with 10.2 years of schooling. The figures on the years of experiences show that certified producers have on average 7.3 years of experience in grapes and 9.2 years in mango production while the non-certified producers have only 5 years and 7 years, respectively. While the years of schooling do not seem to influence the decision to adopt certification, the years of experience do.

The data show that mango and grapes were the main source of income for 91% of the certified producers, for 80% of the producers in process, and for 75% of the non-certified producers. Apart from producing mangoes and grapes, farmers are also involved in the production of other tropical fruits such as coconuts, guava, melons,

banana and papaya (15% of non-certified producers and 2% of certified ones). This result reflects the high dependence of the producers on fruits in general, but also indicates a stronger trend towards specialization for certified producers.

B. Characteristics of the farms. A comparison of the mean values between the groups clearly indicates that certified mango and grapes farmers have much more land (100 ha and 93 ha) and more irrigated area (40 ha and 29 ha) compared to non-certified (Table 2). Indeed, an irrigation system is necessary for fruit production in the surveyed region. There are two types of irrigation systems: the drip and micro sprinkler which are considered very sophisticated while furrow and conventional sprinkler are less sophisticated. The study reveals that most of the certified farmers use very sophisticated irrigation systems (83%). However, also a high percentage of the non-certified farmers have very sophisticated systems (59%).

Table 2. Farm characteristics of mango and grapes farmers

Variables	Non-certified N=155		Producers in process N=94		Certified N=54		
	Mean	Std. deviation	Mean	Std. deviation	Mean	Std. deviation	Ch^2, t test
Mango							
Land size (ha)	20.0	66.8	18.2	27.2	101.0	299.1	0.003***
Irrigated area (ha)	10.3	10.1	11.7	21.8	39.8	86.1	0.000***
Yield (tons per ha)	19.3	8.9	20.4	9.3	25.9	9.6	0.003***
Total income (R$)	125,263	187,526	141,236	219,134	1,215,991	3,434,017	0.000***
Income (R$/ha)	17,050	21,095	8,325	5,839	10,076	8,960	0.000***
Production costs (R$)	58,314	79,995	62,831	98,081	463,108	1,279,293	0.000***
Costs (R$/ha)	7,965	3,601	7,631	3,897	11,814	4,390	0.000***
Total net income (R$)	67,048	123,327	78,405	124,005	752,882	2,171,144	0.327
Net income (R$/ha)	9,085	21,095	8,325	5,839	10,076	8,960	0.887
Grapes							
Land size (ha)	34.7	113.5	8.2	3.1	93.5	304.9	0.194
Irrigated area (ha)	14.4	35.6	6.3	4.1	28.9	77.1	0.198
Yield (tons per ha)	16.3	10.5	17.9	7.9	22.9	8.5	0.014***
Total income (R$)	188,878	450,182	348,396	269,089	606,227	861,867	0.006***
Income (R$/ha)	28,947	20,279	31,513	13,917	42,748	21,177	0.016***
Production costs (R$)	89,279	156,313	160,348	110,438	324,250	485,235	0.083***
Costs (R$/ha)	16,249	8,779	15,666	7,222	22,612	10,049	0.005***
Total net income (R$)	99,598	297,713	188,048	161,734	281,977	456,505	0.012***
Net income (R$/ha)	12,698	14,129	15,847	8,788	20,145	15,288	0.085***

**** Statistically significant at 1% level;** at 5% level; * at 10% level*
Source: Own compilation

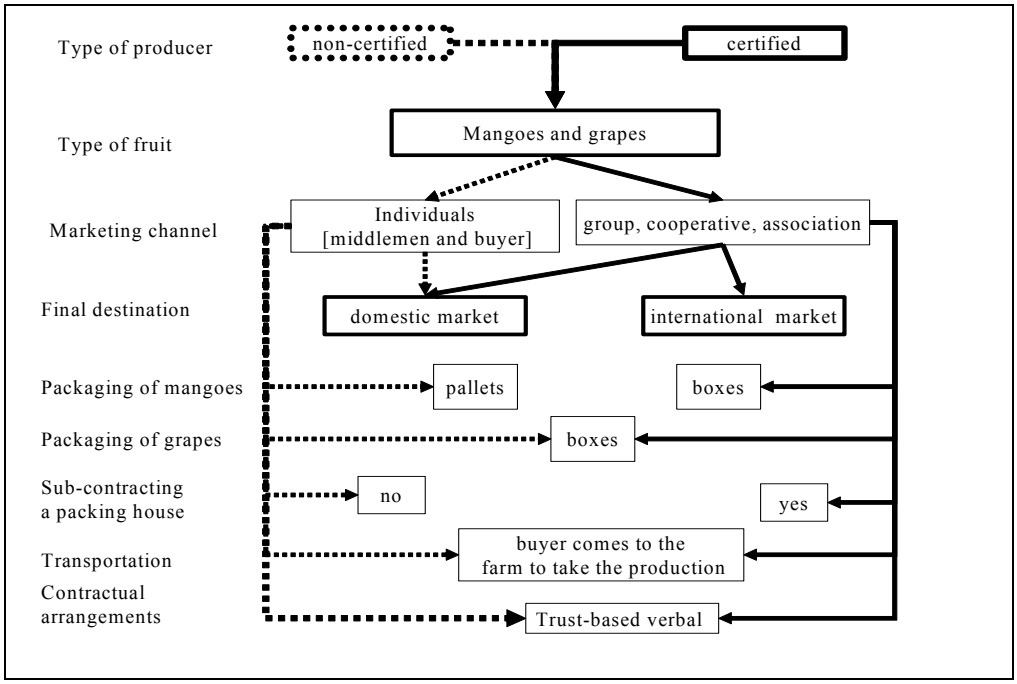
The type of used irrigation system plays an important role with respect to the productivity of the farm. The results show that mango yields on average amount to 19.3 tons per ha for non-certified producers, 20.5 tons per ha for producers in process, and 25.9 tons per ha for certified producers. Concerning grapes, the productivity for non-certified producers is nearly 16.3 tons per ha, while for those in process and for the certified ones, 18 and 23 tons per ha are achieved. Thus, certified farmers achieve in the given sample higher yields than non-certified ones. But they also have relatively

higher net income. Regarding the average net income of grapes farmers, it was found to be around R$12,700[3] per ha for non-certified farmers, R$15,850 for those in process and R$20,150 for the certified ones. Concerning mango farmers, the average net income is approximately R$9,000 for non-certified farmers, R$8,300 for those in process and R$10,100 per ha for the certified ones[4].

5.2. Marketing chain analysis

An analysis of the marketing chain identifies major agents and the transactions between mango and grapes farmers and buyers. In general, an investigation of the functioning of the trading process in both fruit sectors may contribute to a better understanding of the functioning of the whole sector. A differentiation is again being made between farmers who are certified and those who are not.

Figure 2 shows the respective marketing chains relevant in Brazil. Basically producers of grapes and mangoes have two options: either they sell to individuals (specific buyers, middlemen, exporting company) or to a group (group or association of producers, cooperative).



Source: Own compilation

Figure 2. Marketing chains of grapes and mangoes

[3] 1US$ = R$2 at the time of data collection

[4] The total income refers to the fruit production only, however other income sources were found to be negligible.

Around 92% of the non-certified and only 4% of the already certified farmers reported selling to individuals. Nearly 96% of the certified producers belong to a group, cooperative or association exporting mainly to the international market (Tab.3).

Table 3. Description of the variables on marketing chain

Description of the variables	Producers		Chi²
	Cert.	Non-cert.	Sig.
Selling to individual buyers (in %)	3.7	92.4	0.000***
Selling to a group, cooperative or association (in %)	96.3	7.6	0.000***
Years of trading with the buyer/cooperative (mean values)	3.2	6.5	0.000***
Mangoes			
Selling to individual buyers (in %)	6.9	91.8	0.000***
Selling to a group, cooperative or association (in %)	93.1	8.2	0.000***
Years of trading with the buyer/cooperative (mean values)	3.4	6.9	0.000***
Grapes			
Selling to individual buyers (in %)	6.9	89.4	0.000***
Selling to a group, cooperative or association (in %)	93.1	10.6	0.000***
Years of trading with the buyer/cooperative (mean values)	3.9	4.7	0.000***
Certified [n=54] and non-certified producers [n=249]			
*** Statistically significant at 1% level;** at 5% level; * at 10% level			

Source: Own compilation

The reasons leading non-certified farmers to trade with individuals are explained by the fact that there is no other possible buyer. The certified producers selling to groups perceived this as an advantage because first, they have assurance that their products would be sold (89%) and second, they follow the recommendation of EMBRAPA, SEBRAE or other organizations (41%).

Furthermore, the analysis also considers the number of years that the producers have been trading with buyers. The non-certified producers have been operating with their respective buyers for an average of 6.5 years, while the certified ones have an average of only 3.2 years.

There are differences with respect to packaging, post-harvesting and contractual arrangements between certified and non-certified producers which will be further analysed in the following.

5.3. Harvesting process

Maturity is one of the main factors determining the quality of a product. Post harvest technologies deal with separation, sampling, sizing, and sorting as well as with grading. The fruit sector is unique due to its high perishability (Irtwange, 2006). For Newman (2007), one of the constant challenges fruit growers face is to ensure that the production reaching consumers is of a consistently high quality. Therefore, determining when to harvest fruit to sell or long-term storage plays an important role in successful post harvest crop management.

The marketing standards of mangoes (*Mangifera indica L.*) and grapes (*Citrus paradise Macfad.*) are presented by the Europe Fresh Quality Guide (2007) according to the United Nations Economic Commission for Europe (UNECE). The standards

include its definition, minimum requirements, developments and conditions, classification, sizing by weight, presentation, contaminants and hygiene.

Considering the specificities of each type of fruit, the harvesting process can be done using plastic or paper boxes, or pallets. Fruits handled in boxes are supposed to be better preserved while fruits packed in pallets have to be repacked again and this process may damage the product. Nevertheless, sometimes when fruits are sold in pallets to local markets [short distances], they are repacked in boxes for international markets or for transport over long distances in the domestic market.

As Table 4 shows, harvest of grapes is done using paper and plastic boxes by 100% of producers with certification and around 77% of the non-certified ones. Mangoes have been packed in pallets by 94% of the non-certified producers, while 93% of the certified producers use paper and plastic boxes.

Table 4. Description of the variables on post-harvesting

Description of the variables	Producers		Chi², t test
	Cert.	Non-cert.	Sig.
Grapes			
Post-harvesting of grapes is done using paper and plastic boxes (in %)	100.0	77.3	0.000***
Use of a subcontracted packing house for post-harvest handling (in %)	75.9	4.5	0.000***
Buyer transports the fruit (in %)	79.3	100.0	0.000***
Mangoes			
Post-harvesting is done in using paper and plastic boxes (in %)	93.1	3.6	0.000***
Use of a subcontracted packing house for post-harvest handling (in %)	96.6	11.8	0.000***
Buyer transports the fruit (in %)	79.3	98.5	0.000***
Certified grapes producers [n=29] and non-certified grapes producers [n=66]; certified mango producers [n=29] and non-certified mango producers [n=195] *** Statistically significant at 1% level;** at 5% level; * at 10% level			

Source: Own compilation

Further, producers have mainly two options with respect to the post-harvest procedure: either they sell the production directly to the buyer after harvest or utilize a packing house. Producers, who do not have their own packing house, may decide to utilize one from the group, cooperative or association. The advantages of using a packing house are technical (keeping the fruit stored in suitable conditions and temperature in order to maintain the fruit quality) and managerial (producers are less vulnerable to climate shocks and market fluctuations and are able to settle better negotiations through market opportunities). The findings highlight that nearly 97% of the certified producers of mangoes utilize a subcontracted packing house for post-harvest handling compared to 76% of certified grapes producers. In contrast, about 88% and 95% of non-certified mangoes and grapes producers reported that they do not subcontract a packing house, i.e. the fruit is sold directly after being harvested. Some producers decide to transport the products to the respective buyer using their own means of transport, while others wait for the buyer to collect the products at the farm gate. The survey shows that regardless of the fruit and of certification, the buyer comes

with a truck to collect the fruit at the farm. This is true for about 80% of the certified and almost 100% of the non-certified producers. It means that farmers are not responsible for the transportation having lower transaction costs but maybe also receiving lower prices. Choosing the most efficient post harvest system is also closely connected with the contractual arrangements, which will be discussed in the following section.

5.4. Final destination of the fruits

Table 5 presents results on the final destination of the grapes and mangoes production. With respect to non-certified producers, they almost all mention that their mangoes and grapes are sold on the domestic market. However, most of the producers are not aware of where the fruit is sold to after the gate. Thus, it is possible that the fruits are repacked and exported without the producers knowing about it. Certified farmers provided information on the destination of their fruits for the periods before certification and after certification. Interestingly, the percentage of farmers saying that their fruits are sold on the domestic market is lower than that of non-certified farmers: 48% of grapes farmers and 68% of the mango farmers indicate that their fruits were sold on the domestic market because they obtain certification. After having obtained certification, the shares decreased: only 22% of the grapes farmers and 20% of the mango farmers say that their fruits are sold on the domestic market.

Table 5. Details on grapes and mango exports in 2005, percentage of the total volume

Description of the variables (mean value in percentage)	Certified		*Non-certified*
	Before certifying	**After certifying**	**Current**
Grapes			
Domestic Market	48.0	22.0	92.3
US	31.0	20.7	3.2
Europe	20.6	54.0	3.8
Other	0.4	3.3	0.7
Total	100	100	100
Mangoes			
Domestic Market	67.8	20.0	93.3
US	15.3	28.7	0.7
Europe	16.3	49.5	5.1
Other	0.6	1.8	0.9
Total	100	100	100
Certified grapes producers [n=29] and non-certified grapes producers [n=66]; certified mango producers [n=29] and non-certified mango producers [n=195]			

Source: Own compilation

The data also reveals that the importance of the European market as a final destination increased for both grapes and mango producers after certification. The number of certified farmers mentioning Europe as a final consumer market almost tripled over time. The role of the United States is also important as a final market for Brazilian fruits, however, the share of grapes farmers mentioning the US decreased by 30%, while that for mangoes almost doubled. The importance of the other countries as

final destinations is almost negligible, although they slightly increased for certified farmers when comparing before and after certification. The shift of export flows might be explained by the introduction of GlobalGAP, being an initiative of European retailers. However, also other factors like transport capacities or trade agreements may play a role.

5.5. Contractual arrangements

Producers of fruits and vegetables operate in an unusually risky economic environment. While these farmers face the same sort of production risk common to other agricultural products, they also produce a perishable commodity whose price is subject to large fluctuations. Ligon (2001) points out that one important practice which helps to shield fruit and vegetables producers from price and production risk are contracts. The author emphasizes the importance of written contracts between the producer and the first handler, or intermediary who takes hold of the fruit.

In this study, the contractual arrangements between producer and buyer can be divided into three categories: written contracts; trust-based verbal contracts[5]; and verbal contracts only. As Table 6 shows, 87% of the certified farmers reported dealing with the buyer through a trust-based verbal contract. The remaining 13% even have a written contract. With respect to the non-certified producers two third (about 73%) have a trust-based verbal contract. A written contract was given only in 3% of the cases. The remaining 24% indicate to have a verbal contract only.

Table 6. Description of the variables on contractual arrangements

Description of the variables	Producers		Chi², t test
	Cert.	Non-cert.	Sig.
Both mango and grapes			
Verbal contract with trust (in %)	87.0	73.5	0.015**
Verbal contract (in %)	0.0	23.3	0.000***
Written contract (in %)	13.0	3.2	0.008***
Only mangoes			
Verbal contract with trust (in %)	95.6	72.8	0.000***
Verbal contract (in %)	0.0	23.6	0.001***
Written contract (in %)	3.4	3.6	0.723
Only grapes			
Verbal contract with trust (in %)	75.9	69.7	0.345
Verbal contract (in %)	0.0	24.2	0.002***
Written contract (in %)	24.1	6.1	0.017**
Certified grapes producers [n=29] and non-certified grapes producers [n=66]; certified mango producers [n=29] and non-certified mango producers [n=195]			
*** Statistically significant at 1% level;** at 5% level; * at 10% level			

Source: Own compilation

Analyzing the type of contract by fruit, the study shows that written contracts are much more often given to grapes farmers, especially the certified ones. Only 4% of

[5] The verbal contract based on trust relates to settlements between producer and buyer after a certain number of successful negotiations.

the mango farmers receive a written contract, but most certified mango farmers indicate to have a trust-based verbal contract, compared with only 73% of the non-certified producers.

A deeper analysis of the contractual clauses may provide a better understanding of the characteristics of the transactions. The analysis below tries to illustrate the contractual arrangements between mango and grapes growers and their respective buyers (Table 7). The analysis relates to the verbal trust-based agreement. Farmers who deliver their fruits to a middleman or exporter indicate that they had eleven negotiations, while those who sold to a group or cooperative had only four negotiations. Interesting is the result that all groups or cooperatives pay in cash, while 15% of the individual buyers pay in rates and 16% do not pay at all. Thus, the farmers are better off when selling to a group or cooperative. However, a group or cooperative is more likely to set the price while the producers selling to individual middlemen or exporters have a little more flexibility in negotiating the price.

Table 7. Contractual trust-based arrangements

Details of the negotiation (mean value)	*Verbal trust-based*	
	Individuals (N=189)	**Group/cooper. (N=47)**
Number of trading relations	11.0	4.0
Payment in cash (in %)	74.6	100.0
Payment in rates (in %)	15.3	0.0
Non-payment cases (in %)	16.4	0.0
Price determined by the buyer (in %)	34.4	95.7
Price determined by the producer (in %)	92.6	2.7
Buyer is not flexible in the negotiations (in %)	92.1	97.9

Source: Own compilation

6. CONCLUSION

The findings of the grapes and mangoes marketing chains reveal that certified producers generally trade with groups, cooperatives or associations while non-certified farmers trade with individual buyers. Groups, associations or cooperatives are responsible for the collection of the production at the farms, for storage, classification and transportation to the final buyer. In addition, they trade and settle contractual agreements with international buyers. These results show that certified farmers have achieved a higher level of coordination and vertical integration along the chain. On the contrary, the majority of the non-certified farmers trade directly with individual buyers.

The types of governance have been used to illustrate the way power operates in the fruit value chain. On the one hand, non-certified farmers of grapes and mangoes operate in the market-based global value chain. On the other hand, the results reveal that certified farmers, regardless of the fruit, shift from arm's-length market to quasi-hierarchical relationships attributed mainly to a high level of asset specificity, i.e. a shift from market-based global value chain governance to a relational value chain. This is achieved through a close dialogue between more or less equal partners with a more explicit coordination, which shows the importance of the competitive strategies such as certification in driving changes.

The reasons motivating farmers to vertically integrate are the reduction in transaction costs resulting from the economies of scale and the need to ensure consistent quality supply through the adoption of certification. The low number of certified mango and grapes farmers in the Petrolina/Juazeiro region compared to the number of farmers harvesting fruits, indicates that the fruit sector has a huge potential to grow and expand. Targeted support from the government and private sector will likely contribute to an increased competitiveness of the fruit sector.

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