

GLOBAL CHAIN OF MELON PRODUCTION: a study of the value added in the melon produced
in the Brazilian region of Açú-Mossoró

PENHA, Thales Augusto M.¹

BELIK, Walter²

MATOS FILHO, João¹

OLIVEIRA, Guilherme Medeiros³

SUMMARY

This paper aims at identifying the contribution of the production factors in the final value of the melon produced in the Açú-Mossoró area in the international market, as well as in the local market. The methodology adopted was to measure the contribution margin; this method allows the measurement of the contribution of each relation and production factor in the final price of the product in the markets. The data of the production costs were gathered from the Brazilian publication *Agriannual*, which revealed the production costs of the melon produced in the Polo Açú-Mossoró. The analysis of the commercialization of domestic market utilizes the annual average price per kg of melons sold in Brazil to determine the margins and how much is added at each stage. In turn, the analysis of the international market was more complex, where it was assessed the margins of freight, insurance and tariffs on melons sold in the UK market. From the analysis of export values, it was possible to register the actual amount being received by the producer and therefore establish the share of operations in the production of melon. It was observed that workers get a small portion of the final value of the marketed products. However, these values vary among markets. Also, another important factor identified is the margin difference of the melon sold in natural and semi-processed in the British market.

KEYWORDS: Value Added. Melon production chain. Melon Markets. Melon Production Structure

1. INTRODUCTION

Melon production is one of the most important economic activities of the state of Rio Grande do Norte, located specifically in the western region of the state. This production began in the mid-1980s and always had the international consumers as the main marketing channel. This fact lifted Brazil to be one of the five largest exporters of the fruit in the world, according to FAOSTAT data (2015).

However, in the recent years the Brazilian domestic market has shown a significant expansion of the *per capita consumption* of fruit. This is due to an increasing of the general income, as shown by Hoffmann studies (2003 and 2007). Over the years, Polo Açú-Mossoró in Rio Grande do Norte has led the domestic production. Yet, this area suffered several production transformations in the last two decades. In the mid-1990s, there was a technological intensification process combined with a new institutional environment. This new environment was originated from reforms in the Brazilian economy that reduced the amount of agricultural funding and imposed new regulations as a more rigorous supervision of the labor conditions in agriculture. These changes had

¹ Professors of the Department of Economy of the Federal University of Rio Grande do Norte (UFRN)

² Professor of the Institute of Economy in the State University of Campinas (Unicamp)

³ Graduated in Economy

an impact on the mode of production and coordination of labor relations. Case in point, the introduction of the direct wage negotiations between employers and rural workers' unions, a process that occurred concomitantly with technological intensification (OLIVEIRA, 2011).

Though the melon produced in Rio Grande do Norte has a strong presence in international trading, more recently, it has expanded the trading volume in the domestic market. It is necessary to understand how the costs and margins operate in these different markets, considering these recent changes. Thus, the following questions should come up: How does the process of adding value work throughout the melon production chain existent in Polo Açu-Mossoró? What links in the production chain are taking up most of the value generated within the chain?

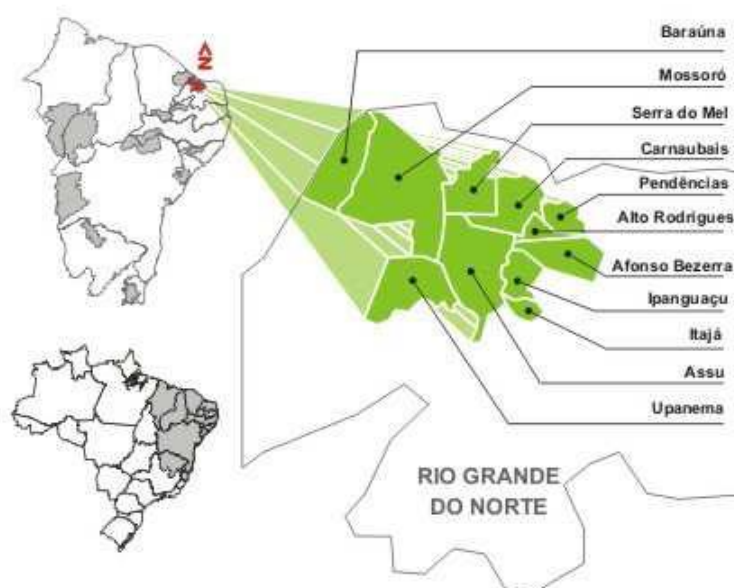
Therefore, this study aims at identifying the contribution of production factors in the final sale value of the melon produced in Polo Açu-Mossoró (labor of field workers, inputs, mechanized operations and administrative expenses), assessing the value received by the producer in the negotiations in the international and domestic market.

The methodology intends to measure the contribution margin; it allows to estimate the proportion of how much each link appropriates from the final value of the product. The production costs data were obtained from the publication of *Agrianual*, that had the data of the production costs from the melon produced in Polo Açu-Mossoró. In the analysis of the domestic market of melons, the annual average price per kg of melons sold in Brazil was used to determine the margins and how much is added at each stage. In turn, the analysis of the international market was more complex, where it was assessed the margins of freight, insurance and tariffs on melons sold in the UK market. From the analysis of export values, it was possible to register the actual amount being received by the producer and therefore establish the share of operations in the production of melon.

2. Origin of Polo Açu-Mossoró

Polo Açu-Mossoró is made up of eleven (11) municipalities: Baraúna, Mossoró, Serra do Mel, Carnaubais, Pendências, Alto do Rodrigues, Afonso Bezerra, Ipanguaçu, Itajá, Açu and Upanema. It has a population of approximately 358,027 inhabitants, which corresponds to about 11% of the total of the Rio Grande do Norte state population. Of the total population, 109,170 inhabitants live in rural areas - representing 30.48%. The area occupies 8,040 Km², which corresponds to 15.23% of the total area of Rio Grande do Norte state, as shown below, in Figure 3. (NUNES; SCHNEIDER, 2008).

Figure 1 - Location of Açú-Mossoró Territory



Source: NUNES & SCHNEIDER (2008)

The establishment of Polo Açú-Mossoró began in the 1970s, with the support of large investments to modernize local agriculture. These investments came mainly from the public sector through the Integrated Rural Development Plan (PDRI), created in 1974. This plan included several projects, which ranged from settlement land reforming to irrigation projects. It sought to improve the agricultural sector in Northeast Brazil and boost the formation of agribusinesses (NUNES, 2009).

One of the important projects contemplated by PDRI was POLONORDESTE project, which addressed developing dynamic producing areas integrated with food industries and markets. However, the implementation of POLONORDESTE depended on the success of the structural constructions in the region, which began in the late 1960s, through the National Program of National Integration (PIN). This program was intended to resort on several hydraulic public works to solve the problem of irregular rainfall in Brazilian Northeast. Because of these complementarities between the POLONORDESTE and PIN programs, the latter was integrated to PDRI. (HEINZE, 2002).

The hydraulic public works were essential for the establishment of the producers in the Northeast. In Polo Açú-Mossoró, the main work was the perpetuation of the Açú-Piranhas River from the dam construction Engineer Armando Ribeiro Gonçalves⁴.

⁴The dam is 6 km away from the city of Açú and has the capacity to store 2.4 million m³ of water. The construction of this work began in 1979 and was completed in 1983 (DNOCS, 2015).

The installation of northeastern agribusinesses, as outlined by the PDRI, was possible due to tax incentives, as well the availability of abundant credit to finance the various programs of agribusiness, including POLONORDESTE, which had as objective integrating markets as well as promoting exportation. These programs aimed at improving agriculture, creating an arrangement between input suppliers and the sector above of agriculture, while being financed by the National Rural Credit System (SNCR), which was also connected to the General Fund for Agriculture and Industry (FUNAGRI) (BELIK, 1992). One of the main tools used to facilitate the installation of companies in the Northeast was the FINOR⁵ program.

In the mid-1980's, the irrigated fruit production began to have more prominence in the Northeast. As Silva (2001) described, this movement was due to the crisis in the agroindustry, in view of the fact that this sector started suffering from the cuts made in tax incentives, caused by the hyperinflation and the 1980s crisis. This crisis also changed the course of economic policies for the agriculture, which started to have the goal of generating foreign exchange to stabilize the balance trade. Among the various projects to promote exports was the inclusion of tropical fruits for fresh consumption in the international market. Combined with this internal situation, important changes also occurred in the international market that allowed greater integration of new production areas and new products in the global food market (FUNCKE et al., 2009). Thus, in the early years of the 1990s, Polo Açu-Mossoró cemented themselves as an important producer of fruit for export.

The emergence of the melon crop in Rio Grande do Norte is strongly linked to the setup of large companies/farms. These companies were specialized in the melon crop oriented to the international market - Europe and the United States mainly. As shown in Table 1 the main representatives of this consolidated production model were the companies Mossoró Agro Indústria S.A. (MAISA) and Fruticultura do Nordeste Ltda (FRUNORTE) (NUNES and MELLO, 2007).

Table 1 - Total Area of Production and Irrigated Area in the year 1996 by Companies

Business	City	Total Area (ha)	Irrigated Area* (ha)
MAISA	Mossoró	30.000	3.000
FRUNORTE	Carnaubais	11.500	1.628
Faz. São João	Mossoró	5.000	604
P. S. Nordeste	Ipanguaçu	850	250
AGRICOL	Baraúnas	700	258
FRUTERRA	Ipanguaçu	620	240
TWA	Baraúnas	320	250
AGROSAFRA	Baraúnas	120	80
AGRIFRUTI	Baraúnas	118	99
ABFRUTA	Baraúnas	-	74

⁵ tax benefit granted by the Federal Government, established by the Law No. 1,376, of 12/12/1974. Investment Fund of the Northeast - FINOR.

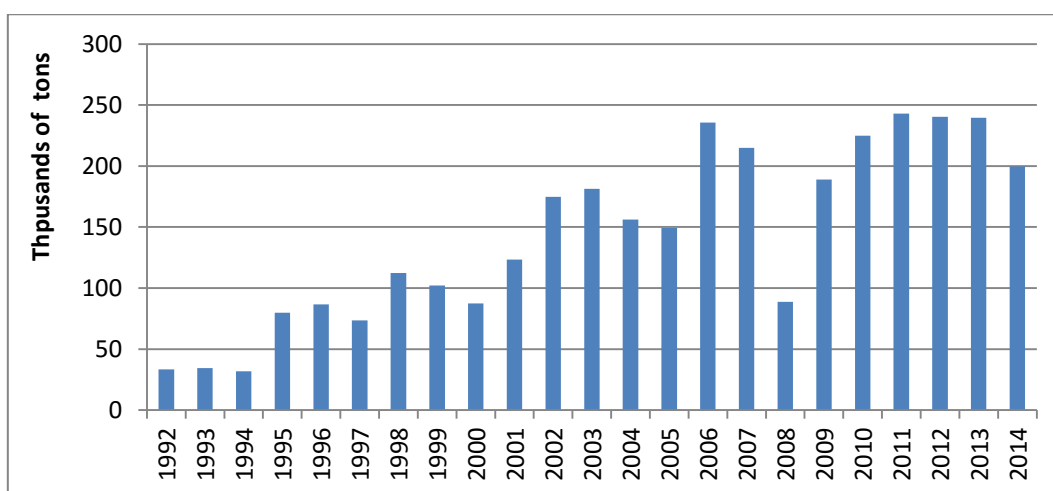
J.P. Produção	Baraúnas	96	60
Flávio	Mossoró	87	20
Hermano	Mossoró	72	20
Antº Gerônimo	Baraúnas	9	18

*It corresponds to the irrigated area per year, which includes the same amount of area for harvest.

Source: SILVA, 2004

These companies leveraged the melon production in the region, as shown in graphic 1, and after the first half of the 1990s, the region had already a production of nearly 40 tons of melon per year, growing more than eight times over two decades.

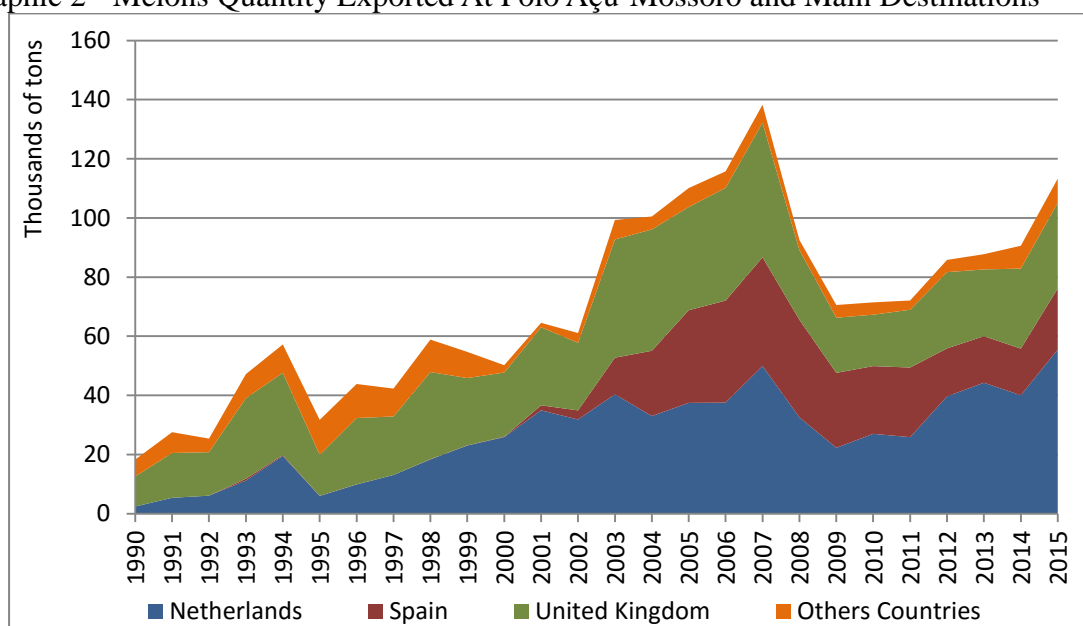
Graphic 1 - Melon Quantity Produced in Polo Açú-Mossoró (1992-2014)



Source: IBGE (2016)

Of all the production from Polo, a substantial part is destined for the international market, as pointed out by graphic 2. The main destinations are: United Kingdom, Netherlands and Spain.

Graphic 2 - Melons Quantity Exported At Polo Açú-Mossoró and Main Destinations



Source: AliceWeb (2016)

In the previous two graphs (1 and 2), we can see a strong growth in the 2000s, both in the produced and exported quantities. This is interesting because it was in this period of expansion that the pioneer companies left the scene, especially the two largest companies Maisa and Frunorte in the early years of the last decade.

Starting from the second half of the 1990's, some changes in the institutional environment began to occur. At this time, a new standard for the Global Agrifood System had been consolidated. The intensification of the integration of the agricultural markets, which began in the 1980's, increased the competition among countries, which created an important debate on the need to end the protectionist policies adopted by developed countries. Only in 1995, at the Uruguay Round of negotiations, an agreement was brought by the GATT. In this agreement, the countries pledged to reduce agricultural subsidies. At the time, health rules were established in order to compatibilize trades between countries (BURFISHER, 2000; BUSCH & BAIN, 2004).

This new scenario of reduced protectionism in agricultural markets allowed a significant improvement in the trading world in the second half of the 90s and the early 2000's. However, the opening and expansion of the market for these new products was only possible due to the increased supply capacity provided by technological advances in harvesting techniques, especially post-harvest ones, such as storing, packing and cooling; since most of these products are intended for fresh consumption (WILKINSON, 2008; Silva, 2001).

If on one hand the agricultural markets had become more integrated, due to the reduction of the protectionism, on the other hand, the debate about the health rules were still unfolding. The issue of food safety emerged from changes in the demography, culture and income, particularly in developed countries (RAUPP, 2010; BELIK, 2007; FRIEDMANN, 1993). The demand for quality by consumers culminated in the emergence of several stamps and certificates aimed at attesting peculiar characteristics of the products. This phenomenon affected the agrifood supply chains as producers had to reorganize their production routines, adapting to certification requirements (WILKINSON, 2008).

Obtaining these certifications is done by the monitoring of agricultural practices, labor and environmental producers, and the characteristics of the products. In Brazil, this process was carried out in part by state agencies, however, private organizations now have a strong importance, including international private organizations. For example, large distribution centers, supermarkets and agencies representing global retailers began to disseminate their own certifications that guarantee quality criteria from their own rules, which are not always homogeneous, culminating in the emergence of dozens of certifications (BUSCH & BAIN, 2004).

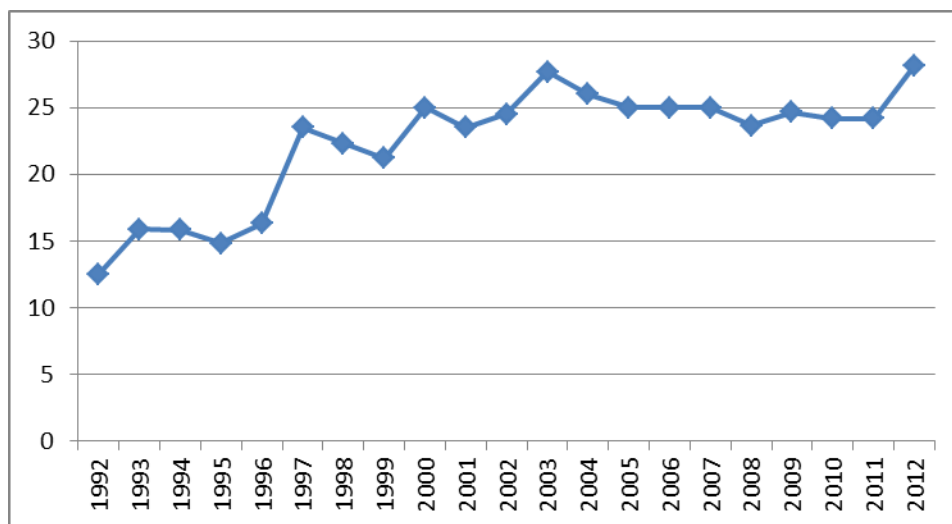
Thus the production of food for distribution in natura was moving away from the old mass-production model and approaching a flexible system (demand-pull) inspired by the concepts of just-

in-time model, in which producers offer differentiated products, respecting demanded specificities (BELIK, 2007; WILKINSON, 2008). The emergence of a food supply system of fresh food is similar to industrial flexible production - with a higher demand for quality, consumers made room on the global stage to large distribution retailers to have a main role in the trade of these products (BELIK 2007).

This change in the composition of the markets had an impact on the coordination of agro-food comercialization. Supermarket chains, wholesalers, traders and brokers have been established as key players in the global agrifood market structure. The new flexible model that was adopted called for new forms of coordination of the transaction between these key players and the farmers. With these new means of coordination, distribution networks and flexible contracts with farmers start to appear. (Menard & KLEIN, 2004; BELIK & Chaim, 1999; Wilkinson, 2008).

The impact of these changes in the melon production chain are seen in graph 3. It was observed that, in the late 1990s, the per hectare productivity had increased considerably - from 1997 to 1998, there is an increase of over 40%. This new pattern of production becomes consolidated in the 2000s with the region having an average of approximately 25 tons produced per hectare, which is an important change when compared with the productivity of 15 tons/ha from the previous decade.

Graphic 3 - Melon Production Yield (tonnes / ha)



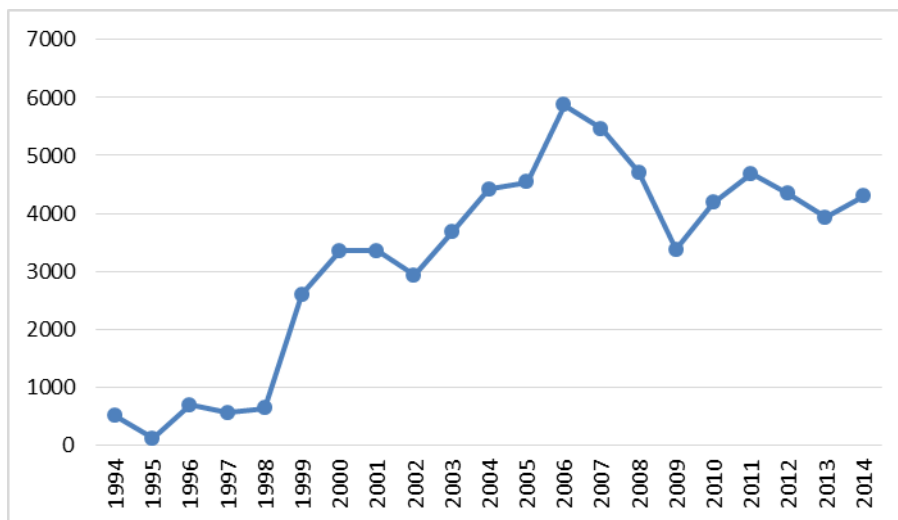
Source: IBGE (2016)

This expansion in production affected the region’s labor market of melon. Graphic 4 indicates the evolution of formal employment in the temporary crop⁶. It is important to notice that a

⁶Although the data is aggregated all the temporary crops of the region there are no other relevant cultures beyond the melon that may cause a serious distortion in the employment statistics.

significant growth occurred at the turn of the 1990s to the 2000s, when the number of formal workers increase over 400%. This expansion of formal employment continued until 2006, when the international crisis affected the dynamics of melon export, decreasing significantly the performance of the labor market.

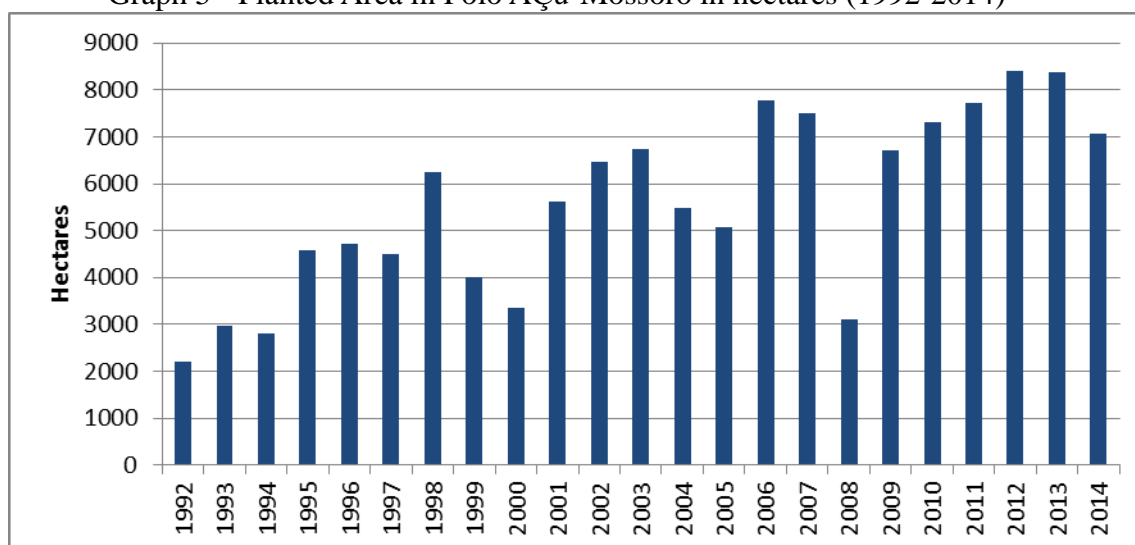
Graph 4 - Formal Employment in Temporary Crop Region Polo Açú-Mossoró (number of employees)



Source: RAIS (2015)

Two important points about the production process and labor relations can be highlighted by analyzing the graphic above. First, the abrupt growth between 1998 and 1999-2000. This growth in the number of formal workers occurred in the same period in which the acreage of the crop in the region had a drop of 47%, comparing data from 1998 to 2000, as shown in graphic 5. This process indicates that, indeed, there was not an increasing in the number of workers, but a process of formalizing the employment of workers who were before informally involved in the production.

Graph 5 - Planted Area in Polo Açú-Mossoró in hectares (1992-2014)



Source: IBGE (2016)

The second point refers to the pattern of the production in the region, in this period of increasing formalization of workers and dropping in the total cropping area. It coincides with the growth in the yield produced in the region, as shown in graphic 3. So it is possible to infer that there was an important technological advance in production techniques that allowed productivity to grow while the area and number of formal workers were being reduced.

In the 2000s we observed different periods in the trajectory of the region; in decade's first half, a strong growth in the quantity produced is noted, along with the exported volume, which reinforces once again the importance of the international markets for the dynamics of the region. However, from 2007 and on, it is possible to see a steep drop in the amount produced, by virtue of the first signs of the international crisis that scattered around the world at the end of the 2000's decade. Thus, there was a decline in the crops resulting in some agents leaving the business, as well as in a falloff in the number of formal jobs, as indicated by graphics 4 and 5.

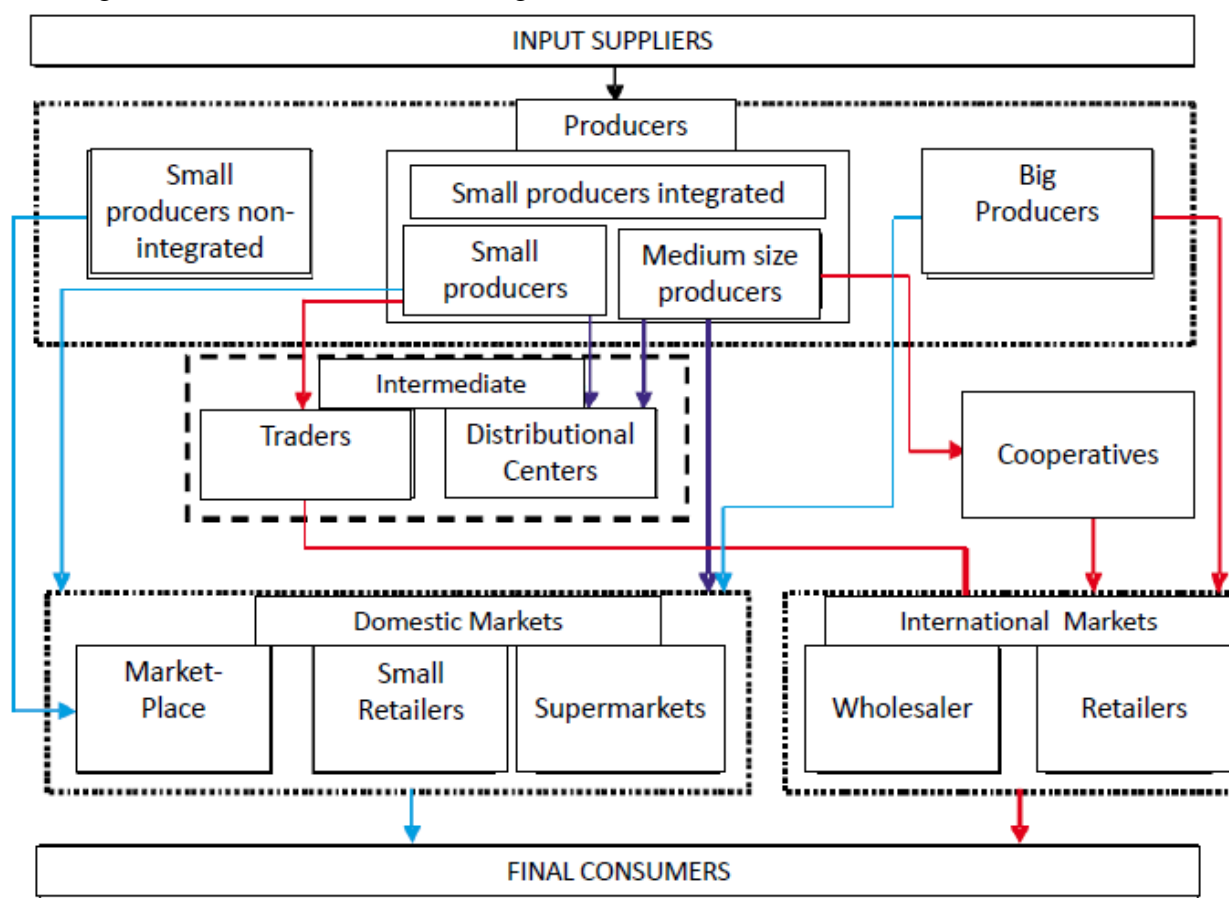
The recovery of the international market only began in the year 2012, as it is showed by Graph 2. Although, the quantity produced had already seen a good recovery in 2009. This fact revealed a new horizon for the melon's destination: the domestic market. The Brazilian population's arising income, as demonstrated in the study of Neri and Souza (2012), particularly in the lower social fraction, has an important influence on the consumption of fruit. This fact is indicated by the survey conducted by the National Agriculture Confederation - CNA (2011), which showed that this portion of the Brazilian population spends a large proportion of their total income on food and therefore, has a higher budget constraint for purchasing fruits. Studies of Hoffmann (2007 and 2010) corroborate this hypothesis, from data of the POF⁷'s 2002/2003 and 2008/2009, he calculated the elasticity of the income-expenditure. In these studies, the author showed that, in general, fruits have a high income elasticity-spending in Brazilian families of all social strata. However, it is in the lower strata that the income elasticity appears to be even greater.

Therefore, this increasing dynamism of the domestic market allowed some producers to, even with the recession in the international melon market, redirect their productions, softening the impact of the international crisis on their business. According to the study by Oliveira (2011), the production flow of the melon produced in Polo Açu-Mossoró is defined as follows: small producers directed their production to central suppliers (CEASAs) and local markets, while large producers export about 80% of their yield. Of the total exported, about 70% are destined to Europe, being the main buyers the UK, that takes up between 35% and 40% of the total exports, and Spain, that gets approximately 30% of it.

⁷ POF - Expenditure Survey conducted by the Brazilian Institute of Geography and Statistics (IBGE). Evaluation of the expenditure and acquisitions by Brazilian families in major regions.

This structuring of the melon production chain is outlined in the work of Velloso and Primo cited by Araújo and Campos (2011), as illustrated in Figure 2.

Figure 2 - Production Chain of Irrigated Fruit Culture in Brazilian Northeast



Source: Velloso e Primo *apud* Araújo e Campos (2011)

In terms of commercialization, the exportation remains as the main channel to drive the region's economy, despite the domestic market presenting itself as a viable alternative in the period of the international recession. However, in view of these findings, it is important to investigate how such a productive melon chain, as described above, has added value in these different markets, and how the factors of production have been paid. Consequently, in the following sections it is explained the methodological approach to understand this process.

3. METHODOLOGY

The study on the added value of agricultural chains refers to the analysis of how the process of production and marketing adds value to the product in the various stages that it exists within its supply chain.

Each production step involves a process of investments, costs and profits. Thus, as pointed out by ARAÚJO (2007), the additional value incorporated by the product is directly linked to the increase in the sophistication of the product. In the agricultural chains, this process of valuation can

be connected to the presentation of the product in natura, highlighting some specific desirable feature, as well as to the consumers, through a sort of processing for adapting to their preferences.

In the productive melon chain, the added value occurs mainly by appreciation of intrinsic aspects of fresh fruit by the consumers, such as taste, size or origin. These features tend to vary from one market to another, so the final destination has a considerable impact on determining the value of the product and consequently the value destined to the links in the production chain. From these considerations, it will be analyzed the value-adding process of the melon produced in the Polo Açú-Mossoró region, from the perspectives of the two main markets for the region's production, the domestic market and the international market. The specifics of the analysis of each of these markets will be detailed in the following sections.

3.1 Analysis of international market

The international market analysis requires further treatment. As shown in Graph 1 from the total number of melon produced in the Polo Açú-Mossoró region, almost all of it is directed to three countries, namely: Spain, United Kingdom and the Netherlands. Therefore, these markets have different coordination mechanisms, which will influence the management of the production chain. In this paper, only the U.K. market was analyzed, due to the accessibility of the data.

To determine the value added in each link of the melon production chain - both inside and outside of the farm, to the final consumer in the U.K., the following methodological procedures were used:

In the case of the melon sold by the whole fruit, the price per kilo paid by the final consumer was gathered from the website <<http://www.mysupermarket.co.uk>> that provides data of the variation in prices of products in the main UK supermarkets, including the average of the last 12 months. The supermarket's profit margin is calculated by the deduction of the wholesale prices from the amount paid by the customers, as shown in equation 1. The prices charged by wholesale in the international market were based on monthly reports from the International Trade Center (ITC), an agency under the joint authority of the UN and WTO.

$$\text{Supermarket Margin} = \text{Final Consumer Price} - \text{Wholesales Prices} \quad 1$$

In turn, the wholesaler marketing margin is calculated by the difference between the selling price and the CIF price of melon imported from Brazil. In the case of international transactions, the value of the information involved of a given trade flow is presented in two ways. One shows the value of the transaction without insurance costs, customs duties and freight - this is the price Free on Board (FOB). This information is published by the exporting country, declaring the value from

this perspective. The second way is by incorporating the cost values and freight rates. It is called CIF value or "Cost, Insurance and Freight", and its value is normally issued by the statements of the importer.

Therefore, as shown in Equation 2, the difference between the CIF and FOB value are spending on freight, insurance and fees.

$$CIF\ value - FOB\ value = costs\ of\ freights, insurances\ and\ taxes \quad 2$$

FOB and CIF values were obtained from the Comtrade Database, which discloses the total quantity exported and the amounts declared for both FOB and CIF.

From dividing the total value of exports from country 'I' to country 'J', by the total quantity exported, it is possible to find a proxy for price per kg of melon traded, according to FOB and CIF, in the equations 3 and 4 below.

$$\sum \frac{x_{i,j}}{q_{i,j}} \quad 3$$

Analogously, it is also possible define the proxy price paid by the importer:

$$\sum \frac{x_{j,i}}{q_{i,j}} \quad 4$$

Thus, it is considered the FOB price the value received by the producer⁸. Thus, another feature of the added value process is the analysis of the production costs inside the farm. The production costs data used in this article were taken from 2016 Agriannual publication, which contained information about the production costs of the year 2015 for melon production in Mossoró area, see Annex 1.

From these data, it is possible to estimate the production costs per kg of melon produced. And from subtracting the price received per kg of melon (i.e. the FOB value), it is possible to identify the margin of the producer.

After disaggregating these steps, it is possible to calculate and indicate the share of each stage of the production in the melon chain at their final values (margins, inputs, labor), and to recognize which agents are seizing most of the total.

⁸ According to the interviews, the export contracts of a cooperative of medium-sized producers in the Mossoró region are carried out in FOB value, that is, the customer pays the costs. However, this agreement is only made if the seller, in this case the producer, sells a whole shipping container, since the fees are charged by containers, not by transacted unit.

However, there is a subtlety in the U.K. market, as part of the melon is sold by the whole, with its price per kg presenting a value on average in 2015 of US\$ 1.20, according to data from <mysupermarket.com.uk>. Though, another important part of the melon marketed in the UK goes through a minimal processing of being sliced and sold in small portions, where the price per kg suffers a considerable change, averaging US\$ 4.31 in the year 2015. In this last case, the margin of the supermarket also involves other operational costs, such as packaging and skilled labor. To observe the impact of the appropriate value of the melons from Polo Açú-Mossoró that are marketed in the United Kingdom, two cases should be analyzed separately.

For the analysis to be more standardized and allow comparisons between all the values along the entire production chain, all the monetary information have been converted into US dollars. Therefore, information about production costs gathered in Brazilian *real* were converted into US dollars using the average exchange rate from the exact time. FOB and CIF values obtained from the Comtrade database were already in dollars. Additionally, the data from the ITC wholesalers and prices from UK supermarkets were in British pounds and therefore were also converted to US dollars, by using the average exchange rate of pound/dollar from said time.

3.2 – Domestic market

In the analysis of the melon domestic market, wholesale market data from Cepea database (ESALQ/USP) was used, which provides the prices of melon produced in Polo Açú-Mossoró region from several Wholesales Centers (Ceasas)⁹. To calculate the profit margin of wholesalers also in Cepea, the producer prices were taken into consideration. The difference between the wholesale price and the producer price is the marketing margin of wholesalers.

From the prices paid to producers, the analogously production costs are withdrawn as described in the analysis of the aggregated price on the international market.

Therefore, from these methodological procedures, it is possible to analyze how the adding value process is throughout the melon chain in the Polo Açú-Mossoró region with their main final markets. In the next section, the results will be presented and discussed.

4 - ANALYSIS OF THE RESULTS

The melon produced in the region of Mossoró basically has the same production system, albeit the size of the property and the type of enterprise. It was observed in the field research that was conducted in the Polo Açú-Mossoró region that there is a considerable degree of diffusion of

⁹The Prohort database that shows the sales price in Brazil, wholesalers plants in the period 2010-2014, but did not identify the melon from Polo Açú-Mossoro. Regardless, the results collected by Prohort showed good acceptance with respect to the results of Cepea.

technology, with family farmers using techniques from large companies, specific seeds, or even the use of seedlings produced in greenhouses, as well as mulching¹⁰ to improve productivity.

According to the Brazilian statistics institute – IBGE (2016) - in 2014, 7.103 hectares were planted with melon in the region and just one company, Agrícola Famosa, accounts for about 80% of the production, with the remaining portion in the hands of a group of medium-sized producers and some small producers.

Melon is a short-cycle plant that allows the production of at least four cycles a year. The demand for water is very high which makes this resource critical to the location of the property. The properties must extract water from the soil for irrigation, what makes the upkeep costs (equipment, depreciation and electricity) very high, about US\$ 75 per hectare. There is no charging for the use of water, though, as it is considered a public good - see Annex 1 (Agriannual, 2016). In preliminary calculations, land costs were not considered, i.e. there is no feedback from the cost of the land.

Another important observation is that all assets and capital goods used in the production are considered to be available for the producer. No financing costs of inputs or lease of machines, although maintenance costs are considered when dealing with these machines.

The factor with the higher production costs are the agricultural inputs, as shown in Table 2, and about 80% of these costs come from seeds [ranging from 2,000 to US\$ 6,000 per kg depending on the type of melon. They are produced by Syngenta company] and fertilizers. The seeds are not commonly planted directly on the field, as they normally germinate in trays made of polystyrene or plastic, and only then, these developed seedlings are moved into the soil. This improves performance because it allows greater effectiveness of seed germination.

Table 2 - Melon Production Costs in 2015

	Field workers	machines	Agricultural inputs	adm	Agronomist	Field technician	Taxes/ fees	Total
R\$/Ha*	2.655,54	3.118,86	12.056,57	992,61	472,80	70,79	782,00	20.149,17
R\$/Kg	0,11	0,12	0,48	0,04	0,02	0,01	0,03	0,81
US\$/Kg**	0,04	0,04	0,16	0,01	0,01	0,01	0,01	0,26

Source: Agriannual, 2016

*Melon Productivity in Mossoró region is 25,000 kg / ha

** The dollar ration that was taken into consideration was the average annual change 2015 plus the variation between the months of August to November 2014, since many contracts were still valid at the end of the last year.

It is observed that the field workers represent only 14% of total costs, being the lowest cost if compared with the usage of machines that corresponds to 15% of the production costs. In view of this, it is evident the process of technology intensification in the melon production, with high use of

¹⁰ The mulching technique is to use plastic to cover the soil and protect the melon to increase productivity and reduce the use of inputs (water, agrochemicals and labor-intensive) (QUEIROGA et. Al., 2015).

agricultural machinery and agrochemicals inputs. At the same time, it illustrates the low value of labor in the production process. In the following subsections, it will be discussed and detailed the share of value added by these factors of production in the final value of the products sold in various markets.

4.1 – UK Market

As shown in previous sections, the UK is one of the main consumers of the melon produced in Polo Acu-Mossoró. Accordingly, this section will analyze how much each link in the production chain of melon produced in the Polo region receives from the final price paid by British consumers.

As shown in Table 3, the final average price paid in UK supermarkets in 2015 was about \$ 1.20. It is interesting to observe that, from the low value used by the supermarkets when fresh whole melons are sold, US\$ 0.02 happens to be the contribution margin per kilogram. In Europe, the wholesalers grab the largest share, about US\$ 0.16 per kg.

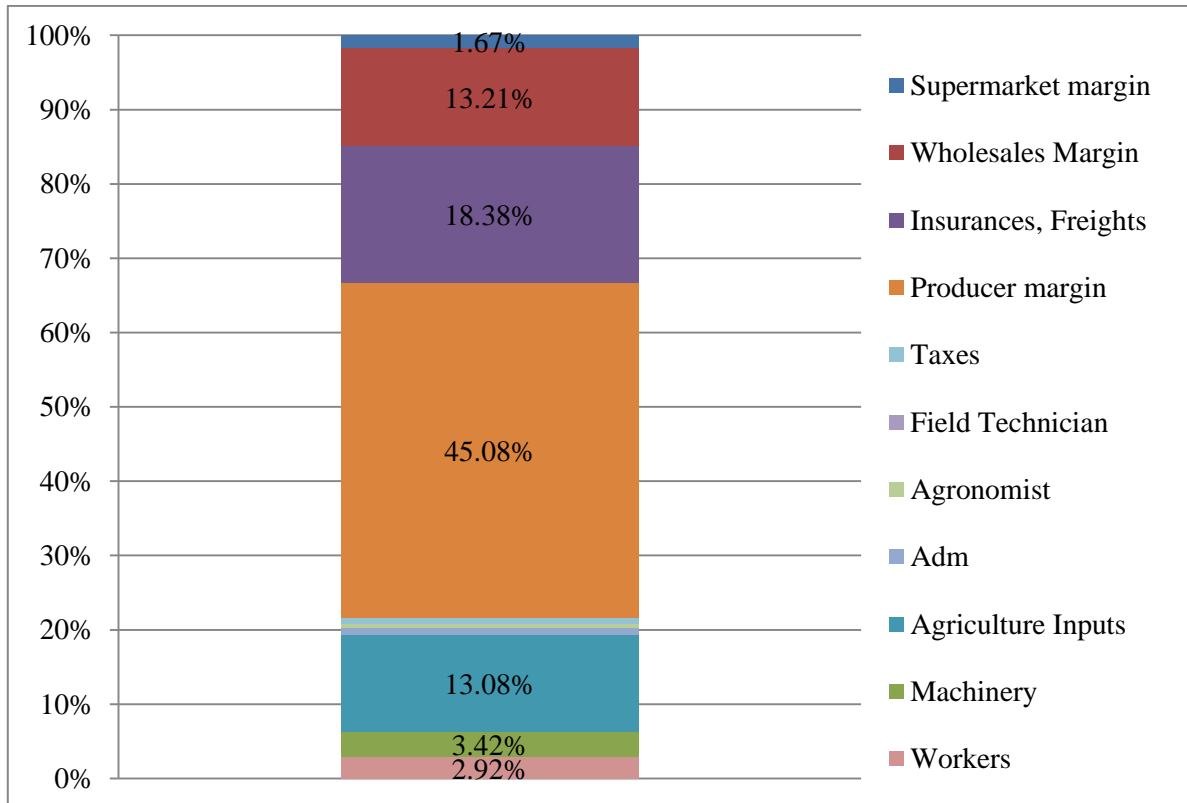
Table 3 - Adding Value of whole melon chain sold in the United Kingdom (US \$ 2015)

Agents	Values	Data source
Supermarket price	1.20	my supermarket
Supermarket profit margin	0.02	
Wholesale price	1.18	Intracem
Wholesaler profit margin	0.16	
CIF	1.02	Comtrade/Coopyfrutas
Insurance, freight and fees	0.22	
FOB (producer price)	0.80	Comtrade
Producer margin	0.54	Comtrade/Agrianual
Taxes/Fees	0.01	Agrianual
Field Technician	0.00	Agrianual
Agronomist	0.01	Agrianual
Administration	0.01	Agrianual
Agricultural inputs	0.16	Agrianual
Machinery	0.04	Agrianual
Field workers	0.04	Agrianual

Source: Prepared

Graphic 6 presents the proportion of shares from each production link of the product marketed in the UK. It is observed that 66% of the final value is generated inside the farm, and much of this part is the margin of the producers, while less than 3% is the compensation paid to the workers.

Graph 6 - Adding value of the fresh whole melon consumed in the UK

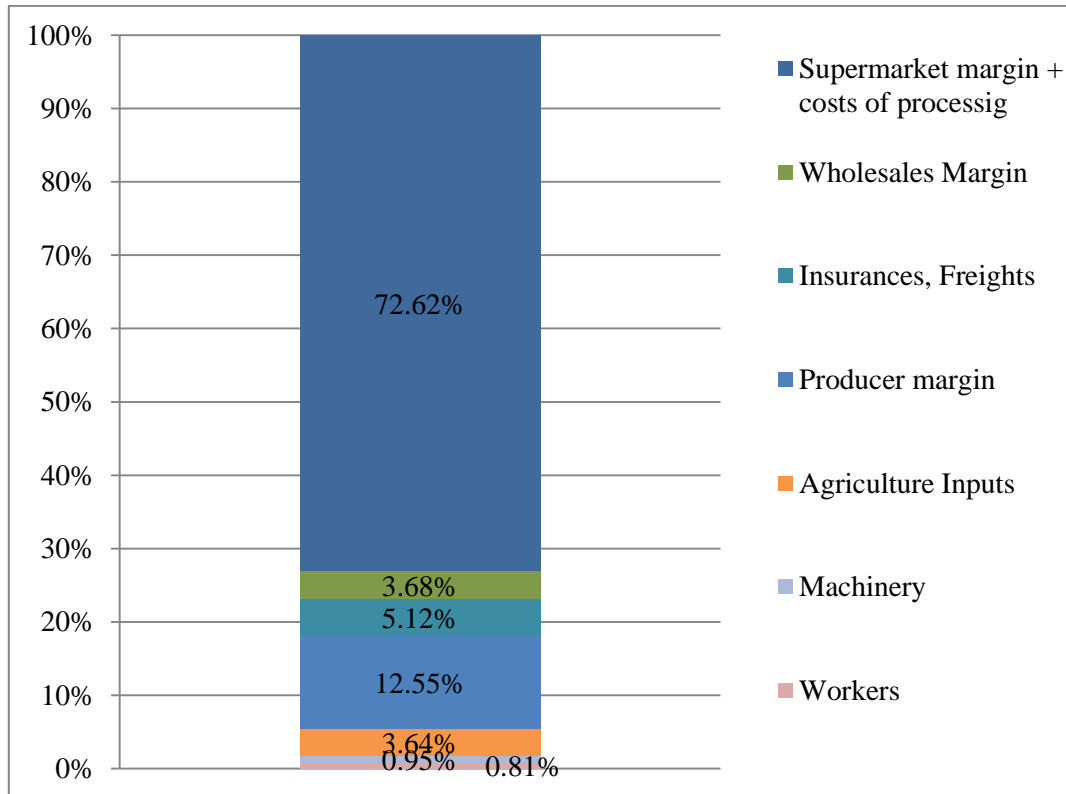


Source: prepared

The poor performance in the value added by the supermarket in the final product is a counterpoint to the specific proposition that reinforces the power of the supermarket chains in the agricultural markets, as outlined in section 2. However, it is important to notice that the melons consumed in the European markets are rarely acquired in a whole manner. Much of the melon is consumed in small portions, provided by the supermarket chains.

With the small portions of melon, the marketing margin of the supermarket chains grows significantly, almost quadrupling the final value of the product in relation to the fresh whole melon. Thus, by making this minimal processing, supermarket chains are able to take over 70% of the final value of the product. Meanwhile, the producer participation share is reduced to approximately 10%. The worker's situation, however, appears to be even more dramatic in this market, as their remuneration is less than 1% of the final value – demonstrating the regard of compression in the value-adding process along the chain, as shown in graphic 7.

Graph 7 - Adding Value in fresh sliced melon chain sold in the UK



Source: prepared

It is worth mentioning the producer's position, which has a considerable margin. This fact is allowed by the relation of sales and costs in the international market, as many of the inputs purchased by farmers are imported, having indexed prices at the current exchange rate. This softens the impact of currency exchange fluctuation, as it equally affects revenue and expenses proportionally. Moreover, there is an expense cut agreement between producers and buyers for the boxes used to store the melon for shipping.

4.2 - Domestic market analysis

Because of the strong connection with the international market and the presence of a large company that has Europe as its main market, only an amount that is less than 20% is directed to the domestic market. Although, some medium and small producers prefer this market due to lower transaction costs. The production intended for Brazil supplies both regional and South-Central markets in the country. In this marketing process, the Ceasas are the main destinations and this process is often managed by middlemen who have contacts in different places.

At the Ceasas, in 2015, the average price of the melon originated from Polo Açú-Mossoró was R\$ 2.35, as shown in Table 4. Noting that the price paid to producers according to the CEPEA data was R\$ 1.78, leaving a share of 24% in the final value of the product, as seen in Figure 7.

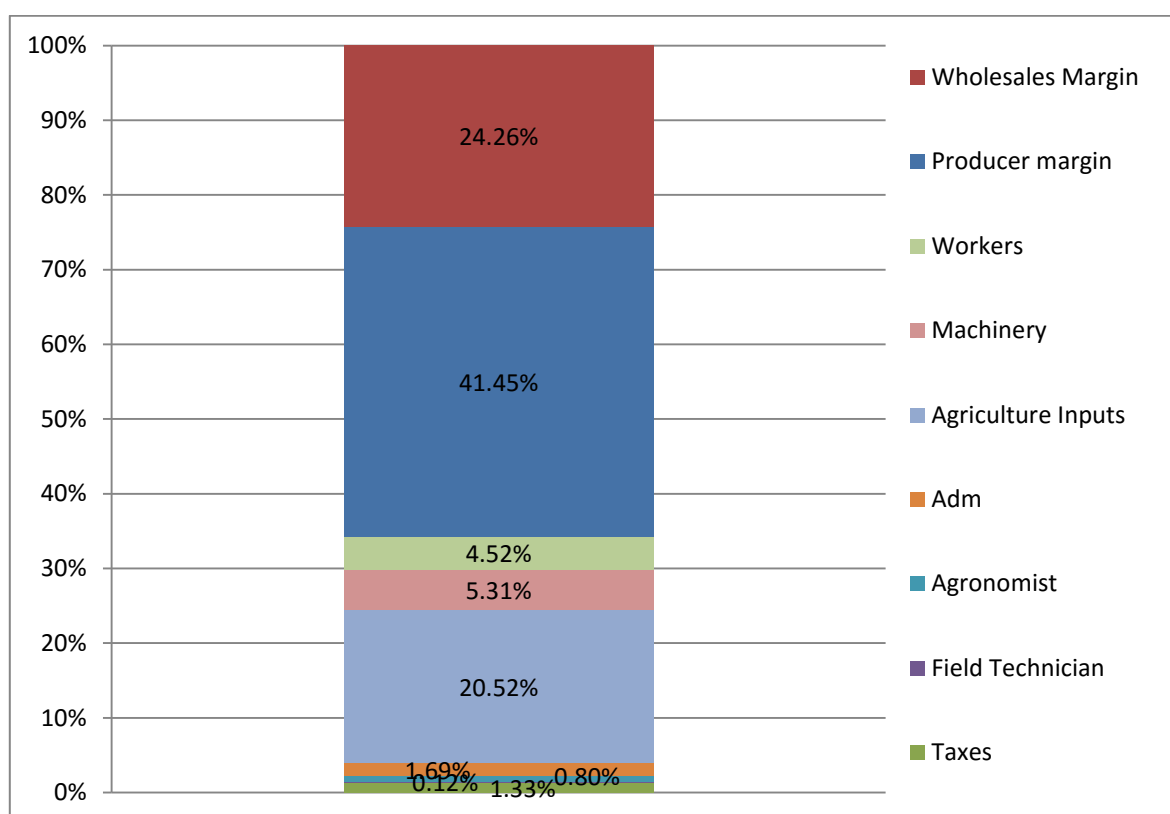
Table 4 - Adding Value in the whole melon chain sold in Brazil

Agents	Valores em R\$	Fonte do dado
Wholesale price	2.35	Cepea
Wholesale profit margin + Shipping	0.57	
Price Producer	1.78	Cepea
Producer Profit Margin	0.97	
Taxes / Fees	0.03	Agrianual
Field technician	0.00	Agrianual
Agronomist	0.02	Agrianual
Management	0.04	Agrianual
Agricultural inputs	0.48	Agrianual
machinery	0.12	Agrianual
Worker	0.11	Agrianual

Source: prepared

It is also observed that domestic producers still maintain a good contribution margin, with the participation from the worker appearing a little higher than while in international markets - about 4% higher, but even so, it is still a very low value.

Graphic 7 - Adding Value in the whole melon chain sold in Brazil



Source: prepared

Regarding labor relations, it is worth mentioning that due to accomplishments in the union front and to the pressure coming from rigorous certification requirements for the products to be marketed internationally, the producing companies/farms started having entirely new costs for covering determinations imposed by the labor laws and the sanitary control bodies. Such costs did

not exist before the year 2000. From the worker's point of view, little was added to their wage - although they had secured some additional earnings (e.g. weekly paid rest, holidays, subsidized meals etc.), but for the employers, this was a clear squeeze in their margins. New studies could be conducted to argue about the increase of expenses by the employer for having a gain in productivity stimulated by a better employee welfare.

5 – CONCLUDING REMARKS

This study aimed at analyzing the melon production chain in the Polo Acu-Mossoró region. For this matter, some basic aspects were clarified regarding the evolution of the productive structure of the region in the past decades. It was observed that Polo Açú-Mossoró structurally built itself out of public investments on water infrastructure, that ultimately attracted private groups and further development. Thus, melon production is consolidated in the early 1990's based on large companies that produced melon for exportation in large irrigated areas.

However, in the late 1990's, even though the two largest companies had declared bankruptcy, the Polo retained its performance, as the old businesses were replaced by new agents. These new agents incorporated new technical standards that enabled greater productivity, even with the reduction of the area for cropping. Furthermore, in this period, it was registered a large increase in the number of formal employees.

After having this brief story laid out, the paper focused on the goal of analyzing how technical details in the marketing chains affect the final value for the end-consumer. For this, both the domestic and foreign markets were assessed. For the foreign markets, one of the main destination countries, in particular, was analyzed: The United Kingdom. Thus, it was studied how much each step in the production chain contributes for the final price paid by British consumers.

In this market, there is a special feature: when observed the amount paid for a whole melon, it was noticed that supermarkets profit on tight margins, about US\$ 0.02 per kg. The agricultural company gets more than 60% of the value; 40% of these make up the profit, while the highest costs are of agricultural inputs and machinery, leaving the workers with a small portion of about 3%.

This result seems contradictory for a literature view of it, since it states the power of the supermarket chains in agricultural markets, evidenced by the fact that a large part of the melon consumed in the UK is sold in small, sliced portions that has the price for the kg reaching more than US\$ 4.00. Consequently, supermarkets take up about 72% of the value of these products, while reducing the producer's profit margin and the value of labor even more - that happens to contribute less than 1% to the total amount.

Finally, when analyzed the value-adding process in the domestic wholesale market, which is the main domestic marketing channel, a greater participation of the labor factor was noticed - about 4% - but still well below the profit margins of producer and wholesalers.

REFERENCES

AGRIANUAL, F. N. P. Anuário da agricultura brasileira. São Paulo, OESP Gráfica, 2016.

ALICEWEB. Ministério da Indústria e Comércio (MDIC). Disponível em: <<http://aliceweb.mdic.gov.br/>>. Acesso em: set 2015.

ARAÚJO, Massilon J. **Fundamentos de agronegócios.** Editora Atlas SA, 2ª Ed. 2007.

ARAÚJO, V. F. da S. & CAMPOS, D. F. A cadeia logística do melão produzido no Agropolo Fruticultor Mossoró/Açu. **REN. Revista econômica do nordeste**, v. 42, n. 3, p. 505-529, 2011.

BELIK, Walter. **Agroindústria processadora e política econômica.** Campinas: UNICAMP-IE, 1992.

_____. **Agricultura, concentração no setor de comercialização e novos espaços para a distribuição de produtos frescos, Economia Ensaios.** vol. 22. Uberlândia: UFU, 2007.

BELIK, W. & CHAIM, N. A. Formas híbridas de coordenação na distribuição de frutas, legumes e verduras no Brasil. **Revista Cadernos de Debate**, v.7, p.1-9, 1999.

BURFISHER, M. The Institutional Environment for Agricultural Trade in the FTAA. In: LOYNS, *et al.* (Eds.). **Policy Harmonization and Adjustment in the North American Agricultural and Food Industry.** Proceedings of the Fifth Agricultural and Food Policy Systems Information Workshop. Texas: Texas A&M University/University of Guelph/El Colegio de México, 2000, pp. 190-206.

BUSCH, L., & BAIN, C. New! Improved? The Transformation of the Global Agrifood System. **Rural Sociology**, v. 69, n. 3, pp. 321-346, 2004.

CONFEDERAÇÃO NACIONAL DA AGRICULTURA (CNA). Consumo de Frutas e Hortaliças. Brasília: CNA, 2011.

COMTRADE, U. N. United Nations commodity trade statistics database. URL: <http://comtrade.un.org>, 2015.

FAOSTAT, Food Agriculture Organization of the United Nations. Disponível em: <<http://faostat3.fao.org/home/E>>. Acesso em: nov 2015.

FRIEDMANN, H. The Political Economy of Food: a Global Crisis. **New Left Review**, n. 197, Janeiro-Fevereiro, 1993.

FUNCKE, A.; MIRA, E.; MASCARENHAS, G., & PEREIRA, P. Sistema Produtivo 04: Perspectivas do Investimento em Agronegócio, Rio de Janeiro: UFRJ, 2009.

HEINZE, B. C. L. B. **Importância da agricultura irrigada para o desenvolvimento da Região Nordeste do Brasil**. Monografia apresentada ao curso MBA em Gestão Sustentável da Agricultura Irrigada da ECOBUSINESS SCHOOL/FGV. Brasília, 2002.

HOFFMANN, R. Elasticidades-renda das despesas e do consumo de alimentos no Brasil em 2002-2003. In: SILVEIRA, F. G.; SERVO, L. M. S.; MENEZES, T.; PIOLA, S. F. (Org.). Gasto e consumo das famílias brasileiras contemporâneas. Brasília: IPEA, p. 463-485, 2007. v. 2.

_____. Estimativas das elasticidades-renda de várias categorias de despesa e de consumo, especialmente alimentos, no Brasil, com base na POF de 2008-2009. **Revista de Economia Agrícola**, v. 57, n. 2, p. 49-62, 2010

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICAS (IBGE). Censo Agropecuário de 2006. Disponível em: <http://www.ibge.gov.br/home/estatistica/economia/agropecuaria/censoagro/brasil_2006/default.shtm>. Acesso: nov 2015.

INTERNATIONAL TRADE CENTER (ITC). Price information updates and market dynamics. Disponível em: <<http://www.intracen.org/itc/market-insider/fruits-and-vegetables/price-information-updates/>>

MÉNARD, C. & KLEIN, P. G. Organizational issues in the agrifood sector: toward a comparative approach. **American Journal of Agricultural Economics**, v. 86, n. 3, p. 750-755, 2004.

NERI, M. & SOUZA, P. H. C. F. **A década inclusiva (2001-2011): desigualdade, pobreza e políticas de renda**. Brasília: Ipea, 2012

NUNES, Emanuel Márcio; SCHNEIDER, Sérgio. A dinâmica desigual do desenvolvimento regional no nordeste: o pólo Assu/Mossoró (RN). Artigo apresentado no XLVI Congresso da Sociedade Brasileira de Economia, Administração e Sociologia Rural, 2008.

NUNES, E. M. **Reestruturação agrícola, instituições e desenvolvimento rural no nordeste: as dinâmicas regionais e a diversificação da agricultura familiar no polo Assu-Mossoró (RN)**, Porto Alegre: UFRGS, 2009.

OLIVEIRA, E. P. de. **Arranjos produtivos globalizados: o caso do APL da fruticultura de Melão de Mossoró/Baraúna-RN**. Dissertação de mestrado em economia. Universidade Federal do Rio Grande do Norte-PPECO, Natal: UFRN, 2011.

PRODUÇÃO AGRÍCOLA ANUAL (PAM). Disponível em: <www.ibge.gov.br>. Acesso em: outubro de 2015

QUEIROGA, G. M. T. et al. Os impactos da tecnologia de mulching utilizada no cultivo do melão na região de Mossoró. **Revista Verde de Agroecologia e Desenvolvimento Sustentável**, v. 10, n. 3, p. 77-82, 2015.

RAUPP, A. Transformações no sistema agroalimentar: novas e velhas possibilidades para a agricultura familiar. **Anais do IV Encontro da Rede de Estudos Rurais: Mundo rural, políticas públicas e atores em reconhecimento político**, 2010.

SILVA, Aldenôr Gomes da. Trabalho e tecnologia na produção de frutas irrigadas no rio grande do norte – Brasil. In.: **Globalização, trabalho, meio ambiente. Mudanças socioeconômicas em**

regiões frutícolas para exportação. Org: Josefa Salete Barbosa Cavalcanti. Pernambuco, Brasil, 2004, 380 pag.

SILVA, P. C. G. Articulação do interesse público e privado no Polo Petrolina-PE / Juazeiro-BA. Em busca de espaço no mercado globalizado de frutas frescas. Tese de Doutorado. Universidade Estadual de Campinas. Campinas: UNICAMP, 2001.

VELLOSO, A. V. & PRIMO, M. A. M. Gestão da base de fornecedores no agronegócio de processamento de manga do Vale do São Francisco: uma análise a partir das orientações da gestão da cadeia de suprimentos. **ANAIS DO ENANPAD**, 2006, Salvador-Rio de Janeiro: ANPAD, 2006.

WILKINSON, J. Mercados, redes e valores: o novo mundo da agricultura familiar. Porto Alegre: UFRGS, 2008.

ANNEX 1 – Melon Production Costs in 2015

Description	Especification	Unit Value (R\$)	Quantity	Total Value
A – Mechanized Operations				
Soil Preparation				
Ploughing	HM Tp 75cv. 4x4 + harrow 14x26	89.09	3.2	285.09
Harrowing grader	HM Tp 75cv. 4x4 + disking. 32x20"	84.12	1.4	117.77
liming	HM Tp 65cv. 4x2 + dist. limestone 2,3m2	98.89	1.6	158.22
Leveled Construction	HM Tp 90cv. 4x4 + leveler 14x18"	122.6	0.7	85.82
Implantation				
furrowing	HM Tp 65cv. 4x2 + roto-encanteirador	74.55	6	447.30
Internal Trasnport of Fertilizers	HM Tp 65cv. 4x2 + carreta 4t	78.59	2	157.18
Fertilizer	HM Tp 65cv. 4x2 + fertilizer	91.93	5	459.65
Cultivation				
Pulverization	HM Tp 65cv. 4x2 + pulv. bars 600 l	87.96	3	263.88
Mowing	HM Tp 65cv. 4x2 + hydraulic mowing	91.98	5	459.90
Irrigation				
Irrigation	R\$/ha	230.41	1	230.41
Harvest				
Harvest / Transport.	HM Tp 65cv. 4x2 + trailer 4t	113.41	4	453.64
Subtotal A				3,118.86
<u>B – Manual Operations</u>				
Soil Preparation				
Liming	Worker-day	52.09	0.25	13.02
Nivelation	Technical day	353.94	0.2	70.79
Implantiton				
Fertilizing	Worker-day	52.09	4	208.36
Plantation	Worker-day	52.09	3	156.27
Harvest				
Pulverization (6x)	Worker-day	52.09	3.6	187.52
Hoeing (2x)	Worker-day	52.09	30	1,562.70
Fertilizing	Worker-day	52.09	4	208.36
Turning the fruit	Worker-day	52.09	3	156.27

Irrigation				
Irrigation	Worker-day	52.09	3.13	163.04
Subtotal B				2,726.33
<u>C – INPUTS</u>				
c1. Fertilizers (**)				
Limestone	R\$/ton	142.92	2	285.84
Manure	R\$/ton	575	10	5,750.00
Urea	R\$/ton	1520	0.59	896.80
superphosphate	R\$/ton	1350	1	1,350.00
Potassium chloride	R\$/ton	2020	0.49	989.80
potassium sulfate	R\$/ton	3190	0.18	574.20
Phosphoric acid	R\$/kg	1.96	50	98.00
c2. Phytosanitary				
acaricide	R\$/ liter	19.87		344.44
Fungicide	R\$/kg	41.1		922.79
Insecticide	R\$/liter	31.6		198.50
Vegetal Oil	R\$/ liter	20	2	40.00
c3. herbicides				
Postemergence	R\$/litro	16.4	5.5	90.20
c4. Seeds				
Seeds	R\$/kg	430	1.2	516.00
Subtotal C				12,056.57
<u>D – ADMINISTRATION</u>				
Agronomist	R\$/ha	472.8	1	472.80
Accounting	R\$/ha	354.6	1	354.60
electricity / Phone	R\$/ha	472.8	1	472.80
Travels	R\$/ha	165.21	1	165.21
Taxes	% Revenue	2.30%	1	782.00
Subtotal D				2,247.41
Total Cost (R\$/ha)		20,149.17		
Revenue (R\$/ha)		34,000		
Result (R\$/ha)		13,815		
Cost per Kg (R\$/Kg)		0.81		

HM=Hour/machine V.U.=Unitary value Tp=Tire tractor

Obs.: The costs above do not include maintenance and investment expenses.

(*) Irrigation: The annual costs with irrigation include the expenses in depreciation, maintenance and electricity.

(**) Inputs: Average values. It is necessary to assess the soil situation.