

FACULDADES ALVES FARIA – ALFA

**DAIRY CLUSTER OF MORRINHOS AND PIRACANJUBA, GOIAS – CENTRAL
BRAZIL**

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MICROECONOMICS OF COMPETITIVENESS: CASE STUDIES

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1. INTRODUCTION

Dairy production and its derivatives is a complex business involving a significant number of players, can employ an important portion of the local working population and has intrinsic risks due to the perishability of its outcomes. Internationally there are strong participants operating dairy productive chains like the United States, United Kingdom, Germany, France, New Zealand, China, India, Pakistan and Brazil.

The dairy activities in Brazil are as old as the country itself dating back to the Sixteenth Century when the Portuguese colonizers started to bring the first herds from Europe. Since then the practice has been disseminated all over the territories at the same time transforming and becoming part of the Brazilian rural landscape.








In Central Brazil the cattle raising started to become relevant in the vacuum left by the gold and other mineral rush that happened in the Eighteenth Century. In those times the interiorization began in an intense form motivated by the discovery of precious minerals in the region of the states of Minas Gerais and Goias. For a long time and up to the 1960's, the state of Goias was identified with subsistence cattle raising and dairy activities were done with low technological level.

All the mentioned complexities involved in the dairy business justify the use of the cluster concept to approach a better understanding of the phenomenon. In this paper the challenge is to analyze and explore the dairy cluster in the cities of Morrinhos and Piracanjuba, both located in the state of Goias, in Central Brazil. The main purpose is to raise the main actors of this cluster, as well its determinants, where the locations have strong vocation for agribusiness, with focus on dairy cattle keeping.

2. DAIRY PRODUCTION TODAY

The main segments that compose the dairy production chain involve a large number of institutions and agents (Figure 1). It is a web of firms and entities with the following players: the input industry for agriculture and for manufacturing industry; dairy farms; milk collection and raw material transport; milk processing industries; distribution logistics, wholesalers, retailers and consumers – finally, industrial and government.

Figure 1 – Milk Production Chain

Input Industry	Primary Production	Milk Collection	Processing industries	Distribution	Market	Consumption
 <ul style="list-style-type: none"> - Seeds; - Fertilizers; - Feeds; - Vet Products; - Semen; - Equipment and Machine; - Input industry; - Packages; - Service delivery; - Technical assistance. 	 <ul style="list-style-type: none"> - Specialized producing units; - Non-specialized producing units. 	 <ul style="list-style-type: none"> - Logistics of Milk collection; - Bulk transportation. 	 <ul style="list-style-type: none"> - Cooperatives; - National and Multinational corporations; - Small dairy; - Mini-plants; - Imported dairy products; - Informal processing. 	 <ul style="list-style-type: none"> - Logistics of distribution; - Distribution Centers; - Refrigerated and Non-isothermal refrigerated transports. 	 <ul style="list-style-type: none"> - Wholesale, retail and informal market; - Supermarket; - Grocery stores; - Bakery; - Snack Bars; - Exporters. 	 <ul style="list-style-type: none"> - Consumer; - Food industry; - Government.

Source: Adapted from Machado (2014).

According to Mezzadri (2014), the biggest milk producer in 2014 was the European Union, producing 144.7 billion liters of milk, followed by India with production of 141.1 billion liters of milk, and in the third place of the ranking the United States, with production of 93.1 billion liters. As informed by the author, Brazil was in fifth place with a production of 33.3 billion liters of milk per year.

With regard to milk consumption, India was in 2014 the biggest consumer of the product and the countries that produce more are also the countries that consume more. Concerning this issue Brazil also placed in fifth position (Mezzadri, 2014).

Considering the annual production of milk per lactating cow (~ productivity) the Brazilian figures are well below the European Union, North America and some Asian countries, proving a low milk production per cow as shown in Table 1.

Table 1 – Production: Kg of milk per lactating cow / year

País	2011	2012	2013
United States	9,678	9,841	9,902
United Kingdom	7,630	7,665	7,758
Germany	7,237	7,280	7,293
France	4,335	6,587	6,414
New Zealand	3,829	4,128	3,947
Russia	3,857	3,913	3,900
Turkey	2,899	2,942	2,970
China	3,003	3,095	2,934
Brazil	1,382	1,417	1,492
India	1,321	1,361	1,350
Pakistan	1,230	1,230	1,230

Source: Adapted from Otto, Neves and Pinto (2012).

Taking into account the per capita consumption of milk, Brazil is among the ten biggest consumers (Otto; Neves; Pinto, 2012). Table 2 lists the main worldwide consumers.

Table 2 - Ranking of per capita consumption of liquid milk

Country	Kg/ inhab / year
Australia	151.81
Ukraine	128.86
Canada	117.81
United States	108.53
Russia	98.50
EU-27	91.32
Brazil	87.09
Argélia	79.73
New Zealand	79.53
Argentina	74.67

Source: Adapted from Otto, Neves and Pinto (2012).

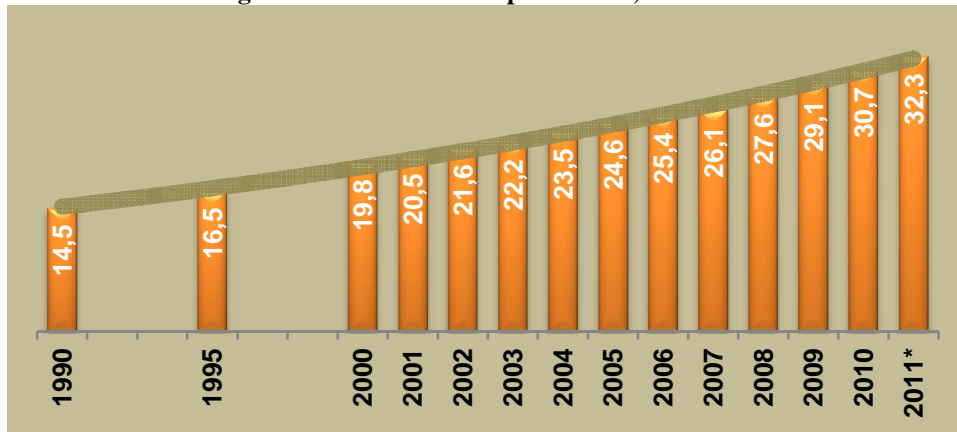
Regarding the milk history in Brazil, Lopes (2016) reports the milk production of the country started in 1532, year that the first cows and oxen carried from Europe to the new Portuguese colony, through the expedition of Martin Afonso de Souza. The product spread all over the country but without significant technological evolutions. In the decade of 1950 the milk industrialization began to develop, but a significant progress was perceived only from the 1980's on.

In the following two decades after the 1980's, according to Lopes (2016), the long shelf life milk (UHT – ultra high treatment) started gaining space and became one of the most sold forms in the country. This technology allowed an extended preservation of the product enabling other regions not only the metropolitan areas to produce milk and compete in the consumer market. Another important factor was the market opening after the 1990's, which happened in the country, and generated an invasion of imported products, including dairy products. This exposed domestic production to international competition and thus forced the milk activity to develop, to search more technology, to compete in the globalized market.

For this reason the milk production is one of the most traditional activities in the rural Brazilian environment (BRASIL, 2014). According to the agriculture census taken by IBGE, in 2006, there were around 1.35 million of rural establishments in the country that produced milk, involving approximately 5 million of people. Moreover this production moves mainly the economy of small and medium-sized municipalities.

The result of the technological advance, according to Lopes (2016) was an important growth in the Brazilian dairy production, and in the last 10 year this production grew 55% as shown in Figure 2.

Figure 2 – Brazilian milk production, 1990-2011



Source: Lopes (2016).

About national milk production, the Brazilian Institute for Geography and Statistics (IBGE, 2016) presented, for 2014, the South region as the biggest milk producer in the country followed by the Southeast region and in third the Mid-West region.

On one hand, a relevant fact however is that currently in Brazil almost 8.5% of the production establishments (around 115.000 producers) are responsible for 53.1% of milk produced in the country. On the other hand, 91.5% of the producers provides only 46.8% of the total milk. There are in consequence few producers with high productivity. All sorts of problems are related to the dairy activities: pure-bred animals with low ability for milk production; inappropriate food management, reproduction and sanitation; low level of instruction of producers which is an obstacle for the use of available technologies; and lack of agricultural extensions services (BRASIL, 2014).

Regard to the Brazilian exportations of dairy products, IBGE (2016) presented that the numbers are not significant. According to the Institute data, in the last 5 years, the importations always overcome the exportations. However in 2014 there was an improvement of 195.3% in the exports, signaling Brazil has thrived space in the external market of milk derivatives (LOPES, 2016).

What prevents partially the exportation to growth to more demanding markets is the problems with the quality of the Brazilian product (BRASIL, 2014). To mention as an example many countries potentially Brazil's competitors in dairy products, have eradicated the brucellosis and the tuberculosis in their cattle herds; these diseases persist even sporadically in the country.

According to Mezzadri (2014), the exportations, mainly after 2014, were driven by a set of factors: good internal production; the high of the dairy prices in the market, consequence of the appreciation of the Brazilian of the Real; and sales growth of milk powder

in the external market. Moreover, according to the author, the main destinations were Venezuela, Russia and Taiwan. The importations, in turn, are predominantly from Mercosur countries like Argentina and Uruguay.

Due the different challenges to be overcome and the characteristics of the livestock sector in Brazil, the Ministry of Agriculture, Livestock and Food Supply, developed the *Plano Mais Pecuária 2014* (More Cattle Raising Program 2014) which is split into two programs: *Mais Leite* and *Mais Carne* (More Milk and More Beef). Within each program there are many developed, related and managed projects in a coordinated way, to obtain results that allow achieving the strategic objective of the Plan. The projects are grouped in four axes: genetic improvement; market expansion; technology adoption; and safety and quality of the products.

The frames 1, 2, 3 and 4 show the objectives and the responsible for the management strategy in the *Plano Mais Leite* in Brazil.

Frame 1 – Genetic improvement

Objectives	Increase the offer of improved animals, which are interest to the dairy farming in country; Increase the use of genetic material of improved animals by the rural producers; Provision of information about the bovine genetic in the country.
Responsible	Secretariat for Development and Cooperatives.

Source: Adapted from *Plano Mais Pecuária* (MAPA, 2014).

According to PMP (2014) this axis has as scope: to articulate and support financing from Breeder Associations and other institutions that do animal breeding; to incorporate of the use of genomics in Brazilian genetic breeding programs; to encourage the adoption of genetic improvement and trainings in artificial insemination; to encourage the acquisition of cows and improved bulls; to strengthen and enlarge the programs of dissemination of genetic material from improved animals; to modernize of the National Zootechnical Archive; and to review of the legislation about the genealogical records.

Frame 2 – Extension of Market

Objectives	Increase the milk and other dairy products consumption; Increase the number of countries buyers of the Brazilian milk.
Responsible	Secretariat for Development and Cooperatives.

Source: Adapted from *Plano Mais Pecuária* (MAPA, 2014).

The axis related to the Extension of Market, the PMP (MAPA, 2014) has as purpose: to articulate and support financially milk marketing action in the internal market and the creation of products with geographic indication and with distinctive signs; to stimulate public agencies to promote research projects to develop new dairy products with higher added value,

as non-allergenic products and the functional ones; to promote and financially support actions of international marketing of Brazilian milk; to map new markets and support new projects for markets extension with partnership with APEX (Brazilian Agency for Promotion of Exports and Investments).

Frame 3 – Technology adoption

Objectives	Empower technicians, producers and rural producers; Promote technological solutions to the sector bottlenecks; Increase the transfer of the technology to the rural producer.
Responsible	Secretariat for Development and Cooperatives.

Source: Adapted from *Plano Mais Pecuária* (MAPA, 2014).

With focus on the technology incorporation, the project has as scope: to articulate and financially support initiatives with the objective of training producers, technicians and rural workers in techniques of farm management, nutritional and pasture management, sanitary and reproductive management besides techniques of milk production with quality; to articulate with educational institutions such as SENAR (National Rural Apprenticeship Service), EMATER (Technical Assistance and Rural Extension), ANATER (National Agency for Technical Rural Assistance), etc.; to promote research programs in the areas of milk quality, animal and plant genetic improvement, sustainable management, livestock accuracy and animal health; to articulate along with governmental technical agencies such as CNPQ (National Council for Scientific and Technological Development), FINEP (The Study and Project Funding Agency), EMBRAPA (Brazilian Agricultural Research Corporation), OEPAs (State Organizations for Agricultural Research) and the Universities; to articulate and support financially the expansion of projects of proven efficiency in rural management properties; and to support the diffusion of sustainable technologies.

Frame 4 – Safety and Quality of the products

Objectives	Improve the milk quality made in Brazilian rural properties; Promote the oversight of products that come from animal origin in the country; Reduce the prevalence of bovine brucellosis and tuberculosis in the Brazilian herd.
Responsible	Secretariat for Development and Cooperatives, Secretariat for Agriculture Defense.

Source: Adapted from *Plano Mais Pecuária* (MAPA, 2014).

Finally, the axis that treats the Safety and Quality of the products has a scope: to articulate and support financially the expansion of projects of proven efficiency in milk production with quality; to support projects of structure that result in improved of milk production with quality; to support the project of structure that result in improved of milk

such as construction of electric network, road paving, and others; to improve management of the Brazilian Network of Milk Quality (RBQL); to accompany the adequacy of results from analysis within standards of IN 62/2011¹ and the National Program for Control of Residues and Contaminants and modernization of current legislation (ex. RIISPOA²); to articulate and support elaboration of plans of state and private actions to control and eradicate Bovine Brucellosis and Tuberculosis; and to review the current legislation.

3. DAIRY PRODUCTION IN GOIAS

The State of Goiás, located in the Mid-West Region of Brazil, is composed of 246 municipalities, has a huge territorial extension and favorable climate, being highlighted in the agricultural production of the country. Goiás participation in the national GDP is small – less than 3% - but it grows at a faster pace than Brazilian average, and occupies the ninth position among the states of the country (Otto; Neves; Pinto, 2012). According to Institute Mauro Borges for Statistics and Socioeconomic Studies (IMB, 2016), the agriculture highlights Goiás economy with participation of 12,3% in Gross Added Value to basic state prices.

Goiás is presenting an important increase in the last years in its livestock production including milk and its derivatives (Otto, Neves and Pinto, 2012). This is mainly because of the fertile lands, abundance of water, favorable weather, modernization of the cultivation pastures and feeding techniques, beyond the more efficient animal management.

In relation to the participation of production of milk in Brazil, the Institute points Goiás produced in 2013, 11.0% of the national total. Historically analyzing in 1974 the milk production in Goiás was 452.4 million of liters. In 1993 the production was 1.4 billion; in other words, in two decades the production grew more than 200%, much higher than national growth in the same period which was 120%. In 2013 the State produced 3.7 billion of liters of milk and there was an increase of 168% in relation to 1994, while the production increase in the country was 117% (IBGE, 2016).

The dairy market suffered changes in its dynamism, which brings more complexity to the transactions in the productive chain. According to Silva, Buschnelli and Pasqualetto (2013, p. 2860), “the dairy production in Goiás underwent an intense modernization process in the decades of 1990 and 2000”. To the authors there was a significant evolution in the production procedures: the milking was manual once a day and the productivity was between

¹ Normative Instructions nº 51/2002 e nº 62/2011, which set deadlines and quality standards to the milk to be commercialized.

² RIISPOA – Regulation of Industrial and Sanitary Inspection of Animal Origin Products.

3 to 7 liters per day; the cattle was more rustic, had a free grazed feeding and in times of drought, the feed supplementation was realized with corn and cane sugar. Currently the milking is mechanic normally twice a day, the cattle from improved genetic are fed basically with balanced processed industrial food. The production per head grew from 8 to 20 liters/day on average (Silva, Buschnelli and Pasqualetto, 2013).

The data from IBGE showed examples of modernization in the municipalities of Morrinhos and Piracanjuba, a higher dairy production to the region way above the country average according to Table 3.

Table 3 – Milk Production (1,000 liters) from Morrinhos and Piracanjuba x Brazil

	1990	2014	Evolution %
Brazil	14,484,414	35,274,171	143.53%
Goiás	1,071,966	3,684,341	243.70%
Piracanjuba	27,791	154,800	457.01%
Morrinhos	26,900	80,000	197.39%

Source: Adapted from IBGE (2016).

Therefore, the productive milk chain in Brazil and in Goiás has a high relevance in economic environment once it generates wealth, employs regional labor force and ensures food and income to the population (Silva, Buschnelli and Pasqualetto, 2013).

4. INFORMATION ABOUT THE REGION

IBGE proposes the division of Brazilian territory in micro and mesoregions. According to the Institute mesoregion is an individualized area in one Federation Unity that presents form of organization of geographic space defined by the following dimensions: the social process as determinant, the natural geographic framework, the communication network and the elements of spatial articulation (Lima, 2002). This generates a region identity to the mesoregion built along history by the society that lives there.

In another way microregion is a division that covers parts of a mesoregion with some specificities on the organization of space. However they do not need necessarily to have the same attributes not either need to be self-sufficient or exclusive/unique (Lima, 2002).

In the case of Goiás State the territory is divided in five geographic mesoregions: Middle, East, North-West, North and South (IMB, 2016). In its turn the mesoregions are subdivided in 18 geographic microregions where are locates the 246 municipalities of the State. The 18 geographic micro-regions are the following: Anicuns, Anápolis, Aragarças, Catalão, Ceres, Chapada dos Veadeiros, Entorno do Distrito Federal, Goiânia, Iporá, Meia

Ponte, Pires do Rio, Porangatu, Quirinópolis, Rio Vermelho, Sudoeste, São Miguel do Araguaia, Vale do Rio dos Bois and Paranã (IMB, 2016).

Particularly the Municipalities Morrinhos and Piracanjuba, the focus of this study, are located in Meia Ponte microregion which also is composed by the municipalities of Água Limpa, Aloândia, Bom Jesus de Goiás, Buriti Alegre, Cachoeira Dourada, Caldas Novas, Cromínia, Goiatuba, Inaciolândia, Itumbiara, Joviânia, Mairipotaba, Marzagão, Panamá, Pontalina, Porteirão, Professor Jamil, Rio Quente and Vicentinópolis (IMB, 2016).

In a socioeconomic context, Meia Ponte microregion occupies a prominent place in the national milk production being in third place in the ranking of the main milk microregions producers of the country. Producing 467,610 thousand liters a year, the Meia Ponte microregion is just after Chapeco microregion (638,029), in Southern State of Santa Catarina, and Passo Fundo microregion (475,121), in the State Rio Grande do Sul, also in the South region of Brazil (EMBRAPA, 2015).

5. REGION ECONOMIC PERFORMANCE AND FORMATION

As mentioned before the municipalities of Morrinhos and Piracanjuba are located in the same microregion of Meia Ponte in Goiás State and as Table 4 shows they have closer characteristics.

Table 4 – Characteristics of the Municipalities

	Morrinhos	Piracanjuba
Estimated Population 2015	44,607	24,772
Population 2010	41,460	24,026
Area of Territorial unit (km²)	2,846,199	2,403,167
GDP per capita at current prices 2013	24,318	24,329
IDHM 2010	0,734	0,721
Resident population literate	35,604	20,372

Source: Adapted from IBGE (2016).

According to Table 4, it is seen that despite differences such as population and territorial area, the municipalities present similarities in economic product (GDP) and also in terms of quality of life (IDHM), with small variation. The next topics will present in greater depth the characteristics of the two municipalities studied in this paper.

5.1 Characteristics of the Municipality of Morrinhos

The Municipality of Morrinhos is located in the South of Goiás, in Meia Ponte microregion. In 2015, Morrinhos had an estimated population of 44,607 inhabitants (IBGE, 2016). According to IMB (2016) Morrinhos is a municipality with high agriculture potential.

This sector took part with 25.3% in the city added value of the municipality in 2013 (IMB, 2016). The service sector is the one with highest share of added value, 56.2%. In the industrial sector (18.5%), the transformation industry is the more important with 71.1% of the sector's VA, with the presence of food industries (dairy products and slaughterhouses) and alcohol fabrication industries.

In the agriculture sector, besides the milk productive chain, Morrinhos economy has also presence in horticulture, seed production (soybean, corn) and sugar cane. It is the second largest producer of industrial tomato in the State, with production of 125,500 tons in 2014 (IMB, 2016; IBGE, 2016).

According to the Survey on the Municipal Cattle Production (PPM) data in the year of 2013, Morrinhos occupied the first place in the milk production of Goias. In 2013, the state produced 165.5 million of milk liters, there was an increase of 319% in relation to 1994, while the production growth in the State was 168%. In relation to the total of the State, the participation of milk production from Morrinhos municipality was 4.4% according to the survey on the Municipal Cattle Production (IBGE, 2016). However, in 2014, there was a significant decline in milk production, closing the year with 80,000 thousand milk liters.

The municipality in 2013 had an average productivity of 1,770 liters/cow/year. In the same period the average productivity in the state and in the country was 1,387 and 1,492 liters/cow/year respectively (IBGE, 2016). Therefore, the municipality of Morrinhos has an average milk productivity higher than the State and the Country.

Beyond these dairy production characteristics of the municipality, in educational field, Morrinhos has a *Campus* of Goiano Federal Institute and offers the following technical professionalized courses: Informatics, Food, Agribusiness and Agriculture. The offered courses in graduation level are: Internet Systems, Foods, Animal Production, Chemistry, Pedagogy and Agronomy. It is observed that many courses offered by the Institute have affinity with the main economic activity of the municipality.

Morrinhos also has a Campus of the State University of Goias (UEG), which offers different courses but none of them are focused in the milk business. Besides these public institutions, there are several private institutions that also offer higher education in the municipality.

Finally, in the economic aspects, according to IMB (2016), the municipality is considered an "Economy of High Capacity", in other words, present a total GDP above the

average of other Brazilian municipalities of similar size. In Goiás there are only other 20 municipalities with the standards of Morrinhos.

5.1 Characteristics of the Municipality of Piracanjuba

The Piracanjuba region is also located in South of Goiás in Meia Ponte microregion, which weather is hot with rainy summers and dry winters. The predominant vegetation is savanna, with small patches of riparian forests along the rivers. The arable lands are dominated by artificial pastures, rice plantations, corn, soybean and cassava (IMB, 2016).

The economic basis of the municipality is the dairy farming where the herd is one of the biggest in de State with 86,000 heads of milky cows (IBGE, 2016). In 2014, the milk production in Piracanjuba was 154,800 thousand liters per year, higher than Morrinhos' production, which obtained an average production of 80,000 thousand liters in 2014, a reduction of 48% in relation to 2013, according to IBGE (2015) data. The average productivity of the municipality is 1,715 liters/cow/year, also higher than the state and the country productivity, of 1,387 and 1,492 liters/cow/year, respectively. Beyond the milk productive chain, the municipality cultivates pineapple, orange and passion fruit (IMB, 2016).

In an educational perspective, Piracanjuba is behind Morrinhos because there is no public institution that offers technical and higher education. Some few private institutions offer higher education in the city, but its focus is the agribusiness.

In relation to the economic aspect according to the Mauro Borges Institute the municipality is considered as an "Economy of Medium-Sized Capacity". In other words, its economic production is similar to median of Brazilian municipalities, with an intermediate growth.

In relation to the Financial Institutions, both municipalities are supplied by many banks public or private. *Banco do Brasil* has branches in both cities contributing to the allocation of resources from federal governmental financial support funds, like FCO - Constitutional Fund of Center West, one of the most important credit lines for long-term investments in agribusiness. *Caixa Econômica Federal* is also a governmental financial institution present in both municipalities, as much as other private banks, which the main ones are *Itáu* and *Bradesco*.

6. BUSINESS ENVIRONMENT OF THE REGION

According to IBGE (2016) the dairy production from Meia Ponte microregion in 2014 was 565,317 thousand liters, representing approximately 16% of the total production of the state. In relation to municipalities of Morrinhos and Piracanjuba, the production in the same year represented 27.4% and 14.2% respectively of all production of the micro-region, being both cities the biggest milk producers in Meia Ponte.

Corroborating this information, Table 5 presents a data summary from IBGE, where are presented the milk production numbers in both municipalities during the years of 2004 to 2014 (IBGE, 2016).

Table 5 – Dairy Production (1,000 liters/year): Comparative between the Municipalities

YEAR	MORRINHOS	PIRACANJUBA
2014	80,000,000	154,800,000
2013	165,495,000	147,490,000
2012	144,150,000	123,280,000
2011	128,800,000	117,936,000
2010	112,007,000	114,313,000
2009	94,998,000	112,395,000
2008	80,807,000	107,942,000
2007	74,073,000	98,947,000
2006	67,339,000	89,952,000
2005	70,883,000	92,734,000
2004	74,613,000	90,033,000

Source: Adapted from IBGE (2016).

Finally, assessing the cattle herd performance in numbers of cattle heads, and the number of milky cows in both Municipalities, it is seen that in 2014, Piracanjuba presented a total of 235,000 cattle heads and 86,000 lactating cows. In Morrinhos the size of cattle herd was bigger representing in the same year a total of 286,000 heads; the number of lactating cows stands behind Piracanjuba, with 44,500 cows (IMB, 2016).

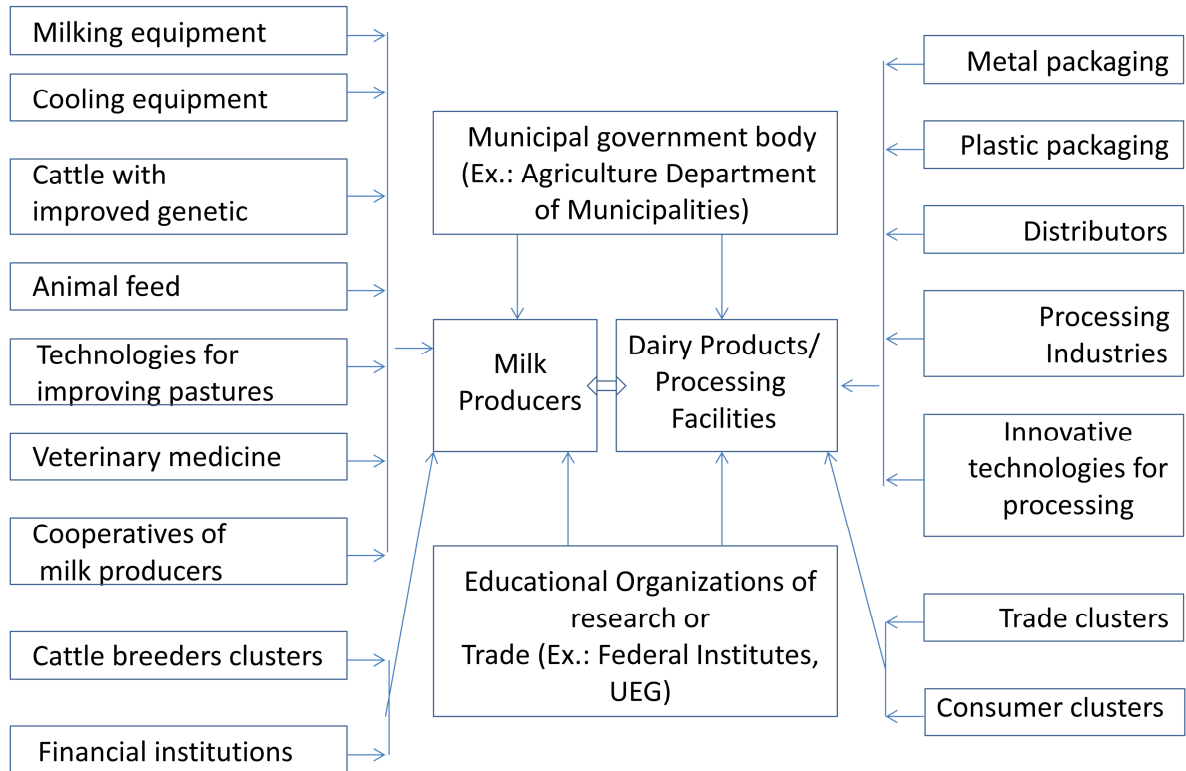
7. THE DAIRY CLUSTER

For a better understanding of how the Dairy Cluster under study is formed, Figure 3 illustrates the interdependent relation in dairy productive chain.

Given the elements and the relations presented in the Dairy Cluster under study, it is observed companies looking for differentials to face the strong competition in the market. The Porter's Diamond model (Figure 4) is totally applied to the explored business cluster, where this model is composed by four key factors of competitive advantage: the factor conditions; the demand conditions; the correlated and supporting industries; and the strategy, structure and rivalry of sector's firms (Porter, 1990).

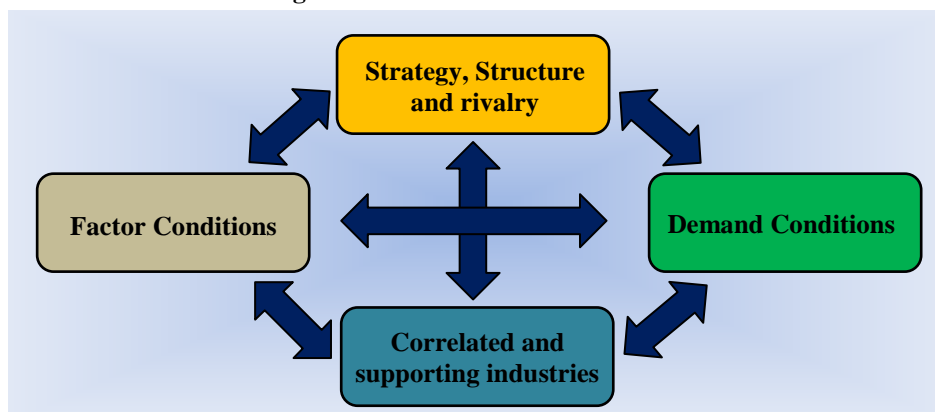
Porter (1990) points out that through this model it is possible to identify the competitiveness basis of a sector in a specific geographic location. The next topics will explore in details each of the dimension of the Porter's diamond model adapted to the dairy cluster of the municipalities of Morrinhos and Piracanjuba in the state of Goias.

Figure 3 – Dairy Cluster



Source: Elaborated by the Authors (2016).

Figure 4 – Model of Porter's Diamond



Source: Adapted from Porter (1990).

7.1 Factor Conditions

In Porter's Diamond Model, the conditions of production factors are related to the fundamental structure makes the region competitive, such as availability of qualified manpower, access to technology, availability of natural and financial resources, infrastructure, etc. (Otto; Neves; Pinto, 2012).

With a view to the milk production in the studied region, there are many involved interdependent relations among the players involved: milking machines, cooling machines; cattle with an improved genetic; food to animal; technologies to improvement of pastures; veterinary medicines; and cooperatives of milk production. The action of these components in the cluster has the purpose to amplify the production with focus to the increase of productivity and reduction of primary costs.

Events such as "a day in the country" and technological events are also initiatives that promote the development of the activity in the municipalities. For example, the TECNOLEITE COMPLEM 2016, promoted by the Cooperative of Milk Producers of Morrinhos (COMPLEM) which occurred in the period of 17 to 20 of May is now in its sixth edition. It is considered one of the biggest technological events in terms of dairy production of the State.

According to Machado (2014), the producers have sought to invest in the dairy activities to raise the technological level of the farms, with the promotion of expansion or the improvement of the facilities, purchasing of machinery and equipment, and with the acquisition of new animals too.

The technology also has a major role in the cluster development. According to Otto, Neves and Pinto (2012), the development of technology in the production process, aligned to the genetic improvements of the dairy herd, by the use of races from European origin, enable the increase of production and the competitiveness.

One important component of the factor conditions is the educational organizations that operate in this cluster under study, as developers of manpower in the municipalities. They also play an important function in the research, improving not only the processing of the raw material but also improving the processes occurred in primary production.

Another important element related to the dairy farming are the financial institutions, which focused in agribusiness through specific packages, allowing the financing and the development of dairy activity. The long-term financing as those granted by the federal government funds like FCO - Fund of the Middle-West. Operated by *Banco do Brasil* this

fund allows the milk producer to finance the acquisition of cow and technological equipment for milking as much as warehouses and equipment in general, in order to improve the productivity and quality gains, storage and handling of milk.

According IBGE data published in Portal Brasil website, the volume of milk produced in the country has increased each year enlarging 50% in the last 10 years.

Focusing the productivity the Federal Government plans to launch a program that will cover the five biggest milk producers states in Brazil: Rio Grande do Sul, Santa Catarina, Goias, Minas Gerais and Parana, and will benefit small and big producers in these States, which together are responsible for 73% of dairy production in the country. The measures to be adopted refer to the eradication of brucellosis and tuberculosis in the dairy herd according to *Plano Mais Pecuária* (MAPA, 2014).

7.2 Demand Conditions

According to Otto, Neves and Pinto (2012) the Brazilian population specifically the middle class is presenting an increase which affects positively the consumption of milk and other dairy products. Focusing the regions of the country the authors point Northeast presents the bigger consumption potential as well as the one that has the fastest growing.

Although the Brazilian domestic consumption is heated, there is an unfavorable counterpoint to the producers because of an incentive to import products from Mercosur countries. This might reduce the profitability of dairy farmers due to the high costs of the production chain (Otto; Neves; Pinto, 2012).

In contrast, the biggest Brazilian purchase power makes the consumers more demanding, which requires more product development, with intense use of new technologies. The consumers (final consumers, wholesalers, industries and companies), and the public in general, have little influence in the development of the productive chain mainly and in the formation of final prices (Machado, 2014).

The final consumer is demanding recently new forms of milk and its derivatives: lights, diets, lactose free versions with or without Probiotics (allergic and functional). These new formats respond to the demand of products to those consumers with health problem, restrictive diets, or those who follow more healthy or differentiated nutritional diet. These products represent opportunities of adding value because the final cost to the consumer is well higher.

Finally in terms of demand conditions, there is the problem of seasonality of dairy production in Brazil. Due to periods of drought and different conditions, specifically between the months of May and September, the cost of production increases and the prices have to be passed on to the clients, consequently reducing the consumption in this part of the year (Otto; Neves; Pinto, 2012).

7.3 Correlated and Supporting Industries

The factor correlated and supporting industries is associated to the existence of suppliers of products and services, buying industries and distribution channels, or even other kinds of industries that promote the share of technologies and knowledge that result in an increase of the competitiveness of the chain (Otto; Neves; Pinto, 2012).

Analyzing the collection, processing and distribution, in dairy cluster, the dairy products are the main element that influence all the productive chain. According to Machado (2014), the relation between producers and milk processors presents difficulties especially the lack of transparency in the price formation, where farmers complain they do not know how the value paid by industries for the raw materials is calculated. Moreover, they have no notion about the variables that make the calculation. For example: raw material quality, volume, distance, collecting temperature, fidelity, among others.

Machado (2014) also argues that in a perception of processor industries the difficulties of the relation with the producer are due in first place to the fact that the producer always are focused on price formation and only secondarily they care about other issues.

Otto, Neves and Pinto (2012) also point to other barriers affecting processors industries such as high logistic costs, mainly the cost related to the freight since the dairies do not organize themselves to acquire the product collectively. To this situation, the authors present as solution the constitution of Local Production Arrangements near the agribusiness, since they minimize the conflicts/costs of all productive chain.

However, besides the present conflicts, the dairies are prioritizing the technological innovations, both on processing and development of products as well as the logistics of these products to the supermarket shelves.

7.4 Structure, Strategy e Rivalry between firms

In this determinant, the aspects are considered in relation to the context where the firms are created, organized and directed, as well as the nature of internal rivalry of

arrangement, because the competitive environment requires from companies the quest for differentiation.

In this context and with focus on the milk processors industries of the studied region, the Leite Brasil magazine published in the year of 2016 the ranking of the biggest dairies in Brazil, where two firms of Piracanjuba, Itambé and Bela Vista, were the third and fourth place respectively in the item “milking” out of 15 companies.

Analyzing the number of producers that supply the dairies, also according to the magazine, Bela Vista Dairy ranked in second place with 6,619 producers and Itambé Dairy ranked in fourth place receiving milk from 5,716 producers.

In the case of Morrinhos, one of the most important player of the cluster is the Cooperativa Mista dos Produtores de Leite de Morrinhos (COMPLEM, 2016), founded on 26 June 1978. Initially it was affiliate to the Central Cooperative of Dairies of São Paulo, which has already operated in the region since 1975. Only in December of 2002, the milk producers from Morrinhos realized that the dairy branch could be a good investment and decided to organize themselves. In this period there was a definitive rupture with the cooperative from Sao Paulo (the richer Southern state), and since then Complem belonged only to its members in Morrinhos.

According to information from the cooperative website, currently 100% of the captured milk by Complem is industrialized in its factories. Today there is a manufacturing unit of dairies in the municipalities of Caldas Novas, Rio Quente, Água Limpa, Edealina, besides the Distribution Centers in the big cities Goiânia and Brasília (COMPLEM, 2016).

Complem has a total of 4,093 members according to the Cooperative data. The principal products developed are UHT milk, pasteurized milk, mozzarella cheese, dairy beverage, cream cheese, heavy cream *in natura*, milk jam and butter, involving a total of 26 products in its mix of dairy line. The cooperative also has supermarkets and agribusiness stores in 12 municipalities of the region, as much as a gas stations in Morrinhos, a mineral salt factory; a feed fabric and a grain storage unit (COMPLEM, 2016).

According to Complem website information, the Cooperative looks for the improvement and enhancement in all sectors of the companies. Recently it was implemented the granulation process of the milk collection and the raw material started to be cooling in their own farms, realizing a real leap in terms of conservation of milk quality. Other innovation involves the technical assistance with the producers: a team of professionals is

acting directly in the agricultural sector with products such as agricultural pesticides, fertilizers, seeds, etc.

In Piracanjuba there is the Agricultural Cooperative of Piracajuba (COAPIL), an entity with 40 years of existence. The Cooperative is reference in the State of Goias and deals with more than 600 producers in the segment. Coapil has recently 1,485 members, employs 232 employees and keeps operating the constant units of veterinary drug stores, gas station, feed factory and mineralized salt, supermarket, post milk reception, general warehouse constituted by four grain silos with a total capacity of 400,000 grain bags. Recently it is receiving around 140,000 liters of milk per day in its Post Milk Reception (COAPIL, 2016).

Besides the cooperative, the rural producers associated to the Coapil founded Sicoob Goias Coapil, a non-banking financial institution constituted to supply them with rural credit, with purpose to develop the agribusiness activity as a whole in Piracanjuba (COAPIL, 2016).

In Porter's Diamond Model the government role appears as influencer of international competitiveness of a nation because in all levels the government actions, - the elaboration of policy-stimulation, the variations in the fiscal, monetary and spending policies, the establishing barriers, among other -, can improve or worsen the competitive advantage of a country. The government can influence and be influenced by the four Diamond aspects cited above and it is exactly this influence that determines the positive and/or negative character of the government in the creation process of competitive advantage.

According to Otto, Neves and Pinto (2012), projects and actions that involve public and private initiatives are essential to make productive chain grow in a sustainable form. They also pointed that paucity of information and studies to support the public policies and the business strategies have become an obstacle in Brazil for a more rapid development, which results in lesser degree of competitiveness in different sectors of the economy.

With focus on government action and its public policies, Machado (2014) points out that in the Government vision, the credit for financing the dairy business is the most important policy for the rural producers. However some producers argue that fiscal waivers are what they really need. The author points to an interest curiosity: despite the fact that these producers highlight the reduction of the tax burden as the main stimulus to activity, they have little knowledge of these policies.

8. BUSINESS ENVIRONMENT OF THE CLUSTER

Analyzing the cluster business environment, it is necessary to study the competitiveness of the milk production segment. According to Lopes (2016) the key-agents of the dairy productive chain should be identified and the competitiveness assessed with focus on seven drivers: management, quality, technology, productive resources, market structure, institutional environment and market relationships.

Thus, according to Carvalhaes, Cunha and Wander (2015), the business environment of the dairy cluster can be valued by the following form: the negotiation power of the small producers and small-sized and fragile industries; low technological index in terms of genetic quality of the herd and the management; low scale of management of activity; indebted producers; unsuccessful public policies (for example the FCO - Constitutional Fund of the Middle-West); reduction of pasture area motivated by the expansion of the sugar and alcohol sector; poor police enforcement of the raw material in rural properties; low productivity for long periods of drought; instability of the milk prices; high production costs driven by spendings on concentrated feed and manpower; and producers in milk branch for a long time resistant to technological changes.

There are another prominent aspects such as the improvement in quality of the final product; the existence of an efficient and well organized agro industrial structure; the proximity to big cities and urban regions such as Goiânia, Brasília, Triângulo Mineiro and São Paulo; existence of cooperative that promotes the dairy activity in the region; and the harmonic relation between supermarkets and the agents of productive chain, which facilitates the commercialization and reduce the opportunism of intermediation, among others.

According to Lopes (2016) the scenario to dairy sector is promising. It has been sought more and more efficiency in the agricultural productivity of corn, soybean, sugar cane and others, what will generate more competitive costs in the feed production to the cows. Beyond this, according to the author, Brazil inevitably, will expand its exportations of dairy products, since the high potential of increasing of the production and the industrialization already installed in the region and in the country.

Looking at the internal Brazilian market, there is also room for improvement: the milk consumption per person per year suggested by the World Health Organization, is 210 liters, 17% less than the actual 173.6 liters/person/year (CONAB, 2016). Moreover, with the recent average increase of the Brazilian income, the tendency is toward demand expansion of milk *in natura* and its derivatives with higher value-added.

9. RECCOMENDATIONS FOR THE REGION

According to Silva, Buschnelli and Pasqualetto (2013, p. 2871), there is “a need of research intensification about technologies less intensive in the use of industrial supplies and the development of dairy races better adapted to the tropical climate and to the pastures of the goiano savanna”. There are still many things to be evaluated in these aspects in order for the dairy business to have a better productivity with sustainability, without higher damages to the local environment, to the people and to the fauna in general.

In this regard, the region needs to create and reinforce programs of genetic improvement, both in specialized races and in adapted races to the weather conditions and the management. It needs to expand the use of artificial insemination since recently only around 10% of the dairy cows receive the reproductive biotechnology (BRASIL, 2014). Besides providing genetics with high quality to the producers of the region, the increase of this activity will also promote the livestock development as a whole, bringing jobs and income. It could offer to other localities improved animals of interest to the dairy farming.

Furthermore, taking into account this historical vocation of milk production in the region, there is a need in the logistics improvement, considering the product perishability. Recently the overland route is the only kind of transportation of these products. However, not only expensive, it is a lengthy transport and demands more cooling structure. The land road network can be considered a good choice, but there is no other ongoing project such as air transport or railways.

This item also includes the electric energy issue. The region has already presented problems in providing energy with frequent interruptions and failures, which brings losses of products and loss to the producers and to the industry. It is necessary that the electric energy provider improves the supply and other electric generators (solar, wind) need to be incorporated in order to reduce the impacts of any failure in the supply.

Moreover, there is a concern about professional formation, both in acting in the milk production and cattle management, and in the industrialization and distribution. There is a need for a higher investment, public or private, in qualification, formation and actualization as much as research and development (Silva, Buschnelli and Pasqualetto, 2015).

10. RECCOMENDATIONS FOR THE CLUSTER

In face of what was studied, some recommendations and direction will be realized with the purpose to strengthen the productive chain, as well as the promotion of competitive efficiency to the Cluster under study.

It is recommended to the business cluster, among other aspects, according to Tupy (2010), to avoid cows of races that do not add higher productivity such as Zebu cattle, adopting preferably Dutch genotypes, jersey and its mestizo.

According to Otto, Neves and Pinto (2012), the technology development in the production process aligned to the genetic improvement of the dairy cattle by the use of races from European origin, allow the increasing of production and competitiveness. It is necessary a higher application in research resources, beyond existing technologies, which enable the fixation of these races of animals in the region. To the authors investments in quality food, animal comfort, arrangement and sanity, will allow the local producers to enjoy the productive potential of the Holsteins.

Other aspect that calls attention is the cattle sanity, which according to Otto, Neves and Pinto (2012). According to these authors one of the weakest points verified in the productive chain in Goiás are the poor control by farmers over diseases and parasites. This is especially important since the raw material and the final product are fully associated to the population health, mainly the child and elderly audience. Also in this aspect, the authors argue that there must be a mobilization, of all involved, encouraging campaigns and intense policies, in order to increase the security in the productive process conditions and raise the quality of the milk and derivatives produced.

The milk productive chain in Goiás must seek the leadership in profitability and technical assistance, because this way it would achieve reduction of the impacts in the production costs, and increase of milk quality and synergy among all links in dairy sector. In this regard, federal government programs like Technical Assistance for Rural Producer (MAPA, 2016) will provide besides productivity gains, technological transference, higher emphasis on intense exploration of pastures, realization of rotated grazing of animals and the treatment of pastures with fertilizing/renovation techniques.

Other necessary and fundamental point to the dairy cluster is to invest in the transference of skills and new technologies to rural producers. For this it is necessary that the cluster articulates with institutions of state (State Agriculture Association, State Technical Assistance Company, State Agriculture Secretary) and national amplitude (Brazilian

Agricultural Research Corporation, National Learning Rural Service, Agriculture Ministry, among others), to realize projects of producers, technicians and rural employees, in management methods of rural propriety, nutritional and pastures management, sanitary and reproductive management, as much as milk production with quality (Otto; Neves; Pinto, 2012).

Despite the satisfactory number of cooperatives in the state of Goiás, it is essential to have more initiatives for associativity and cooperative spirit, suggesting the entities to improve their images among the producers, influencing their perception towards a fundamental role for increasing its bargaining power. Moreover, it is recommended that these cooperatives diversify their actions, promoting competitions that recognize the producers with higher adherence to established parameters by the regulatory bodies, as well the creation of certification that recognizes the producer by the quality of his products and social-environmental responsibility.

With focus on the feed supplied to cattle, it is advisable an adequate monitoring under technical advice, so that quantity supplied would be correct, in terms of weight and nutritional quality. The correct ration supply, according to the profile of herd production, can be a crucial factor to the business profitability (Tupy, 2011).

Another important issue for the region is the investment in grain storage, since the expansion of storage structures could benefit the local producers, enabling the acquisition of inputs in bulk, what reduces the costs substantially with animal ration (Otto; Neves; Pinto, 2012). Furthermore, this action could facilitate the products logistics and consequently a reducing expenditure with freight of raw material transport, which could benefit the acquisition in higher production times and lower prices.

In terms of local dairy industries, one suggestion is to create products with geographic indication and with different signals, which differentiate the production in the region. Besides, the development of new dairy products with higher added value such as non-allergic and functional products should be stimulated (BRASIL, 2014). Thus, the products portfolio enlargement enables the differentiation of the other competitors on the market as much as the possibility of growth in demand.

Finally, it is also recommended to Morrinhos and Piracanjuba cluster to have effective actions alignment to the strategies from federal government agencies, e.g. *Plano Mais Pecuária: Mais Leite 2014*. This governmental program prioritizes many grouped projects in

specific axes, which objectives and well-defined scopes will enable the evolution of the state of Goiás dairy cluster.

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