

CONILON Coffee

3rd Edition

Updated and expanded

The Coffea canephora produced in Brazil

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Coffea canephora

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1 INTRODUCTION

Coffee, originally from Africa and with a history of over a thousand years, has always been marked by legends, grandeur, religiosity, hard work, science, interactions, cycles, dreams, ambitions, progress, frustrations, pride, joy and pleasure. It is a beverage that surprises every year, gains adepts, has its production increased and its quality improved.

It stands out as an agricultural product, among the most important in social and economic aspects for more than 60 producing countries (ICO, 2012) and for hundreds of other consumer markets, constituting one of the five most traded agricultural potential in the world (FAO, 2010).

Coffee stands out in the world economy, occupying the second place in the generation of the planet wealth, after the oil (MISHRA; SLATER, 2012). It has moved more than 90 billion dollars a year. However, less than 10% of that value is left to producer countries. Its productive chain employs directly or indirectly about half a billion people, corresponding to about 8% of the world population. Only in production and marketing activities it demands the direct and indirect work of more than 100 million people, the great majority of whom are small farmers living in developing countries (CIC, 2010).

History shows that even with the many consumption restrictions, little by little the planting and use of coffee was disseminated in different parts, becoming the second most consumed natural beverage in the world, being universal, without socioeconomic distinction of people, races, religions and cultures.

According to Davicon and Ponte (2005), at the beginning of the 21st century, coffee consumption in the world was estimated at about 2.25 billion cups. However, the act of consumption of the product, at the time, differs a lot from the current standard, since new concepts related to the forms of preparation and consumption have been included, where the consumers can choose between hundreds of blends available regarding origin, methods of grinding, flavorings, packaging, types of preparation, beverages and "social and/or environmental content".

From the 124 listed species of *Coffea*, *Coffea arabica* (arabica coffee) and *Coffea canephora* (conilon and robusta coffee) are responsible for almost all coffee consumed in the world (DAVIS et al., 2011). Regarding its production, it can be verified that the statistics from different sources are divergent. The literature shows a world production in 2014 between 143.0 and 152.6 million

of 60kg processed coffee bags, with a more real value estimated around 146 million bags. Even with the differences in numbers, from 81 to 88 million bags for arabica coffee and from 55 to 65 million bags for conilon and robusta coffee, there is a very close balance between world production and consumption (CARVALHO, 2015; OIC, 2015; USDA, 2015).

The two species are very different concerning the agronomic, biochemical and sensory aspects of the grains, the market and the use of the respective products. But regardless of this question, there is a growing demand, especially for higher quality coffees in the two species in both producing and consuming countries, especially in those emerging ones.

As a result of the rich chemical and sensory constitution, coffee has been prepared and consumed in the most different forms, such as hot and cold drinks, from coffee to long coffee, cappuccino, *espresso*, soluble coffee, sachet, capsules, coffee with milk, 'three in one', beer, cakes, ice creams, candies and even cosmetics. Recently, nutraceutical properties have been identified in coffee, with important nutritional values and use in the manufacture of medicines against functional diseases, such as alcoholism, depression, hypertension, Parkinson's disease, Alzheimer's disease, and also in the perfumery and cosmetics field.

Coffee is a booming beverage in the world, whether in any form of preparation and presentation. There is growth in consumption of gourmets, single-dose coffee capsules machine and soluble coffees, which explains the growth in the production of arabica and conilon. There is room for everyone, meeting the needs of the most varied social strata of the population (ANUÁRIO, 2014).

According to the International Coffee Organization (ICO), in the face of consumption growth of 1.5% to 2.5% per year, it is believed that in 2025 the world will demand about 25 to 35 million bags of coffee or more (ANUÁRIO, 2015). If this scenario is confirmed, associated with the projection of 45% use of *C. canephora* in coffee beverages, the outlook for robusta and conilon for the next ten years will be very encouraging.

Coffee is a very special page in the history of Brazil. Since its introduction in 1727, it has become one of the most important products in the Country, in the creation of jobs, production of wealth, agricultural diversification and in the establishment of man in the countryside. Part of this story was told in verse by Bobbio (2012), at the opening of the International Conference of *C. canephora* held in the State of Espírito Santo in 2012, which the synthesis is presented below.

(to be continued)

Part of the coffee story told in Cordel

Coffee is native plant
From African countries,
And in the Middle East
It exists for more than a thousand years,
Its properties
Have crossed oceans.

Another kind of Coffee
Latter was perceived
With a characteristic
Which is very well consumed,
It is the "African robusta"
"Conilon" is how it is known.

It was called "Green Gold"
It gained fame and projection,
Internationally
By its value,
In the time of the empire was
Export product.

It was in the Kaffa region
That's why the name Coffee,
There are many theories
As it really is,
It was discovered in Arabia
Leaves, flowers, fruit and tree.

I know that the Arabica Coffee was brought
From French Guiana,
Arriving here in Brazil
With the highest nobility,
In the state of Pará
It showed its wealth.

And it continued with prestige
After its establishment
From the Republic and even nowadays
It keeps its tradition,
It's the Brazilian beverage.
Which has more production.

(conclusion)		
They were shepherds of goats Who discovered it first, They ate the fruits That sprang up from the ground, And they got smarter. They walked all day long.	A Portuguese sergeant Called Mello Palheta, Seventeen, twenty-seven (1727) I brought it in his suitcase, The tasty coffee And took a note with his pen.	Here in Espírito Santo The conilon was introduced, In the city of Cachoeiro It was displayed And from the Monte Líbano farm Knowledge was born.
At the beginning, Coffee was used as food, And soon changed to wine To keep the livelihood, And also in medicine It had the recognition.	Arriving here in Brazil In the yard he planted, Some seedlings he brought Quickly the Coffee survived, It was in Belém of Pará Where it all began.	It was Jerônimo Monteiro The Governor back then, That in nine hundred and twelve (1912) Stay informed, reader Brought the first seeds Of Coffee with so much love.
They say it was the Arabs The first ones to plant it, Hence the “coffea arabica” They started cultivating it, This is the scientific name. That came to stay.	Then the coffee ran All Brazilian soil, In small plantations But nowadays it is a pioneer, Purple or red Lands It occupies the whole country.	Our state stands out As the largest producer, In competitiveness It is a great consumer, We have productivity Our coffee has flavor.

Source: Bobbio (2012).

The objective of this chapter is to describe a panorama of the species *C. canephora*, focusing mainly on conilon, approaching aspects of its history, importance, geographical distribution, use, evolution, perspectives and future scenarios.

2 CULTIVATION OVERVIEW

2.1 GENERAL ASPECTS OF HISTORY, ORIGIN, DISTRIBUTION AND CHARACTERIZATION

Arabica coffee, originated from Ethiopia, had its earliest evidence of cultivation in Yemen before the fifteenth century. The first contact with the Europeans was in 1615. It arrived in North America in 1668. The culture was introduced into America by the Dutch through the colony of Suriname in 1718. In 1899 the Dutch took it to places in India, today Indonesia. It came to Brazil from French Guiana in 1727, introduced in Pará and then it went to Maranhão and Southeastern and Southern Regions of Brazil. In 1825, world supply was made by Central and South America, and Brazil became the largest exporter of this product (SILVA; LEITE, 2000). From that date on, it has spread to 15 states in different Brazilian regions, constituting, currently, the fifth product of the national economy, which accounts for more than 30% of world production.

The coffee tree is a perennial bush of the Rubiaceae family, which develops itself in tropical and subtropical regions. World production comes from two species: 1) *C. arabica* - known as arabica coffee, is a softer drink with a more pronounced aroma and flavor. It is marketed pure or in admixture with conilon or robusta. 2) *C. canephora* - known as conilon and robusta coffee, is characterized as a more rustic and with greater production potential coffee, is more neutral beverage and has more pronounced bitterness, higher caffeine content and soluble solids. It is used mainly in blends with arabica and in the manufacture of soluble coffees (FERRÃO, M. et al.,

2007a; MERLO, 2012). Conilon and robusta coffee currently represent around 40% of the coffee produced and marketed worldwide and, according to ICO projections (2015), will produce 65 million bags in the 2015/2016 harvest.

The other species are important in genetic breeding programs, such as sources of genetic variability for productivity, resistance to pests and diseases, caffeine content, soluble solids, tolerance to abiotic stresses, vigor, plant architecture, fruit maturity, beverage quality (FAZUOLI et al., 2007; FERRÃO, M. et al., 2007; FERRÃO, R. et al., 2007).

Africa is the origin continent of coffee and also the one with greatest diversity of it. The *C. arabica* species, originated from Ethiopia, with its botanical classification in 1737, shows greater adaptation in cold climates and higher altitudes. On the other hand, *C. canephora*, represented by the Robusta and Conilon varieties, originating from Guinea in the Congo Basin, with its botanical classification done in 1895-1977, has a geographical distribution in several countries of the African continent. It is a kind of cross-fertilization, with a genetic self-incompatibility mechanism, rustic, tolerant to various diseases and that adapts better in tropical low-altitude and higher-temperature tropical conditions (CHEVALIER, 1944; CHARRIER; BERTHAUD, 1988; FERRÃO, R. et al., 2007; MERLO, 2012).

The first crops and the first research work on genetic improvement with *C. canephora* were carried out in Java, around 1900, due to a large rust outbreak that affected the coffee plantations of southern and eastern Asia. The species that was resistant to the disease and presented adequate adaptation in climatic conditions unfavorable to the cultivation of arabica coffee, became the subject of scientific studies aiming its economic exploitation (VAN DER VOOSSEN, 1985; SMITH, 1985; CHARRIER; BERTHAUD, 1988).

It was then grown in other regions of Africa, Asia and Latin America, especially in underdeveloped or developing countries, by small family-based producers, with more than 70% of cultivated areas being smaller than 10 ha (OXFAM, 2012). In Brazil, in 1912 (MERLO, 2012), the greatest impulse in the plantations of *C. canephora* was with the emergence of soluble coffee in the 1950's and its use in the blends of roasted and ground coffee (MALTA, 1986). As a result of its lower acidity and higher amount of soluble solids, it was widely used by the industry in the production of instant coffee and in mixtures with arabica coffee, with a current share of 40% and 50% in the blends, being used to counterbalance the acidity of arabica and give body to the industrialized product (FERRÃO, 2004; ABIC, 2013).

The two most widely cultivated species in the world are very different in number of chromosomes, reproductive and propagation forms, genetic basis, production potential, adaptation, cycle, size, architecture, nutritional requirements, resistance to biotic and abiotic factors, type and size of cherries, types of beans, biochemical constitution of beans, forms of use, among other characteristics.

C. canephora is a perennial species, with shrub and woody stem, with larger leaves and a less intense green color than those of *Coffea arabica*. The flowers are white, in large number by inflorescence and leaf axil. The fruits have a variable number and shape due to the genetic material. They are more resistant to adverse conditions and present higher caffeine content and soluble solids in the beans. According to Berthaud (1986), Montagnon, Leroy and Yapo (1992),

in this species, there are distinct genetic materials, referenced worldwide as robusta or conilon.

The robusta type materials are characterized by being multi-stemmed, higher size and erect growth habit, larger and less branched stems, larger leaves with a more intense green color, larger fruits with more mucilage and with later ripening, more vigorous plants, more tolerant to rust (*Hemileia vastatrix*) and less tolerance to drought. The grains presented better beverage quality comparing with the conilon group.

The genetic material of conilon type are multi-stemmed plants, shrub growth, more branched stems, smaller and more elongated leaves, light green color, smaller fruits with less mucilage and earlier ripening, high production potential, greater susceptibility to rust and greater tolerance to drought when compared to the previous group.

Figure 1 illustrates aspects of differentiation between conilon and robusta coffee trees.

The varieties of both types, as well as the coffees produced by them, are generically called 'robusta coffees', whose origin is related to the greater resistance to biotic and abiotic factors (PAULINO et al., 1984).

Robusta genetic materials are cultivated predominantly by countries in Asia and Africa and are responsible for about 78% of the production of this species. In Brazil, the 'Conilon' cultivation predominates (FONSECA, 1996; FERRÃO, M. et al., 2007), except for small 'Robusta' plantations found in the State of Rondônia (NUNES et al., 2014).

2.2 ECONOMIC AND SOCIAL ASPECTS

Coffee is a universal product that occupies a prominent position in the world economy, in the jobs and income generation, both for producing and consuming countries (PONTES, 2002). The coffee market can be understood in two aspects. On the one hand, production occurs predominantly in underdeveloped or developing countries of the southern hemisphere, cultivated by smallholders associated with family farming. On the other hand, consumption is concentrated in developed countries of the northern hemisphere (JACOMINI; BACHA; FERRACIOLLI, 2015).

Statistics from different sources show an evolution in the coffee production worldwide and the participation of Latin American (57.33%), Asia (31.26%) and Africa (11.41%) countries for a total global coffee production estimated in 2015, in the order of 152.60 million bags. The following countries account for more than 80% of production: Brazil (35.07%), Vietnam (19.29%), Colombia (8.56%), Indonesia (6.03%), Ethiopia (4.43%), Honduras (3.56%), India (3.49%) and others (19.57%). Evaluating statistics from the same source consulted (USDA, 2015a), it has been verified that in the last 40 years there has been an increase of 56% in general production, with 17% for arabica coffee and 195% for the production of robusta and conilon coffee (Figure 2).

According to Rufino and Arêdes (2009), until 1980 the production of robusta in the world was concentrated in the Ivory Coast, Indonesia and Uganda. In the last years average, Vietnam is the largest producer being responsible for more than 40% of world production, followed by Brazil, with an average participation of 25% and Indonesia, with approximately 15%. Uganda,

Ivory Coast and India are important producers of this type of coffee, with a share of 3% to 6% of production (ICO, 2012, SAOUD, 2014, USDA, 2015a). Specially highlighting Vietnam, which in the last ten years almost doubled its production, reaching in 2015 about 27 million bags (USDA, 2015b).



Figure 1. Illustrative aspects of differentiation between conilon coffee trees (Brasil - States: Espírito Santo, Rondônia and Bahia) and robusta (Vietnam and India).

Source: Incaper and Romário Gava Ferrão.

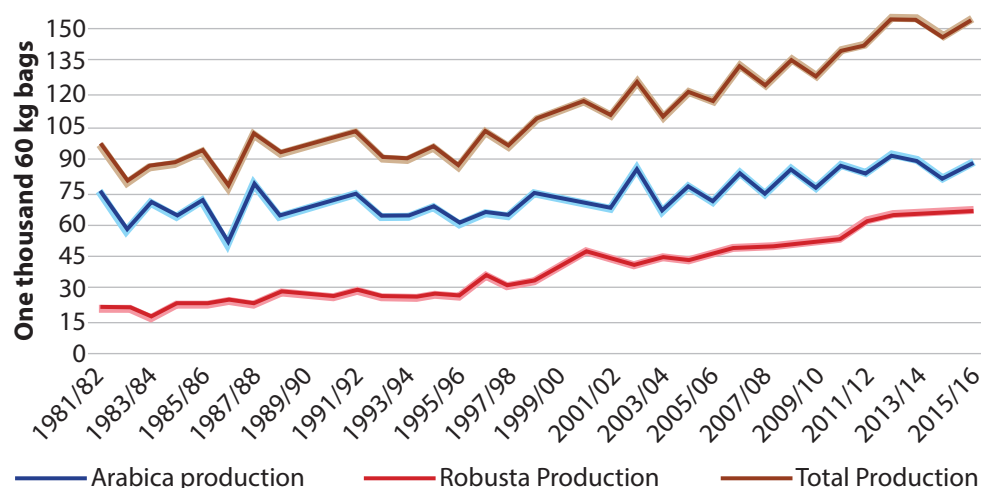


Figure 2. Evolution of the total production of arabica and robusta/conilon coffee in the world, from 1981 to 2015.

Source: USDA (2015a).

There is a growing demand for conilon and robusta coffee in the world, which is attributed to its greater general use expansion, greater competitiveness and profitability in different sectors of the production chain. There has been a progressive increase in world production and exports, leveraged mainly by Vietnam and Brazil, which have significantly increased productivity through the continuous and more intensive use of inputs and technology. Thus, the coffee market has been consolidating worldwide, becoming more mature, attracted by the forms and types of beverages demanded, mainly by emerging markets (PIRES, 2015).

2.2.1 Coffee in Brazil

With almost 300 years of history with coffee, Brazil is the largest producer, exporter and second largest consumer of coffee in the world, besides being known as the country of “many aromas and flavors”. In many importing countries, Brazilian coffee is recognized for its sustainability.

Brazil has had a very strong relationship with coffee since its arrival in the country. This grain became the main motor of the national economy in the mid-nineteenth and early twentieth centuries. Although other products currently divide leadership and also assume relevance in the country, it continues to exercise fundamental economic and social importance, generating significant numbers of jobs, income and foreign exchange.

With a production of between 45 and 50 million bags in 2 million hectares, Brazil has a coffee-growing area of about 287 thousand properties, with a predominance of micro and small farmers, with an average area of 8.1 hectares, cultivated in approximately 2,000 cities, distributed in 15 states (MAPA, 2014). The production is concentrated in Minas Gerais (MG), Espírito Santo (ES), São Paulo (SP), Paraná (PR), Rondônia (RO) and Bahia (BA), which account for more than 97% of national production. With the average productivity of 24 processed bags per hectare, Brazilian coffee is among the most competitive ones in the world. Of the total produced

in the country, about 28.9% is conilon and 71.1% is arabica coffee (ANUÁRIO, 2014, CONAB, 2014). Considering the entire production chain, according to the Ministério da Agricultura, Pecuária e Abastecimento - Mapa (Agriculture, Livestock and Supply Ministry), coffee accounts for 8 million direct and indirect jobs, for 6.9% of all Brazilian agribusiness exports and is also one of the main products of the country that annually demand resources of costing, investments and commercialization. Currently, it is the fifth most exported item by the Brazilian agribusiness, after the soybean and sugar-alcohol complex, meats, as well as forest products (BUREAU DE INTELIGÊNCIA COMPETITIVA DO CAFÉ, 2015).

The data shows that, in addition to being historically the largest producer and the second largest consumer in the world, coffee is found in 98.2% of Brazilian homes and has been one of the most consumed foods, at the rate of 81 liters per inhabitant/year, with growth of 1.24% per year (ABIC, 2013). Of the more than 20 million bags consumed internally, 94% are roasted and ground coffee and 6% soluble coffee. The rest, in the form of green coffee, has as main destinations the European Union, the United States of America (USA) and Japan, while soluble coffee goes predominantly to the USA, the European Union and Russia (SÓRIO, 2015).

2.2.2 Conilon Coffee in Brazil

Known in Brazil as robusta coffee, conilon was introduced in the country by the state of Espírito Santo in 1912, brought by Jerônimo Monteiro, former governor of the state (BANDES, 1987; FERRÃO, M. et al., 2007; FERRAO, R. et al., 2007; MERLO, 2012; VARGAS, 2012). However, it was not until 1972 that the first significant yields of the species were recorded in Brazil, from 250,000 annual bags on that occasion to about 12.9 million of processed bags of 60kg in 2014. The largest Brazilian producers are the states of Espírito Santo, Rondônia and Bahia, with 78%, 13% and 7%, respectively (CONAB, 2014).

The Espírito Santo conilon coffee industry occupies a special place in the history, culture, landscape and economy of more than 80% of the municipalities in the State. The production of 9.95 million bags, together with the average productivity of 35 bags per hectare puts the State in a prominent position in the Brazilian and international economy (CONAB, 2014).

It is important to highlight that the productive arrangement of Espírito Santo conilon coffee is one of the most dynamic, representative, successful and with suitable institutional consolidation in the links of primary production, research and extension as well as in the links of commercialization, manufacturing and export of agribusiness from the state of Espírito Santo (FELIPE; VILLASCHI FILHO; OLIVEIRA, 2010; VILLASCHI FILHO, 2010).

Market experts show that the presence of conilon in the world blends has grown in recent years, due to the more aggressive posture of Vietnam, the largest global exporter of *C. canephora*. Brazil's greatest difficulty in competing in the international market, despite having one of the most significant average productivity, is due to the high cost of local production, mainly the high labor value, especially in the harvest and by the country's exchange rate policy (ANUÁRIO ..., 2011, 2014).

While Brazil maintains high domestic consumption, currently in the order of 22 million

bags per year, with growing domestic market, the scenario for the evolution of the conilon production is favorable, since the conilon has been progressively inserting in the *blends* with Brazilian arabica with its use currently in the range of 40% to 50% with a tendency to expand. This fact makes Brazil the largest individual consumer of this type of coffee (LEME, 2014). Allied to what was previously exposed, there is an increasing worldwide demand for coffee, both commercialized in the form of green beans and in the form of soluble, capsules, *espresso* coffee which are increasing consumption options in the world with the use of conilon and that represents the coffee entrance door, mainly in emerging countries.

For the Brazilian coffee growers, the trade advantage of their conilon for the domestic soluble coffee industry is a regular and large-scale demand for its production and distribution of grains (SAES; NISHIJIMA, 2007). This situation has been quite suitable for the country. Thus, the soluble coffee industry has a strategic role for the conilon producer in Brazil, since it is responsible for the absorption of 15% to 20% of the total harvest of this type of coffee, numbers of very positive impact for this particular production.

The conilon coffee productive chain in Brazil has improved its production and quality profile in the last decade due to substantial investments in the development of different technologies, especially in the areas of genetic improvement, coffee plantations management and improvement of irrigation processes, plant nutrition, harvesting, post-harvesting and manufacturing. As an applied result of the research investment, the doubling of average productivity in the last 20 years can be cited, placing Brazilian conilon coffee as one of the most competitive in the world. But for a product marketed by volume, the challenges of expanding the market and gaining value are big.

2.2.3 Technological evolution of conilon in Brazil

The conilon coffee industry in Brazil has been passing through significant evolution in the different producing regions of the country. Among the different factors of its development, we emphasize the prioritization and Brazilian investment in scientific research in the different areas of knowledge, carried out in an integrated way by a network of institutions, which constitute the Consórcio Pesquisa Café (Coffee Research Consortium), focusing on the search for solutions for the main national coffee growers.

Conilon coffee, even being introduced about a century ago in Brazil, only in the 1970s had its cultivation boosted, but with the use of the technical recommendations of arabica coffee. Over time, these recommendations were found not to be the most suitable ones. Based on this scenario, it has been working since 1985 in a dynamic and continuous research program developed mainly by the Instituto Capixaba de Pesquisa, Assistência Técnica e Extensão Rural - Incaper (Capixaba Institute for Research, Technical Assistance and Rural Extension), Embrapa Rondônia, Instituto Agrônomo de Campinas - IAC (Agronomic Institute of Campinas), Universidade Federal de Viçosa - UFV (Federal University of Viçosa), Universidade Federal do Espírito Santo - Ufes (Federal University of Espírito Santo) among other Brazilian institutions.

As applied research results, hundreds of technologies and knowledge have been developed,

adapted and transferred to producers. Among them, the development and recommendation of 14 cultivars can be highlighted; definition of spacing; plant management (spacing, stem density and pruning), pests, diseases and irrigation; soil conservation practices; recommendations of liming and fertilization, better practices of post-harvesting and quality improvement, besides the expansion of the knowledge base in different areas (FERRÃO, R. et al., 2007, 2012; FONSECA et al., 2015).

These technologies, associated to other organizational and development actions, involving different actors and innumerable institutions in the coffee chain, a network of technical assistance and public and private rural extension, have quadrupled Brazilian production in the period from 1985 to 2015 of conilon coffee (Figure 3). This evolution has been achieved through productivity increase in all Brazilian regions, especially in the states of Espírito Santo, Bahia and Rondônia, where there are records of many crops obtaining more than 100 processed bags per hectare. The ripening uniformity, in-line planting and harvesting at the correct time have provided the peeling of more than 80% of the fruits and the production of premium coffees (Figure 4). Many of these coffees have been winners in quality contests in city, state, national and international levels.

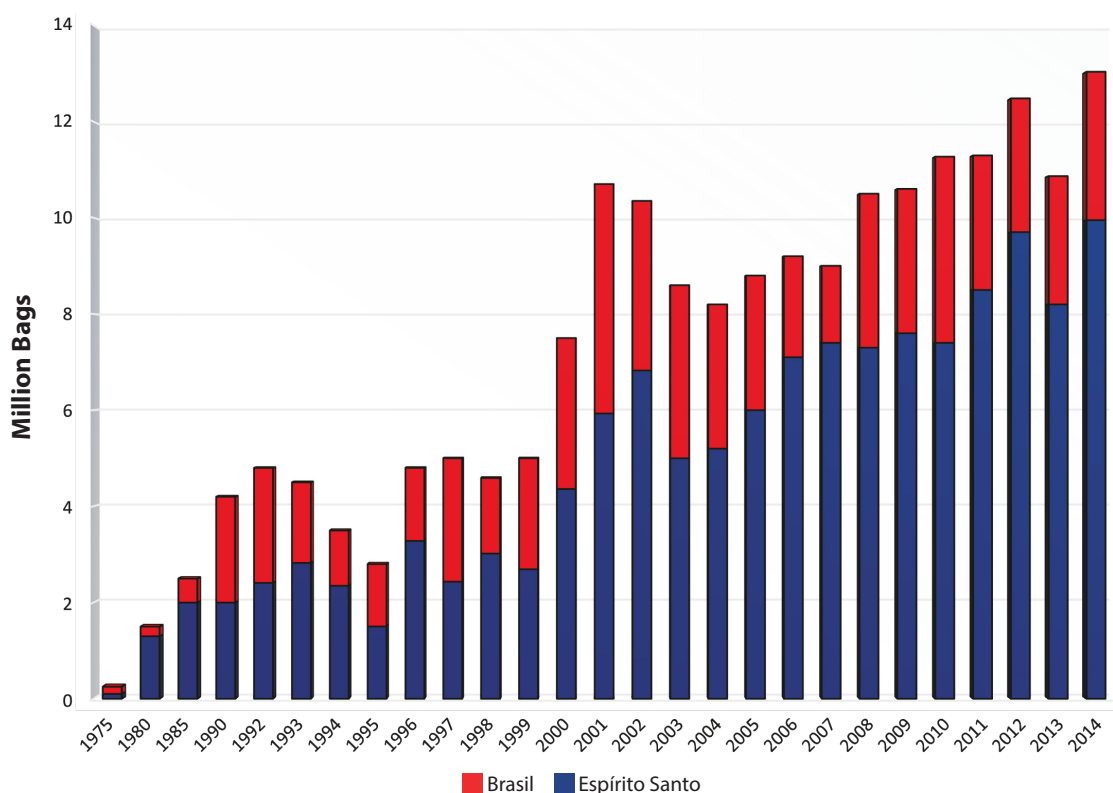


Figure 3. Evolution of conilon coffee production in Espírito Santo and Brasil, from 1975 to 2014.

Source: Malta (1986), Bandes (1987), Conab (2014), ICO (2014), Fonseca et al. (2015).

Over the last two decades, the changes in the farms and in agricultural properties of more than 70% of Espírito Santo conilon coffee growers, who have adopted the technologies developed and/or adapted by Incaper and partners, for the different macro-environments in

the state of Espírito Santo, are well-known. This behavior led to an increase of more than 310% in State production, without a significant increase in planted area. The advances of the Espírito Santo conilon coffee is a reflection of joint efforts performed in several areas combining planning (PEDEAG, 2008) with the practice, serious and entre-preneurial work of the coffee grower who incorporated the knowledge stemming from the scientific research and the industry incentive (FERRÃO et al., 2015b; FONSECA et al., 2015).



Figure 4. Conilon coffee plantations in the State of Espírito Santo, Brasil.

Source: Incaper.

Among the recent results of these studies, the development and protection of four clonal cultivars that are more productive, drought-tolerant, with different fruits ripening time, rust tolerant and with premium beverage quality are exemplified: BRS Ouro Preto, Diamante ES8112, ES8122 - Jequitibá, Centenária ES8132 and Marilândia ES8143 (FERRÃO, M. et al., 2009; EMBRAPA, 2012; FERRÃO et al., 2012, 2014, 2015a, 2015b, 2017). About the work in progress, it might be highlighted the research focused on technologies associated with the viability of mechanical harvesting, performed in an integrated manner between different institutions of the public and private sectors, with the effective participation of the producers. Up to now, several options for crop management and mechanized harvesting of conilon have been developed and are being used by several producers. They have been contributing to the solution of one of the main problems of coffee growers, which is the lack and the high value of labor in the region, mainly in the harvesting, since it constitutes an operation that represents about 50% of the total production cost.

Even with the significant technological advances in the last years, in the producing countries, in many areas of knowledge, not always in equal forms, there are challenges as the thematic focus demanded by the organized sectors of robusta coffee growing and society,

such as: continuous search for the improvement of product quality; development of new cultivars adapted to the different environments and cropping systems and adjusted to the new problems inherent to climate change; continuous development of technologies for harvesting mechanization; technologies aiming the advance in studies on the association of coffees with trees; sustainable technologies to face biotic factors; evolution in water preservation techniques, irrigation management and coexistence with drought.

Not less important are demanded the massive adoption of the called good agricultural practices aiming at the production of premium and sustainable coffees, actions to reduce the use of workforce and production costs, internal and external marketing actions to increase consumption with the conquest of new markets and adding value to the product.

2.3 PERSPECTIVES AND TRENDS FOR *Coffea canephora*

Consumer behavior in relation to coffee has been changing. New products and new preparation equipment stimulate fast changes in coffee consumption habits, especially with the entry of new potential countries that had, until now, little representation.

The statistics show a general increase in coffee consumption in the world, stimulated mainly by the different alternatives of use and preparation of beverages, driven mainly by soluble coffee. This is the most usual form of product entry in Eastern European countries, China and India, especially in these last two, which in addition to being very populous, have tea as a traditionally consumed beverage. Consumers with better purchasing power are more demanding, looking for safer products, derived from quality beans.

One of the findings in the world coffee market is the substantial increase in conilon and robusta coffee demand. The fact would be related to their lower cost of production, higher productivity, better industrial yield and, consequently, lower product final price (ANUÁRIO ..., 2014).

The current moment of coffee in the world indicates a positive scenario, with an expanding global demand. Analysts and market researchers working on a historic series about coffee data around the world, show a balanced evolution between production and consumption, with average growth of about 2.5% per year. The increase in annual consumption has been registered by traditional importing countries (1%) and exporters, such as Brazil (3%) and emerging markets (6%), such as India and China. At the same time as the interest in gourmet coffees in specific countries increases, the demand for soluble coffee in supermarkets that are beginning the habit of consuming the drink grows (ANNUARIO ..., 2014).

Silva (2015), analyzing the participation of different countries in the consumption of coffee in the last 50 years, found that the most significant growth was achieved in the exporting and emerging countries, with the following evolution: traditional markets reduced the participation from 73% to 54%, exporters increased from 25% to 31% and emerging ones from 2% to 15% of world demand (Figure 5).

Saoud (2014) makes a global analysis of ten years of coffee production and consumption in the world, emphasizing robusta and elaborates projections for 2020, presented below.

Initially, the author reinforces data from other literature that shows significant evolution in the growth rates of this beverage production and consumption in the world. It reports a more significant evolution in the last ten years of the robusta coffee, where its share of the market increased from 30% to 40%, with an average annual increase in production of 1.7% and consumption of 3.6%. However, this evolution was not balanced among the producing countries, but fell almost exclusively in Vietnam and Brazil. There was a greater potential for coffee consumption in producing countries, with an increase of around 6% per year, while in importer countries it was 2.2%. A joint analysis of the increase in average consumption of arabica and robusta coffee from the producing countries showed an increase of 3.7% per year. On the other hand, when only the robusta is considered, the number is 7%.

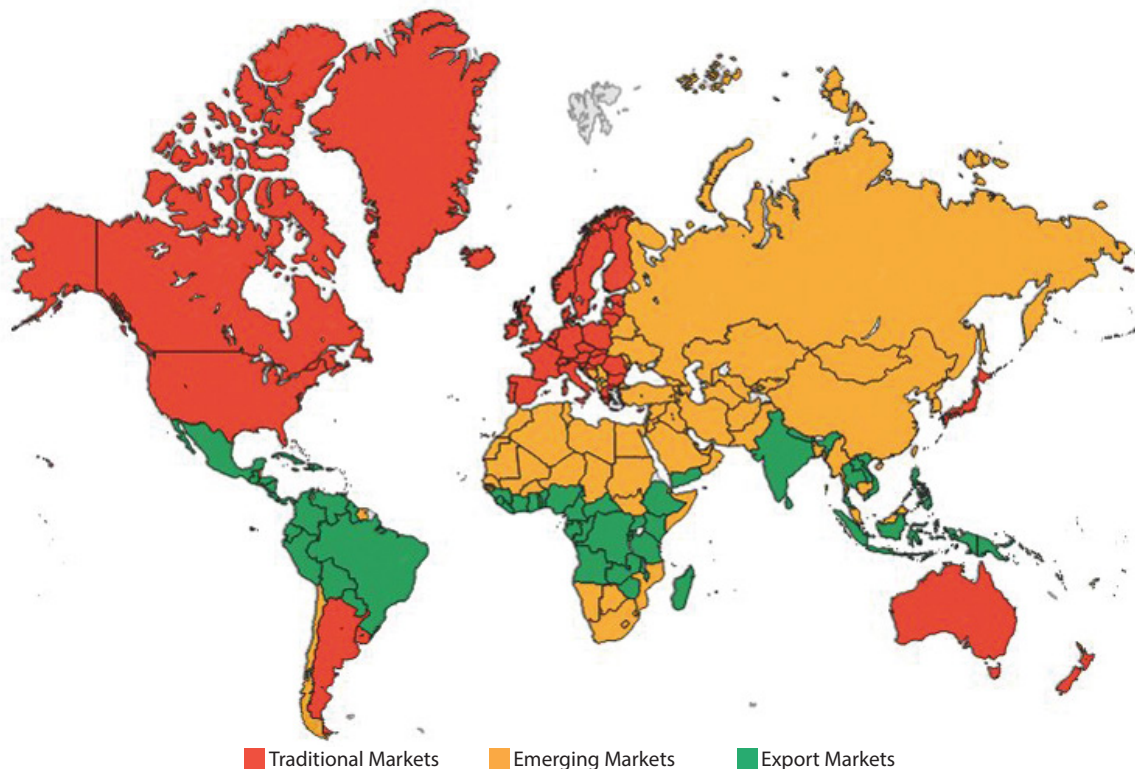


Figure 5. Distribution of coffee consumption worldwide.

Source: Silva (2015).

The world projection of the robusta coffee demand for 2020 carried out by Saoud (2014) considers the scenarios of annual consumption increase of 1.75%; 2.50% and 3.60%. The results of this study indicate the need for an annual production of 64.80; 69.74 and 77.60 million bags respectively for the next five years, thus it needs an increase in production during the period from 10 to 23 million bags. On the other hand, Brando (2014), using information from the IOC, projects that 45% of the world coffee consumption in 2020 will be conilon and robusta. Thus, following the future trends of growth, the market will demand for the next five years the increase of 11.80 to 22.60 million bags for conilon/robusta and from 3.90 to 7.90 million bags for arabica coffee.

Continuing the analysis of Saoud (2014), the question arises: which are the potential countries to meet this growing demand for robusta? Brazil or Vietnam? These countries currently account for over 70% of world production, present climatic conditions, infrastructure and technologies. Continuing, the author makes an analysis of the situation of the main producing countries of robusta. Brazil has, in general, a technical and developed conilon coffee-growing which, together with adequate planning and a continuous scientific research program of more than 30 years in the different areas of knowledge, has the potential to provide technical-scientific support to significantly increase production, without increasing the area, mainly in the State of Espírito Santo and south of Bahia, being able to extend to the State of Rondônia and other states of the central region of the Country.

Countries in Asia, such as Indonesia and India, have large coffee plantations with total area of more than 1 million hectares, but their historical series of low average productivity offers little prospect of significantly increase of production, in short time. On the other hand, Vietnam has a high-productivity coffee crop that has been renewed, with growing and continuous increase of production, possibility of expansion of area and potential to further increasing the production of the country. Still on this continent, there are some potential emerging countries, such as China, Laos Myanmar, Thailand, the Philippines and Cambodia.

Uganda and Ivory Coast, with a historical expression in the production of robusta in Africa, have a slow development coffee-growing, with low average productivity, technological problems of infrastructure and political instability, and have little prospect of significant increases in production.

An intriguing questioning refers to the different earnings received by producers in the marketing of their exported coffees. Brando (2012) clarifies the issue by showing that the transfer of values to producers in the external sale of coffee does not occur in the same way in the world's major grain suppliers. Producers from countries that invest more in coffee have greater return on export revenues and can modernize their structures. In general, the world average is between 65% and 70% of the FOB¹ values of exports. For countries such as Vietnam and Brazil, which have been growing their production through continuous increases in productivity due to the evolution in the use of technologies and are better ranked in the market, the earnings have been between 85% and 90%. On the other hand, in the case of the least technical and low-productivity countries, the transfer to producers is between 25% and 30%.

The tight balance between supply and demand for conilon and robusta in the world shows strong indications for price stability and even appreciation of the product in the international market. One of the feasible alternatives to improve the balance between production and consumption would be the prioritization of political actions, investment in research, training, technical assistance and infrastructure, aiming at increasing productivity and improving final product quality.

Soluble coffee consumption, based on robusta and conilon coffees, is growing worldwide and has been the favorite in many producing markets, such as Indonesia, Vietnam, Mexico and

¹ Abbreviation in English for "Free on Board". In other words, the buyer takes the risks on imports costs.

Colombia. In emerging countries such as Russia, China, Korea, the Philippines, India, Taiwan, also presented in the so-called 'three in one' envelope (soluble, sugar and cream), soluble coffee has been preferred, especially among the young population for being practical with low cost. In addition, it has been increasing the participation of robusta or conilon in blends in the roasted and ground, in the whole market, with percentages that can reach 60% in the mixtures (BRANDO, 2013, 2014).

Data from the Associação Brasileira da Indústria de Café - ABIC (Brazilian Coffee Industry Association), presented in the Brazilian Coffee Year-book (2015), shows that domestic coffee consumption in Brazil from 2000 to 2014 grew from 13.2 to 20.3 million bags, and the per capita consumption of green and roasted coffee in 6.12 kg and 4.89 kg, respectively, characterizing an increase of about 20% in the last ten years. The estimated share of conilon coffee in the *blends* with arabica would have gone from 3.3 million to 11.7 million bags, and the composition index from 25% to 58% in the same period (LEITE, 2014).

In the last ten years, there has been a 350% increase in consumption outside the homes, in coffee shops and restaurants that offer better quality coffees. In the same way, there is a worldwide trend to prepare coffee for a cup, in the form of *espresso*, sachets, capsules, strainers and filter, in which the beverage is prepared and consumed immediately. Important record is given to the growth in the use of machines for the preparation of *espresso* coffee at homes, with almost 1 million machines in Brazil (ABIC, 2015).

In the year 2013/2014, the following increases occurred in the value of different forms of coffee preparation in the country: 4.7% coffee powder, 6% soluble coffee, 8.9% cappuccino, 19% coffee with milk and 55.5% of coffee in capsules. On the other hand, capsules reached approximately 500 thousand Brazilian homes as the segment of the highest consumption growth in the country, but with a variation between 8.9% and 19.6% in the different regions (ABIC, 2013, LIMA, 2015).

The general increase in coffee consumption in the world has been happening due to a number of circumstances, such as the dissemination of the consumption of soluble coffee; the advent of many alternative forms of consumption by the practicality and rationality they provide; the significant quality improvement of the product offered in the market; the increase in family income; a better understanding of the coffee positive influences on human health; and because it is a low representative item of expenditure in the family budget. Many of these factors are closely related to robusta coffee and may probably explain their higher relative growth (FONSECA et al., 2015).

Silva (2015) shows a dynamic tendency of consumption increasing in all markets. There is movement aiming at adding value rather than increasing volume. The greater expansion seems directed to the premium, special products, with greater interest in the original coffees. Another important trend is that with increasing consumption in producing countries, there will be less availability for exporting it. The biggest potential is in the emerging markets, especially China, India and Indonesia, which are populous countries, which in general have shown economic growth and higher available income. Associated with the above, in these places, coffee houses have grown, as attractive environments for people meetings, who have chosen

the consumption of instant coffees, more preferably the soluble ones.

As for prices, there is an interesting aspect in the international coffee market; it means that although the Arabica and Robusta species are in competition for different segments, they are often replaced by one another in *blends* produced for the final consumer. As a consequence, the international price for arabica is highly dependent on the supply and demand of the conilon and robusta market (CIMS, 2014).

The prioritization of a differentiated product, with higher added value can bring good results, this is evidenced by the increasing search of the world market for special coffees from different origins. Data indicates that while the demand for the considered common coffee increases by 2% per year, the best quality increases by more than 20%. The greater gain of the producer may come from quality rather than quantity. Brazil is an example, which in the last ten years has gone from a small volume to more than 15% of the foreign sales of quality-differentiated coffees.

The trends of consumption segments impose new pressures on the coffee growers competitiveness, that face significant challenges not to continue in markets that bring better income. It means that coffee growers face a market where consumers demand new standards of food safety and product quality, as well as environmental and social respect in the production process, and the buyers, cooperatives and industries are increasingly required to meet new standards of storage, traceability and transport (SÓRIO, 2015).

The current favorable picture refers the producers to the following recommendations: intensifying technological investments in crops, in order to exploit to the maximum the production potential of the species; intensifying the use of harvesting and post-harvesting technologies, with an emphasis on the production of peeled cherry (PC); strengthening participation in organizations, especially in cooperatives; preparing the property using good agricultural practices for the production of sustainable premium coffee, thinking of future certification that is of origin, social and / or environmental responsibility.

3 FINAL CONSIDERATIONS

Coffee consumption grows at an average rate of 2.5% a year, with a steady trend in the coming years. Thus, by 2025, the market projects an approximate additional of 25 million bags.

C. canephora is a rustic species, well researched in recent years, presents great potential in terms of production, industrialization process and consumption, with positive perspectives to supply the majority of the growing world demand.

The consumption of robusta has been growing at rates higher than the production of arabica. Thus, overall, there is a need for planning, prioritization of policies for the sector, investment in technologies and producers professionalization, aiming at the general renovation of crops under new technological bases, with the purpose of accelerating sustainable production and the improvement of the product final quality. Consumers have been tasting differentiated coffees and have valued products that are certified, have better quality and are sustainable.

Continuous quality improvement should continue as a global strategic action, aiming at the greater use of robusta in *blends* and in the production of instant coffee, *espresso* and other beverages with coffee.

There is ample space for improving the living conditions of coffee growers in producing countries. For this, it is necessary to improve the policies to overcome some barriers, through the following initiatives: seeking the best regulation of the sector; adjusting the taxation of the product; generally improving the chain efficiency, producers' knowledge of price, bean quality and product marketing and optimizing the general infrastructure of the property. Also, betting on technology to leverage productivity and improve quality; enabling harvesting mechanization; improving business management; prioritizing differentiated marketing strategies to promote domestic and international consumption; disclosing the quality produced with sustainability; and developing new products with added value. These are strategic actions to increase the competitiveness of Brazilian coffee and other producing countries.

Finally, it is important to stimulate the consumption of all forms of coffee, preferably increasing the added value, which would make it possible to improve the profitability of all sectors of the production chain. In the case of Brazil, it is essential to insert more roasted and ground coffee and soluble coffee in the export, as well as to improve the final quality of the product, aiming to add more value in the export of green coffees, thus providing benefits to the producers, to the chain as a whole and society.

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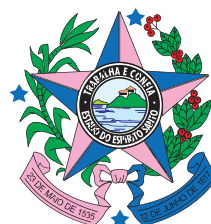
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