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Connection Between Technological Trajectory of the Coffee Sector and the Economic Growth of Brazilian Producing Regions

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CONNECTION BETWEEN TECHNOLOGICAL TRAJECTORY OF THE COFFEE SECTOR AND THE ECONOMIC GROWTH OF BRAZILIAN PRODUCING REGIONS

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ABSTRACT

This study examines the relationship between the trajectory of technological innovations in Brazilian coffee regions in the period 1932-2012, with the economic growth and development in those areas. The objective is to provide information to public and private institutions involved in research, development, innovation and extension, as well as to authorities responsible for regional development policies. First, we studied the evolution of coffee research and we identified technologies that resulted in breakpoints or key points for sectorial development. For this we conducted semi-structured interviews with 14 researchers, farmers and consultants related to the coffee sector. Second, based on those breakpoints, we analyzed the trajectories of innovations in the main Brazilian coffee regions. For this, we developed a structured questionnaire, which was applied to 148 representatives of the coffee sector, by random sampling, for the periods: • 1932-1954: from the beginning of coffee research until the release of the first "modern" coffee cultivar • 1955 - 1974: consolidation of the adoption of this cultivar, launch of the second "modern" cultivar and the beginning of mechanized farming; • 1975 - 1989: consolidation of mechanization and adoption of those two "modern" cultivars; • 1990 - 2000: expanding the use of coffee irrigation; • 2001 - 2012: emphasis on the coffee quality and integrated management of production. To analyze the information from the questionnaire, we used cluster analysis by two-way joining method for the periods identified in the survey, for Brazil as a whole and for each Brazilian coffee region. The results show that in regions where technological

innovations were adopted and consolidated, there was an increase in yield and their socioeconomic indicators are significantly better than in other regions.

Keywords: Coffee production, Regional Development, Multivariate Analysis

INTRODUCTION

The coffee tree was introduced in Brazil early eighteenth century in the north region. At the beginning of the following century its cultivation reached the interior of the Southeast region - the Zona da Mata, in the states of Minas Gerais and Espírito Santo; and the Paraíba Valley and the western region of São Paulo state. The intense rate of expansion in this period led to the development of major projects such as railways that supported economic success of the coffee plantations¹.

Currently, coffee cultivation is concentrated in the states of Minas Gerais, Espírito Santo, São Paulo, Paraná, Rondônia and Bahia, but is also present in eleven other states, and with differentiated competitiveness and resulting production costs of different technological levels, and influenced by factors such as the biennial crop, soil and weather conditions, price and international competition, government incentives and investments in scientific and technological development.

The historical, economic and social evolution of development, in those coffee regions show significant differences. Under one technological paradigm for the segment, there were areas where the development occurred through strong local roots, consolidating private clusters, while in other regions this dynamic besides not having it set up, we observed periods of socio-economic contraction. Aspects related to social organization, and less heterogeneous profile of the occupation of the territory seem to respond by the divergence of vectors of regional development (Bliska et al, 2013).

Taking into consideration that in agricultural production technologies generally result from the interaction between the sources of innovation - so from many technological paradigms and trajectories - they attach to the 'modern' production activities increased efficiency through the application of capital and products resulting from the development - technical, science and information - the clusters identified in the coffee segment constitute competitive regions with characteristics.

¹ Vegro e Bliska, 2007.

A significant example is the increasing use of modern techniques such as irrigation, pruning and planting space, which coupled with the older techniques such as fertilization, liming and phytosanitary control, are pointed out as responsible for minor differences have been found between the volumes of coffee harvested in years of high yield, and low, resulting from biennial harvest, characteristic of arabica coffee, which predominates in the Brazilian coffee production park (IBGE, 2013).

The diagnostic analysis carried out by Bliska et al. (2007) indicated that the diffusion of technologies is critical to the efficiency of the coffee production chain, since many of the solutions to the demands of the coffee sector are available in research and development (R & D) institutions related to that chain. According to this analysis, the issues relating to regional characteristics stand out among the challenges of that supply chain.

Diniz et al. (2011) point in the same direction, considering that one of the major problems currently faced by research institutions and universities is the transfer of knowledge and technology generated to society. Thus, it becomes necessary to improve the interface of technology generation units and technical assistance agencies, in the form of development, dissemination and application of various technologies to farmers and farming regions, providing the continuity of the process of improving coffee production, making it competitive in the long term (Romaniello et al., 2000). Such actions have allowed to raise the competitiveness of coffee, improve quality, to promote social inclusion and growth of coffee production (Souza et al., 2005).

But these actions also depend on the new relations field - city, which may present different regional behaviors. According to Elias (2007) these relations are imposed by the spread of modern agriculture and globalized agribusiness, derived from the exchange of technical, financial and legal services, labor and all other products, between the modern field and the city. The diffusion of agricultural consumption, which grows with the incorporation of science, technology and information in the space demands a high need for these services to assist the producers. Agricultural enterprises, suppliers of chemical products and mechanical implements, biotech research labs, marketing offices and accounting consulting, business technical assistance and transport, agribusiness, supermarket chains, retail distribution, agricultural research and marketing, among others, show a dynamic third sector that affects agricultural activities, existing in the field, to carry out the regulation, management and normalization of

agribusiness. Regional effects of these actions contribute to the formation of particular clusters, which can affect regional economic growth.

Given this context, this study compares data from the trajectory of technological innovations in Brazilian coffee regions in the period 1932-2012, with the economic growth and development of those regions in the same period, to provide data to public and private research, development, innovation and extension, as well as authorities responsible for drafting regional development policies, for making decisions concerning the development of the coffee sector

METODOLOGY

The study was conducted in three phases: 1) collection of secondary data on the technologies developed for the coffee industry, and structured interviews with prominent professionals in the research and extension for coffee production, in order to identify breakpoints in the evolution of sectorial technological trajectories; 2) a questionnaire for regional identification of the fundamental technologies for the production of coffee in different periods of that trajectory, defined on the basis breakpoints identified; 3) survey of socioeconomic indicators for the different coffee regions to compare them with the evolution of coffee research in producing regions.

Evolution of coffee research at the Agronomic Institute and Brazil

In the first phase, the technologies adopted by the coffee industry in the period 1932-2012 were identified. This period took into account the fact that the history of the Agronomic Institute of Campinas (IAC) to be confused with the start of coffee research in Brazil. This Institute was created in 1887 to cater technically the coffee sector. Chronologically, the introduction of coffee cultivation in Brazil and the creation of IAC are considered, respectively, as the second and the third development milestone of Brazilian agriculture (Azevedo, 1994; Ramalho, 2004). However, it was from 1932, with the establishment of the "General Plan for Study of Coffee", at IAC, that the coffee research took great impulse. Identification of breakpoints in the evolution of technological trajectory

Then 14 structured interviews were conducted between April and December 2012, to identify the technologies and policies that resulted in break points in the evolution of the trajectory of coffee research in Brazil, with:

- Five retired Agronomic Institute researchers who have dedicated themselves to the coffee sector between 1945 and 2010.
- Three rural extension workers and two scientific researchers from the state of São Paulo, active in the coffee sector for over 30 years.
- Three scientific researchers of Minas Gerais, with a wide sectorial experience.
- A grower of Minas Gerais with 60 years of experience in the coffee sector.

Identification of coffee technologies most important regionally

Based on data on the technologies developed for the coffee industry and breakpoints in the evolution of sectorial technological trajectory, identified in the first phase, we prepared a questionnaire to identify regionally the technologies, or technological ensembles, most important for the development of national coffee production. In this questionnaire the 15 most used technologies in agricultural production of coffee were presented, and each of the respondents selected those three technologies considered most important for coffee production, for each of the periods of technological trajectory of the agricultural sector. The questionnaire was applied by random sampling, between October 2012 and March 2013, to representatives of the coffee industry in the producing regions of the following Brazilian states:

- São Paulo: Mogiana, Alta Paulista (West), Garça-Marília and Southwest.
- Minas Gerais: South, Zona da Mata and Cerrado.
- Bahia: Chapada Diamantina, Plateau of Conquista and West.
- Espírito Santo: Caparaó, High Caparaó, Central, Northwest and Coastal North.

The questionnaires were held personally, in technical-scientific meeting, specific for the coffee sector, and via internet by an access link to the questionnaire in Peabirus platform, Community Coffee Social Network.

Multivariate analysis

To analyze the information from the questionnaire, we used tables and graphs of class distribution of relative frequencies (Gil, 2012; Pereira, 2004) and cluster analysis by the method two way joining (Hartigan, 1975, Hair et al., 2009) using the software Statistic 8 (Statsoft, 2007).

The two-way joining allows viewing through a graphical color scale, with discrete boundaries, the result of crossing of the observed variables, and classes expressed by a statistical frequency. This clustering method according Rocha et al. (2000), is represented by a graph of the color scale, which expresses in a vertical reading, the differential between each variable evaluated by experts and how unequal is the evaluation for the different activities, and horizontally, a distinction inside of the scales indicated for each activity. A larger range of colors indicates greater heterogeneity. In this work 13 classes of frequencies for better visualization and comprehension of the activities (technologies) were chosen.

With this technique, it is possible to analyze the clustering of cases (activities) and variables simultaneously through their similarities. It allows to evaluate mainly the current situation of the apparatus for generating and transferring technologies across training needs and contribution of research and development, pointed out by experts, so that the identified activities really express their potential.

Indicators of regional development

The economic and social indicators are widely used to analyze the development of a given region, as they are an important tool to support the development of public policy. These indicators can show the positive results of certain regional strategy and at the same time, identify weaknesses that affect their development, and provide subsidies to correct or minimize them (Orlowski e Arend, 2005).

For a greater understanding of the connection between regional development and technological trajectories for the Brazilian coffee growing regions were used statistics from the Ministry of Agriculture, Livestock and Food Supply - MAPA, on the total volume of Brazilian coffee production, average crop yields, and total area of coffee cultivation. To better understand the development of Brazilian coffee regions, will use the Municipal Human Development Index - HDI-M, value of coffee production and Gross Agricultural GDP for some representative municipality of the regions studied.

HDI-M index shows the rates of life expectancy, education and income of a given population. To develop this new index, some adjustments were necessary, since the municipalities are not closed economies, so part of your income may be appropriate for people who do not live in the same town (Orlowski at. al., 2005).

Gross Agricultural GDP is a component of gross domestic product, and aims to measure the riches that were produced in the municipality in order to assess their level of economic growth, evaluating everything that is produced, not what is sold. Gross Agricultural GDP also has its limitations. This because he does not take into account the distribution of wealth, besides being a simple arithmetic mean, which divides the total wealth produced by the number of people residing in rural areas.

The production value shows the evolution of gross income from coffee production, within the establishment over time. It is calculated based on local agricultural production and prices received by producers.

RESULTS

Evolution of coffee research at the Agronomic Institute

For the period 1932 - 2012 were retrieved and documented 556 studies about coffee made on IAC, directed to the coffee sector. These studies were classified according to their covered areas. Based on the frequency distribution of these studies over the period 1932 - 2012 was drawn first approximation of the trajectory of coffee research in Brazil.

Periods of rupture in technological trajectory of the coffee sector

From 14 interviews with experts in the coffee sector, the technologies and policies that represent breakpoints in technological trajectory of the sector, which were identified were used to identify key periods of that trajectory:

- Until 1954: from the start of coffee research, with the founding of IAC, until the beginning of the cultivation of variety Mundo Novo, launched in 1952 by IAC;
- 1955 – 1974: consolidation of the adoption of variety Mundo Novo, implementation of the Plan of Renovation of the Coffee Crop in Brazil, in 1970; launch of variety Catuaí, in 1972, and the beginning of its cultivation.;
- 1975 – 1989: beginning of the mechanization of cultural practices and consolidation of Catuaí farming;
- 1990 – 2000: great expansion of irrigation use, enabling coffee cultivation in Western region of Bahia State and in the Cerrado of Minas Gerais State;

- 2001 – 2002: greater concern with quality, integrated management of production, emphasis on sustainability and greater concern with social and environmental aspects.

Coffee technologies regionally most important

Over the study, 205 questionnaires were applied concerning the most important technologies for coffee in each period of its technological trajectory, regionally distributed as presented in Table 1.

Table 1. Identification of the technological trajectory of Brazilian coffee growing: number of questionnaires answered per the coffee region.

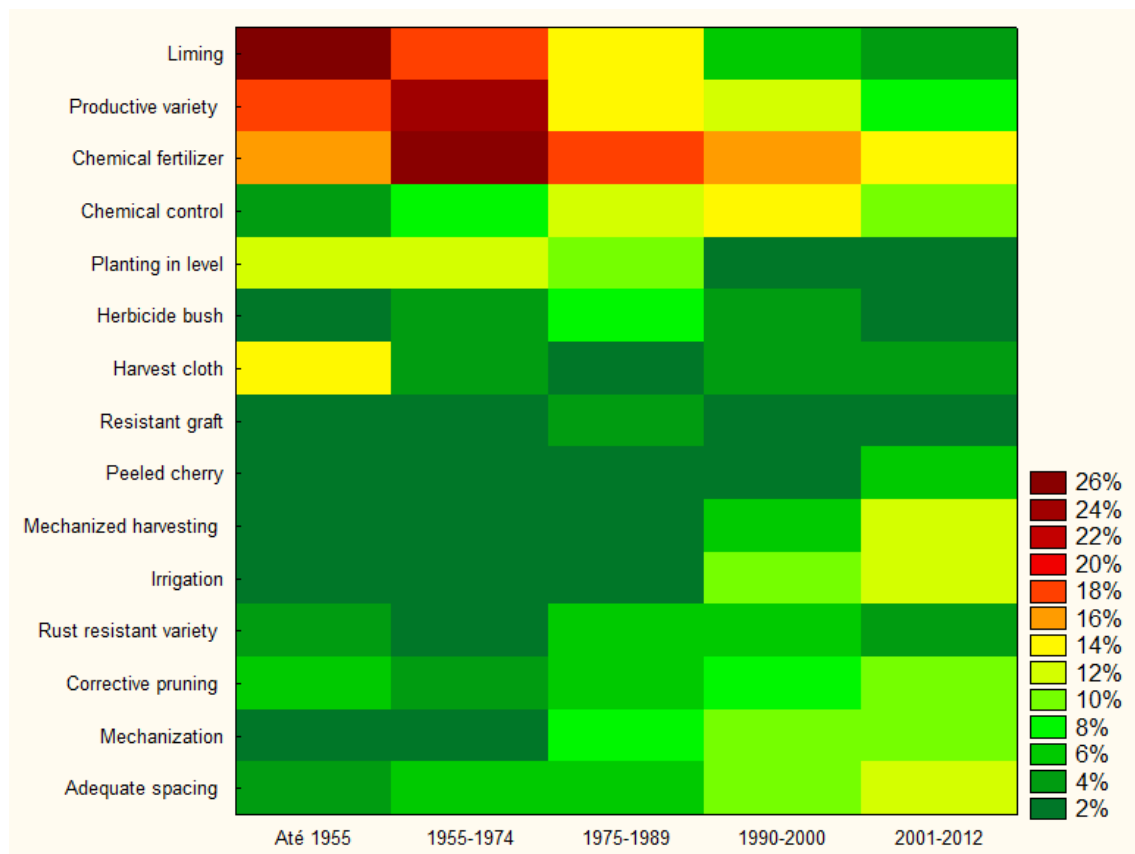
State	Number of answered questionnaires			%	Região	Number of answered questionnaires			%
	Source survey					Source survey			
	Coffee Conferences	Internet	Total			Coffee Conferences	Internet	Total	
MG	91	17	108	52,68	South	52	11	63	30,73
					Zona da Mata	13	2	15	7,32
					Cerrado	24	4	28	13,66
					Jequitinhonha	2	0	2	0,98
ES	18	1	19	9,27	Alto Caparaó	0	0	0	0,00
					Central	6	1	7	3,41
					Northwest	4	0	4	1,95
					Caparaó	5	0	5	2,44
					Coastal North	3	0	3	1,46
SP	23	4	27	13,17	Mogiana	9	3	12	5,85
					Alta Paulista	8	1	9	4,39
					Garça-Marília	4	0	4	1,95
					Southwest	2	0	2	0,98
PR	5	1	6	2,93	Norte Velho	1	1	2	0,98
					Norte Novo	4	0	4	1,95
BA	38	0	38	18,54	West	12	0	12	5,85
					Plateau	2	0	2	0,98
					Chapada	24	0	24	11,71
					Extreme South	0	0	0	0,00
RO	4	0	0	1,95	Rondônia	4	0	4	1,95
RJ	3	0	3	1,46	Northwest	2	0	2	0,98
					Serrana	1	0	1	0,49
Total	182	23	205	100	Total	182	23	205	100,00

Source: Results of the study.

Source: Results of the study.

The latest technologies have contributed to reduce the cost of production, as well as to the viability of farming in areas where there is shortage of manpower, as in western Bahia region entirely dependent on mechanization of farming and harvesting.

The evolution of technological trajectory of coffee in Brazil is illustrated in Figure 2, which shows the color scale generated by two-way joining method. This figure expresses, reading vertically, the technologies used in the analyzed period regarding the relative importance of each technology, and horizontally, the five periods identified in the survey, for Brazil as a whole. The two-way data-joining allows viewing through a graphical color scale with discrete contours, the result of crossing of the observed variables and classes expressed by a statistical frequency, in the case of the study of 2% to 26%.



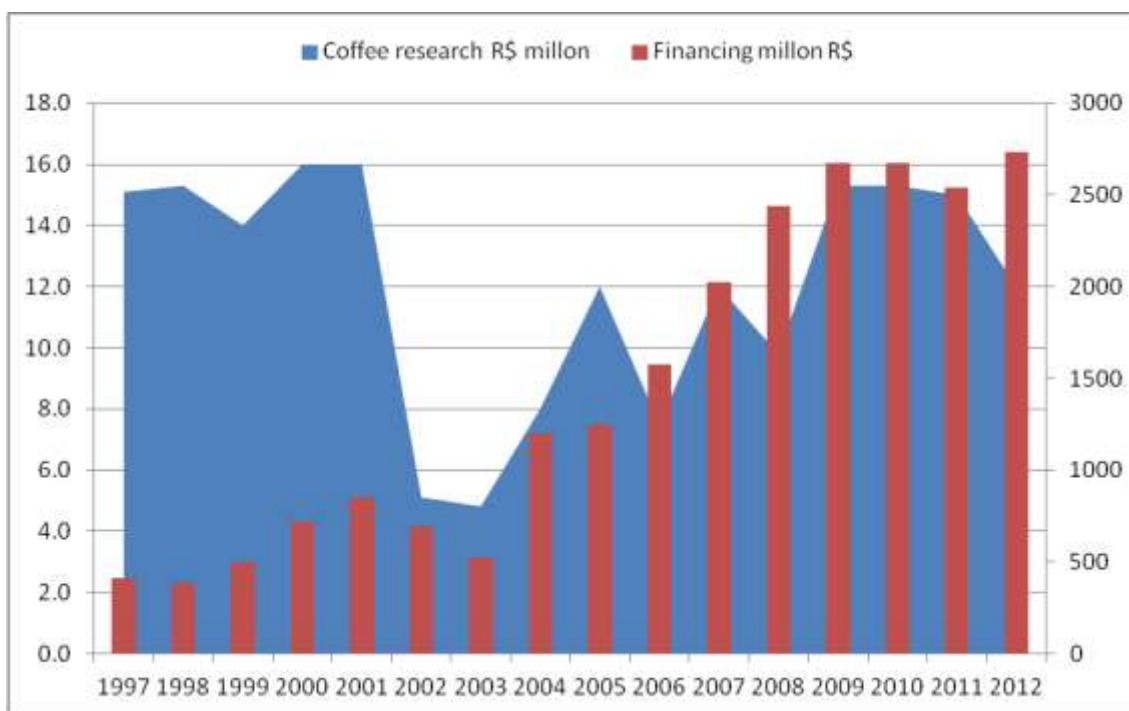
Source: Results of the study.

Figure 2. Technological trajectory analysis using Two-way joining in the Brazilian coffee sector, 1932 a 2012.

These results indicate that chemical fertilization technology is the most important in all five periods analyzed. Its importance in the relative frequency of the data, ranging from 14-26%. It also indicates that the three key technologies for the development of coffee production for the two first periods, until 1955 and from 1955 until 1974, had been liming, chemical fertilization and the use of productive varieties. That is, the nutrition of plants and the genetics were the basis of increased crop yields (Figure 2).

It was precisely in this period that the Agronomic Institute of Campinas intensified his work in breeding, developing productive varieties – modern cultivars: in 1954 was launched the cultivar Mundo Novo, and in 1972 cultivar Catuaí.

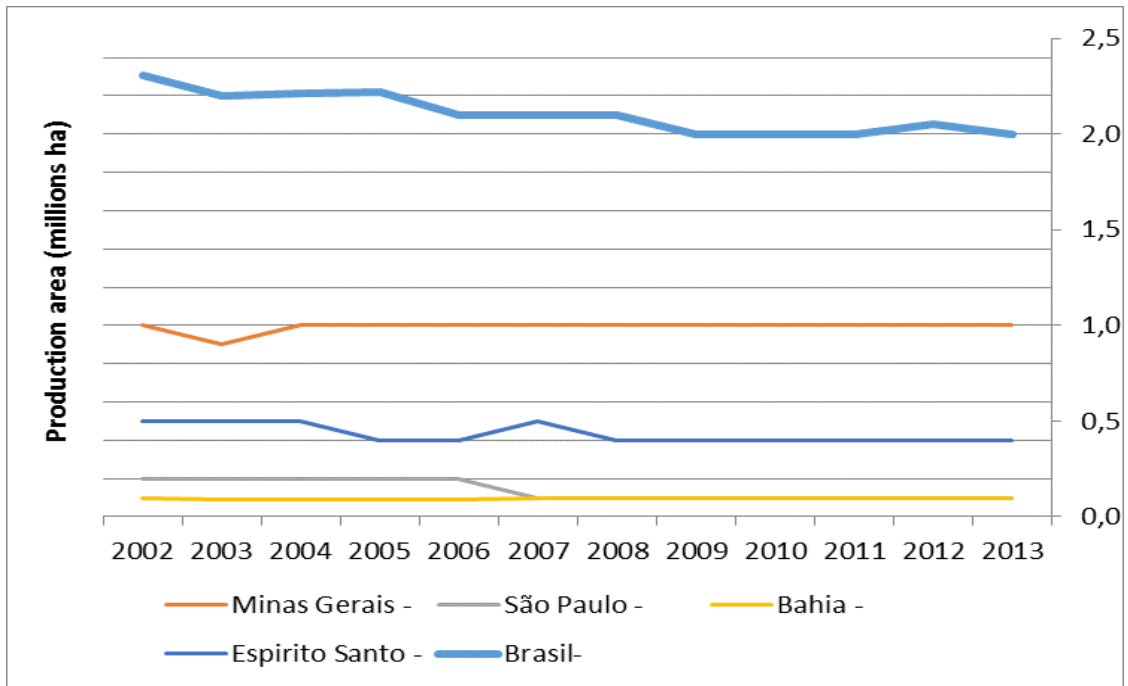
The set of technologies observed for the period 2001 - 2012, clearly represents the profile of the coffee production in the western regions of the state of Bahia, part of the region of Garça and Marília, and Mogiana in São Paulo State, the Cerrado and the southern part the Minas Gerais State. These technologies together show that it is possible to improve the adequacy yield and facilitate handling in large agricultural areas, as well as the shortage of manpower.



Source: Ministry of Agriculture and Livestock - MAP, Coffee Department – DCAF.

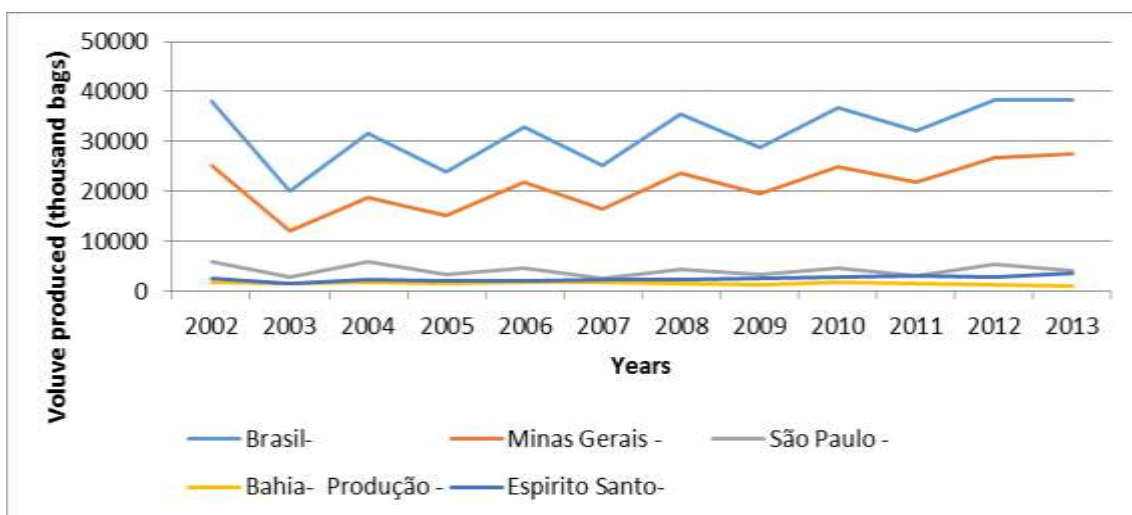
Figure 3. Indicators of investment in coffee research and funding for farmers, 1997 to 2012, R\$ million.

When we look at the data of investment in research, in Figure 3, we can see that the investment has a sharp drop and a gradual recovery in the last nine years. Funding for the producers had a gradual and significant increase especially in the last eight years. The areas production decreased, as shown in Figure 4, while the production and yield gradually increased (Figures 5 and 6).



Source: Ministry of Agriculture and Livestock - MAP, Coffee Department – DCAF.

Figure 4. Indicators for area of coffee production, 2002-2013.

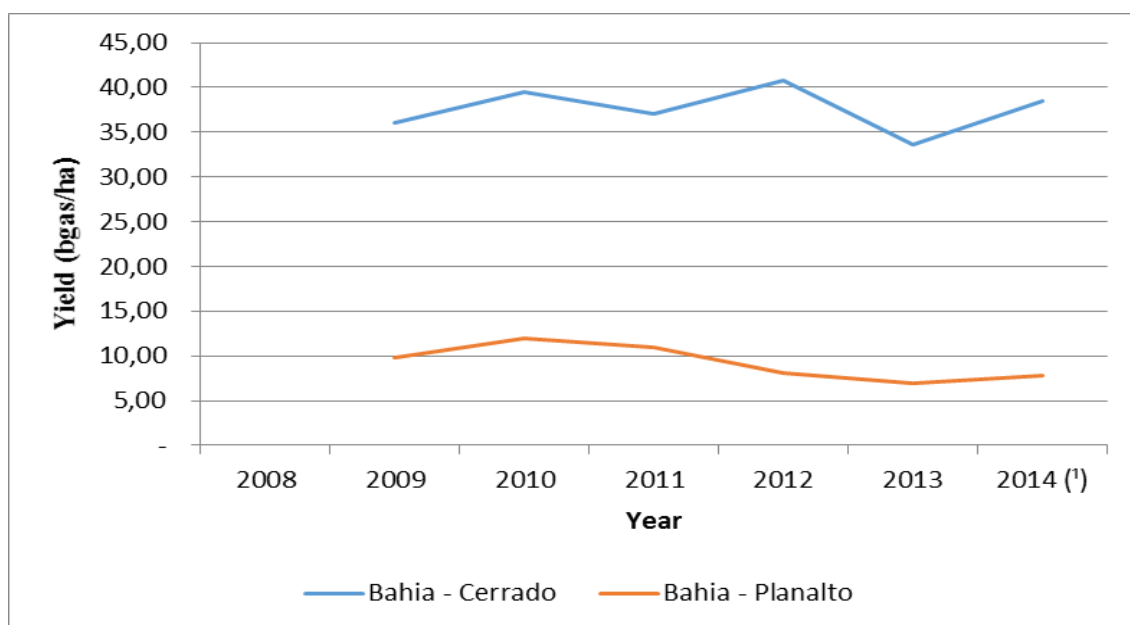


Source: Ministry of Agriculture and Livestock - MAP, Coffee Department – DCAF.

Figure 5 - Indicators of coffee production, 2002-2013

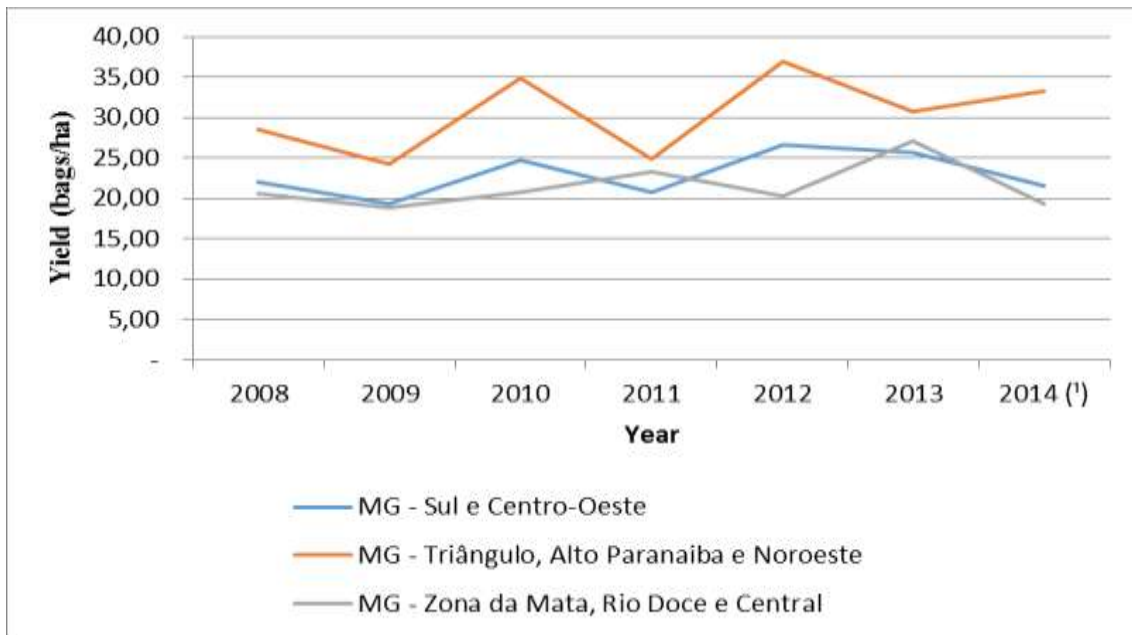
In the last two decades, technologies for coffee plantations were used more intensively, which may have contributed to greater productive efficiency observed in Figure 5, through more rational exploitation of land use and greater care with nutrition coffee, weed control, and of pests and diseases, increased use of irrigation and mechanization of farming and harvesting.

The information in Figure 1, when checked against the indicators in the Figures 6 and 7 show that in regions where technological innovations were identified as the breaking point for the sector development were adopted and consolidated, there was an increase in yield regarding other regions, for instance, in Cerrado of Bahia (Figure 6), and in Triangulo, Alto Paraíba and Northwest of Minas Gerais State (Figure 7).



Source: Ministry of Agriculture and Livestock - MAP, Coffee Department – DCAF.

Figure 6 – Indicators of coffee yield, Bahia coffee regions, 2002 a 2013.

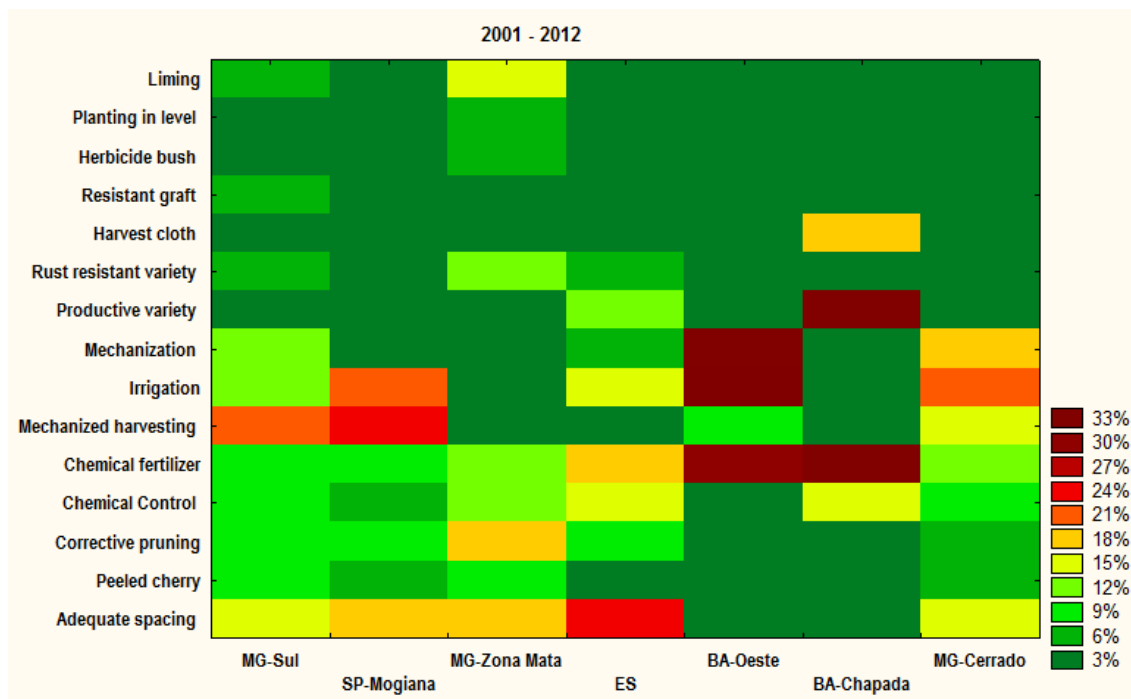


Source: Ministry of Agriculture and Livestock - MAP, Coffee Department – DCAF.

Figure 7 – Indicators of coffee yield, Minas Gerais coffee regions, 2002 a 2013.

Regarding regional analysis of Brazilian coffee growing, it is observed in Figure 8 that in the South of Minas Gerais and Mogiana, in São Paulo, production systems are more homogeneous. In these regions the climatic conditions are very similar, despite the use of irrigation to be one of the key technologies used in part of the region of Garça - Marília and Mogiana in São Paulo.

In the West and in the Chapada of Bahia, the most used technologies are yielding varieties, irrigation, mechanical harvesting and resistant varieties. Remember that coffee production is very important for the agricultural economy of the state of Bahia, a state that currently ranks fourth in the production of coffee in Brazil, having produced 1.80 million 60-kg bags in the 2013 harvest (*Coffea arabica* L. and *C. canephora* Pierre species) and accounting for approximately 3.66% of the national production (CONAB 2013). The State of Bahia has a significant and coffee plantations comprised of three main producing regions (Matiello, 2000).



Source: Results of the study.

Figure 8. Technological trajectory analysis using Two-way joining in the coffee sector, the main Brazilian coffee regions, 2001 a 2012.

In the Plateau region are located in sub-regions of Vitoria da Conquista, Chapada Diamantina and Itiruçu / Jiquiriçá Valley / Brejões (Fernandes, 2011). In this region, 70% of the coffee estates belong to family farming, with crops of up to 05 hectares and produce only 30% of local production (Bliska et al., 2009).

The data in Figure 8 for the Cerrado Mineiro, show that the set of technology mechanization, irrigation, spacing and mechanical harvesting technologies are most used in the analyzed period.

Each segment of this productive chain influences and is influenced by standards of technological development of different segments, correlated by the diffusion of innovations and changes in relative prices and the derived demand.

The coffee production chain is the most important agro-industrial complex of Minas Gerais and has ceaselessly sought greater efficiency and competitiveness. But still do not know their ability to impact different sectors related to it. Cerrado region has produced 27.6 million bags of 60 kg in the 2013 season and contributed with 56.2 in the national production (CONAB, 2013).

Regarding the Zona da Mata region, it covers areas in Minas Gerais and Espírito Santo States, and present similar edaphoclimatic peculiarities. Manhuaçu, in the Zona da Mata, is the main reference for the coffee trade of Espírito Santo State (Federico, 2013).

The slope of the land is very strong, the farms are small and family farms predominate, which interleave coffee production with subsistence crops to supply the local market. The cultural aspect - secular heritage of coffee production - first generates resistance to the adoption of new technical systems on the other hand, perpetuates the practice of coffee farming based on savoir-faire historically constructed as the partnership basis eliminates the monetary costs at times more labor-intensive (harvest and post-harvest). In Figure 8 shows that the most used technology is the adequate spacing, due to the slope of the coffee regions. Other important technologies are chemical fertilizer, chemical control, corrective pruning, irrigation and yield varieties.

When the statistics comparing the HDI - M of some municipalities in the regions analyzed in the study, it was observed that there was a significant improvement in rates in all regions, around 47% increase in the period 1991-2010.

In Table 3 we can see that there was a decline in Value of Coffee Production in some municipalities of Southwest regions and Alta Paulista, in São Paulo. But in general the production value increased between 40 and 50% in more traditional areas. In regions where coffee production is more recent, as in Cerrado of Minas Gerais, the increase was over 150%. Gross Agricultural GDP, also shows an increase in agricultural production in the municipalities of coffee regions, this confirms that the technology not only to more coffee for all agricultural areas had efficiency.

CONCLUSION

The technological trajectory in the agricultural segment of the coffee industry, when faced with indicators of yield of crops, the Coffee Production Value, and indicators of economic development in different coffee regions, allows us to conclude that, in the last two decades, in regions where modern technology has been used intensively, there is greater efficiency in grain production, increasing yield, reducing costs by area and positive social impacts. That is, regions where technological innovations were adopted and consolidated, there was an increase in yield and their socioeconomic indicators are significantly better than in other regions.

Table 3: Value of Coffee Production, 2004/5 and 2011/12; Agricultural GDP, 2001 and 2011; Brazilian coffee regions.

State	Region	Municipality	Value of Coffee Production/mil/R\$		Agricultural GDP	
			2004/05	2011/12	2.001	2011
Espírito Santo (ES)	Serrana	Domingos Martins	20.434	37.882	45.948	122.989
		Marechal Floriano	10.278	19.890	13.740	59.441
		Brejetuba	51.216	111.930	12.695	93.207
		Venda Nova do Imigrante	7.976	16.891	17.309	52.210
	Alto Caparaó	Iúna	22.155	75.708	36.873	73.585
Minas Gerais (MG)	Sul de Minas	Varginha	23.154	63.241	22.752	73.743
		Guaxupé	17.527	62.188	19.147	50.988
		Poços de Caldas	26.400	35.905	18.420	47.875
	Cerrado	Monte Carmelo	76.752	186.451	69.278	217.387
		Araguari	55.860	159.093	117.424	292.801
		Patos de Minas	33.145	75.808	79.699	272.876
		Manhuaçu	59.616	138.956	20.959	181.306
	Zona da Mata	Manhumirim	22.982	61.012	7.551	64.635
		Raul Soares	13.145	26.855	16.041	44.692
		Água Boa	8.139	15.458	23.727	36.626
	Vale do Jequitinhonha	Capelinha	19.521	38.754	37.104	72.161
Turmalina		3.600	6.840	6.474	50.688	
Francia		22.046	36.333	9.975	30.455	
São Paulo (SP)	Alta Mogiana	Pedregulho	23.858	107.778	15.192	39.900
		São João da Boa Vista	9.840	26.827	25.592	55.486
		Marília	2.558	7.410	12.433	38.437
	Centro Oeste	Garça	36.018	84.816	14.001	48.379
		Vera cruz	9.187	23.701	4.480	11.813
	Sudoeste	Pirajú	11.484	32.760	11.218	26.862
		Sarutaia	4.688	735	2.945	5.202
		Timburi	5.208	1.911	2.393	7.963
		Tejupá	14.274	10.616	6.521	13.267
	Alta Paulista	Dracena	2.175	1.989	6.101	29.147
Adamantina		3.607	2.182	10.801	27.578	
Tupã		935	1.020	9.477	73.111	
Bahia (BA)	Oeste	Barreiras	50.885	59.572	132.121	410.960
		Luis Eduardo Guimarães	31.018	40.548	127.700	308.594
	Planalto	Barra do Choça	17.093	63.504	52.254	171.700
		Vitoria da Conquista	6.063	30.800	47.191	99.648
	Chapada Diamantina	Barra da Estiva	18.612	12.500	18.908	60.086
		Piatã	2.041	4.650	6.369	6.238
		Ibicoara	9.520	19.366	23.068	157.791

Source: Results of the study, based on MAPA/CONAB/ABIC (2013).

REFERENCES

ABIC – Associação Brasileira da Indústria de café. **Estatísticas – Produção Agrícola – Café Beneficiado – safra 2013 – Parque Cafeeiro, Produção e Produtividade**. 2013. Disponível: <http://www.abic.com.br/publique/cgi/cgilua.exe/sys/start.htm?sid=48#2248>

AZEVEDO, J.L. (1994) **Ciência e tecnologia no Brasil; uma nova política para um mundo global**. Rio de Janeiro: S.Schwartzman, 1994. 59p.

BLISKA, F.M. de M.; MOURÃO, E.A.B.; AFONSO JÚNIOR, P.C.; VEGRO, C.L.R.; PEREIRA, S.P.; GIOMO, G.S. **Dinâmica fitotécnica e socioeconômica da cafeicultura brasileira**. Informações Econômicas, v.39, n.1, p.5-18, 2009

BLISKA, F.M.M.; GUERREIRO FILHO, O. **Prospecção de Demandas na Cadeia Produtiva do Café no Estado de São Paulo**. Campinas: Instituto Agrônomo, 2007. 75p.

BLISKA, F.M.M.; VEGRO, C.L.R.; FRONZAGLIA, T.; TURCO, P.H.N. **Conexão entre inovação e organização social na expressão de arranjos produtivos cafeeiros no Brasil**. In: Atas. Políticas de Base Regional e Recuperação Econômica. 19º-Congresso da APDR – Associação Portuguesa para o Desenvolvimento Regional. Braga, Portugal: Universidade do Minho, p.1122-1131, 2013.

CASTILLO, R. A. 2008. **“Região competitiva e logística: expressões geográficas da produção e da circulação no período atual”**. In: IV Seminário Internacional sobre Desenvolvimento Regional, 2008, Santa Cruz do Sul RS. Anais do IV Seminário Internacional sobre Desenvolvimento Regional. Santa Cruz do Sul RS :Unisc, v. 1.

CONAB – COMPANHIA NACIONAL DE ABASTECIMENTO. **Avaliação da Safra Brasileira Café Safra 2013 – Quarta Estimativa – Dezembro 2013**. Brasília: CONAB, 2013. Disponível em: <<http://www.conab.gov.br>>. Acesso em: 10 de maio de 2014

FERNANDES, R.H. **Diagnóstico e propostas para a cadeia produtiva do café da Bahia**. Salvador: SEAGRI, 2011. 40p.:il.

FREDERICO, S.: **Cafeicultura científica globalizada e as Montanhas Capixabas: a produção de café arábica nas regiões do Caparaó e Serrana do Espírito Santo, Soc. & Nat.**, Uberlândia, 25 (1): 7-20, jan/abr/2013

GIL, A. **Método e técnicas de pesquisa social**. 6. ed. São Paulo: Atlas, 2012.

HAIR, Jr., J.F.; BLACK, W.C; BABIN, B.J.; ANDERSON, R.E.; TATHAM, R.L. **Análise multivariada de dados**. Trad. Adonai Schlup Sant'Anna. 6. ed. Porto Alegre: Bookman, 2009.

HARTIGAN, J. A. **Clustering algorithms**. New York: Wiley, 365 p., 1975.

IBGE – Instituto Brasileiro de Geografia e Estatística – **Levantamento Sistemático da Produção Agrícola**, Rio de Janeiro v.26 n.1 p.1-83 janeiro 2013. http://www.ibge.gov.br/home/estatistica/indicadores/agropecuaria/lspa/lspa_201301.pdf acesso em: 10 de maio de 2014.

MATIELLO, J.B. **Diagnóstico da cafeicultura baiana**. Salvador: SEAGRI, 2000. 24p

MAPA – Ministério da Agricultura e Pecuária e Abastecimento – Estatísticas, <http://www.agricultura.gov.br/vegetal/estatisticas> acesso em: 31 de maio de 2014.

ORLOWSKI, R. F.; AREND, S. C. **Indicadores de Desenvolvimento sócio Econômico na região da AMOSC – Associação do Município do Oeste de santa Catarina**. Disponível em: <http://www.sober.org.br/palestra/2/922.pdf>>. Acesso em 01 de jun. 2014.

ORGETA, A. C., JESUS, C. M., MOURO, M. C., **Mecanização e Emprego na Cafeicultura do Cerrado Mineiro** Revista ABET vol.VIII—n.2/2009.

POSSAS, M.L.; SALLES-FILHO, S.; SILVEIRA, J.M. **An evolutionary approach to technological innovation in agriculture: some preliminary remarks**. Cadernos de Ciência e Tecnologia, Brasília, v. 11, n. 1/3, p. 9-31, 1994.

PEREIRA, J. C. R. **Análise de dados qualitativos: estratégias metodológicas para as ciências da Saúde, Humanas e Sociais**. 3. ed. São Paulo: Edusp, 156 p., 2004.

RAMALHO, M. A. R. **Genetic improvement and agribusiness in Brazil. Crop Breeding and Applied Biotechnology**. Viçosa, v. 4, n. 2, p. 127-134, 2004.

ROCHA, A. D. et al. **Qualidade de vida, ponto de partida ou resultado final?. Ciência Saúde Coletiva**, Rio de Janeiro, v. 5, n. 1, 2000.

STATSOFT, Inc. **STATISTICA (data analysis software system)**, version 8.0. Tulsa, 2007. Disponível em: <www.statsoft.com>.