MULTIVARIATE ANALYSIS OF PRODUCTION OF PERISHABLE GOODS IN THE STATE OF SÃO PAULO

F. F. Putti[1*], N. Macini[2], I. P. de F. e Silva[1], D. de O. Latorre[1], J. F. da Silva Junior[1], R. Ludwig[1], A. P. R. A. Schimitd[1]

[1]*Faculdade de Ciências Agronômicas, UNESP – Univ Estadual Paulista, Campus de Botucatu, SP, Brasil*
[2]*Faculdade de Economia, Administração e Contabilidade de Ribeirão Preto, USP – Univ de São Paulo, Campus de Ribeirão Preto, SP, Brasil*

ABSTRACT

Brazil is characterized by great diversity. The fact is not different in the state of São Paulo where several crops are produced in different administrative regions. Current study determines which productions are closer to major consumer centers. A multivariate analysis between production and towns has been applied so that the principal components of this analysis may be assessed. Further, the more perishable products are those which are closer to consuming centers.

Keywords: agribusiness, dendrogram, farmer.

ANÁLISE MULTIVARIADA DA PRODUÇÃO DE PRODUTOS PERECÍVEIS NO ESTADO DE SÃO PAULO

RESUMO

O Brasil é caracterizado por sua diversidade. Dentro do estado de São Paulo isso não se diverge, e existem diversas culturas produzidas em diferentes regiões administrativas. Esse trabalho buscou verificar quais as produções estão mais próximas aos grandes centros consumidores. Para determinar os componentes principais dessa análise, foi aplicado a análise multivariada entre a produção e as cidades. Por fim, encontrou-se que os produtos com mais perecibilidade são os que se encontram mais próximas dos centros consumidores.

Palavras-chave: agronegócio, dendrograma, produtor rural.

[*] fernandoputti@fca.unesp.br

INTRODUCTION

Agribusiness is currently one of the economy´s segments with great potential for growth in Brazil. In 2013 it featured more than 20% of the NGP. The productions of goods consumed *in natura* may be underscored in the state of São Paulo, Brazil, due to the nearness to the market and their high aggregated value.

Analyses of edaphoclimatic conditions, prices and future prospects should be taken into account when the place of crop planting has to be decided (FERREIRA, L. 2011).

COSTA et al. (2013) reported, by multivariated analyses, that in the Brazilian state of Minas Gerais government investment for the development of agribusiness highlighted advancements in certain regions.

By cluster analyses, WEERSMA et al. (2009) reported that in the northeastern region of Brazil the production factor involving quality products, quick, regular and punctual delivery, packing meeting distribution demands and irrigation are the factors of great importance in competitiveness.

Agricultural development in the southwestern region of the state of Paraná revealed faults in basic infrastructure due to local conditions. The above analysis by Melo and Silva (2014) was undertaken by multivariate methodologies.

It should be underscored that besides the factors linked to production, another intrinsic factor of agribusiness comprises an analysis of companies linked to regional produce (DIEL et al., 2014).

Current analysis discusses data on how the main products of agribusiness in the state of São Paulo are related to their administration regions and verifies whether produce is close to the consumer centers.

MATERIALS AND METHODS

The analysis of data comprised total produce cultivated and produced in the state of São Paulo, Brazil. In the wake of the great number of municipalities, the state division by the Agricultural Development Offices (EDR) was adopted (Figure 1).

Figure 1 – Map of the regions in the state of São Paulo produced by the Regional Development Offices. Source: IEA (2014).

Data for current investigation were collected from the database of the Institute of Agricultural Economy (IEA, 2014) which makes available download in CVS electronic spreadsheets. Kolmogorov and Smirnov´s test was performed for the statistical analysis of data to verify data normality.

The principal components model was applied for the different groups of variables with Excel program and XLSTAT supplement to correlate the products with the administrative regions.

The correlation between production and town was calculated to determine the principal components. Estimates of eigenvalues and eigenvectors were thus assessed. Eigenvectors are the weight of each variable in each component (axes) and are the coefficients of relationships varying between -1 and +1 (LATTIN et al., 2011).

RESULTS AND DISCUSSION

Table 1 shows a descriptive analysis of the data. Minimum and maximum rates, average and standard deviation were calculated.

Table 1 – Descriptive statistics of data of products from the state of São Paulo, Brazil.

Variable	Minimum	Maximum	Average	Standard deviation
Avocado	2,485	29,715,053	4,734,840,733	7,655,375,135
Pineapple	119	8,911,855	855,837,1333	2,274,670,248
Pumpkin	272,000	718,622,000	110,337,325.3	210,550,228
Squash	2,875	20,962,506	2,735,971,533	5,394,800,841
Lettuce	30,001	64,853,514	9,001,192.6	18,470,146.28
Whole peanuts	72	43,491,797	10,278,685.87	14,573,394.51
Whole rice	2,030	17,889,430	2,621,499,933	4,439,624.39
Banana	973,126	671,071,787	63,820,641	169,437,228.9
Potato	200	142,584,938	19,724,426.21	46,252,165.67
Processed coffee	3,768	23,294,387	5,035,211.8	6,802,527.64
Sugar-cane	10,842	74,1331,756	390,656,800.2	269,996,511.4
Beef	184,116	253,438,001	87,980,013.73	83,438,913.7
Chicken	661,790	10,001,923,762	1,594,735,449	2,796,405,183
Pork	255,927	56,672,804	10,751,417.87	17,496,331.22
Carrot	2,618	651,122,192	99,773,940.27	212,500,776
Beans	3,262	55,584,634	6,016,293,667	14,023,938.84
Guava	23,487	99,037,821	19,034,999.67	28,273,778.3
Orange	38,871	1,903,828,630	475,781,434.8	627,782,663.9
Milk	62,737,800	6,122,261,550	2,474,329,356	2,005,421,554
Lemmon	144,462	353,894,596	48,760,664.73	95,776,511.92
Manioc	1,426,150	36,239,049	8,791,477,133	9,294,561.76
Mango	5,477	552,095,144	16,124,6513.6	193,742,802.9
Passion-fruit	21,439	19,270,896	4,670,112,133	6,173,909,396
Honey	13,760	10,256,062	1,984,232,133	2,786,839.22
Maize	14,555	406,374,847	92,209,667.87	114,104,872.2

Eggs	11,698	246,807,184	39,721,511.13	64,034,290.16
Red pepper	2,261	41,069,558	8,277,185,133	11,077,027.41
Soybean	630	142,620,158	33,664,790.64	42,353,398.78
Tangerine	58,665	126,162,195	34,045,897.93	36,621,243.37
Tomato	2,000	1,903,889,839	394,588,738.1	541,844,213.4

Table 2 – Class division of producing regions according to the products.

Class	1	2	3	4
Goods	4	8	1	2
Sum of weights	4	8	1	2
Interclass variance	3176×10^{15}	11928×10^{15}	0	10320×10^{15}
Minimum distance to centroid	814810798.822	566353816.342	0	2271656984.521
Mean distance to centroid	1433355882.264	997534382.953	0	2271656984.521
Maximum distance to centroid	2370598709.391	1248350847.646	0	2271656984.521
	Araçatuba	Baixada Santista	Campinas	Central
	Presidente Prudente	Barretos		Sorocaba
	São Jose do Rio Preto	Bauru		
	São Jose dos Campos	Franca		
		Marilia		
		Registro		
		Ribeirão Preto		
		São Paulo		

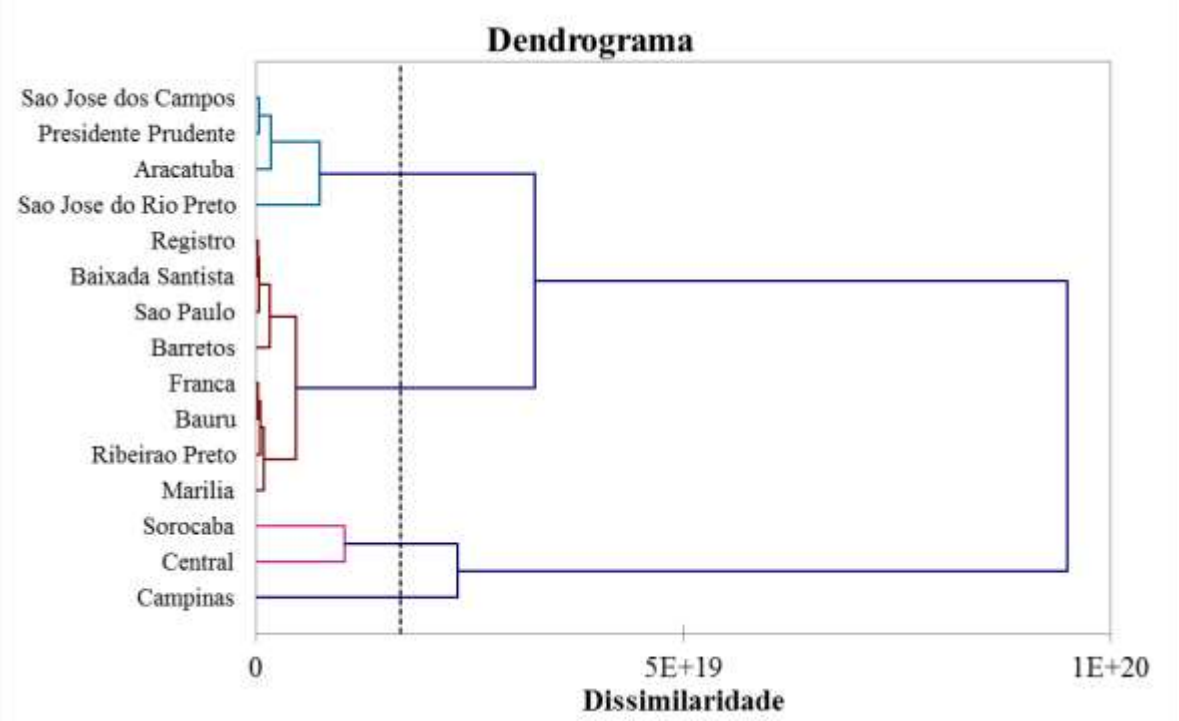

Figure 2 - Dendrogram of the analysis of the state of São Paulo according to products.

The principal components were analyzed so that the behavior of each product could be verified according to the region (Figure 3).

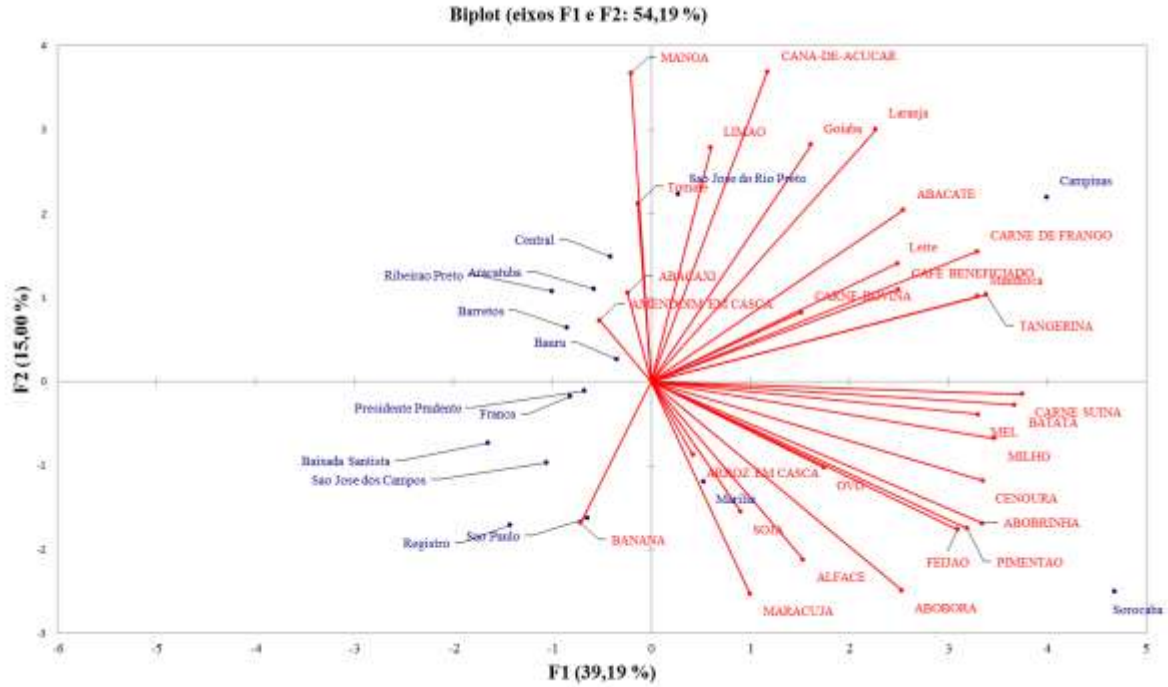

Figure 3 - Analysis of principal components for the producing regions of the state of São Paulo, Brazil.

It may be highlighted that the products requiring faster consumption due to their perishable conditions are produced largely in the regions close to their consumption centers. Edaphoclimatic and demand characteristics influence the production scale per region

The first axes of ACP (F1) with 39.19% of data variations show a high co-relationship between the São José do Rio Preto region with large-scale products, such as oranges, sugarcane, lemons and mangoes. The region´s hot climate and large spreading plantations favor the development of these crops

The concentration of processed products in the Campinas region shows a developing industrial region with several government investments. The region lies close to Brazil´s greatest consumption centers.

There is a great production of vegetables and products that require only small plots of land in the Sorocaba region. Since the region is highly peopled, it is characterized by the cultivation and produce of highly perishable crops

The Marilia region is characterized by its great production of eggs. Further, the fowl´s diet requirements characterize the region as a great soybean producer. Whole rice production is due to the need of hay and bran for fowl litters.

The São Paulo and Registro regions are specialized in the production of banana since they lie in a mountainous region with proper edaphoclimatic conditions for the crop.

CONCLUSIONS

The concentration of vegetables in small homesteads near great consumers´ centers is due to the demand of their consumption within the shortest period.

The region´s edaphoclimatic factors actually determine produce, coupled to technology that stimulates production of industrialized food.

In fact, the state of São Paulo has four distinct regions determined by factors that prop the economy of the administration regions.

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