PEDOLOGIC INDEX AND OF SOILS MANAGEMENT: INSTRUMENT OF PUBLIC POLITICS FOR REDUCTION OF THE REGIONAL INEQUALITIES IN THE STATE OF MINAS GERAIS

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INTRODUCTION

In the analysis of the determinants of yield and of growth in the State of Minas Gerais, beyond social and economic variables, are able to be detached passive geographical variables and active (CARNEIRO *et al.*, 2004).

The passive geographical variables can be, by a side, essentially static, as the latitude or length, or on the other hand, unruly, like the regimen of rains. In any of the cases they are you subject to no control or alteration by the human action. It is able to itself in the maximum one identify that these variables contributed for an uneven development between the regions. They are examples of those variables the climate, the temperature, the relief, the haste and the topography.

The active geographical variables are characterized as those that are subject to technical alterations to the long one of the time and, by that, can have a fundamental paper in the development of determined regions. It soil, as a dynamic component, can be thought like an active geographical variable when itself tappet in count the seen, technological question that this confers the possibility of be modified his use and management.

Climate, soil, topography and haste affect the agriculture under several forms, since the productivity, to the agricultural possibility of to be performing operations, or to even to the geographical distribution of the cultures in a determined region. All those variables condition the distribution of the agricultural, however, the economic and social factors influence more strongly in the kind of culture it to be practiced and, consequently, in the level of yield, if all the other conditions will conjugate favorably.

In this perspective, the present paper had like main objective the construction of the Pedologic Index and of Management of Solos (IPMS) for utilization as bears in economic studies that are going to diminish the inequalities in the counties of Minas Gerais. That index itself base, in principle, in the fact of that peculiar natural fertility, expressed in the

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agricultural aptitude of the lands and associated to management differentiated by means of the technologies utilized by the farmers, healthy important characteristics in the definition of bigger or smaller agricultural output and productivity. As consequence, those characteristics are going to influence in the behavior convergent or divergent of the income of the diverse counties of the State of Minas Gerais.

METHOD ADOPTED

The paper was developed in the scope of the counties. The counties correspond the spatial units, having like base the organization of the resulting space of the structure of output and of regional interaction, grouping towns with economic, social, and physical characteristics of certain homogeneity inside a same state.

The analytic procedures were comprised of analysis of maps, developed in the scope of the Geographical Information Systems (GIS), software Arc View 3.2a, and analysis of correlation and regression, driven with the software Saeg 8.x.

They were adopted some variables of output and yield, obtained through of the Farm Census of 1995/96 and of the Demographic Census of 2000, and environmental variables as the agricultural aptitude of the lands of the State of Minas Gerais (Amaral, 1993) and the Water Index of Thornthwaite and Mather (MINAS GERAIS, 1980).

The IPMS of the counties of Minas Gerais was composed by attributions differentiated to the Index of Agricultural Aptitude (IAG), to the Technological Index (ITE) and to the Water Index (IHI).

The IAG consists of the add of all of the Initial Indexes of Agricultural Aptitude (IIAG), depending on the group of agricultural aptitude, of the area occupied by the even in the counties and of the value attributed to the group.

The IHI is turned out of the add of all of the Initial Water Indexes (IHII), depending on the area occupied by each class of the water index in the counties and of the value conferred to the class in question.

The ITE consists of the add of all of the kinds of technologies, these calculated in function of the percentage of the informers with use of the practical one and to the value delegated for the same one.

Index of Agricultural Aptitude (IAG)

The agricultural aptitude of the lands is a very important variable in the agricultural, however not determinant output. This because the technological practices are capable of exceed big part of the imposed restraints by the natural environment, making feasible the agricultural output for those that possess the necessary capital.

In the evaluation of the agricultural aptitude of the lands of the State of Minas Gerais, Amaral (1993), by means of the hoist of solos of this state, proposed an evaluation and adaptation of the agricultural aptitude of the lands leading itself in consideration the characteristics of the environment, physical characteristics and chemistry of the peculiar classes of soil and the possibility of improvement of five factors basics limit of the lands: natural fertility, excess of water, deficiency of water, sensitivity to the erosion and impediments to the use of agricultural implements.

Amaral (1993) presented six groups of agricultural aptitude, being the three first, groups 1, 2 and 3 appropriate for farmings, while the three lasts were appropriate, respectively, for pasture, forestry and preservation of the fauna and flora. The present paper found to aggregate those groups. The IAG was calculated in function of the characteristic and of the value attributed to the group of agricultural aptitude and of the area occupied by the even in the counties.

The Figure 1 shows the IAG distributed in the 66 counties of the State of Minas Gerais. The IAG is situated between 0 and 10. The counties holders of the bigger values of the IAG are bearers of the best lands, second the criteria adopted in the classification of the agricultural aptitude.

Notice itself that the biggest values (situated between 7.14 and 8.47) are found in the counties of Frutal, Ituiutaba, Uberaba and Uberlândia (region Triângulo Mineiro/Alto Paranaíba), Paracatu (region Noroeste de Minas), Janaúba, Montes Claros and Salinas (region Norte de Minas), Pedra Azul (region Jequitinhonha), Nanuque (region Vale do Mucuri) and Bom Despacho (region Central Mineira).

To big frequency of the IAG in those counties must himself mainly to the strong occurrence of the group 2 of agricultural aptitude. Loudly values of the IAG necessarily will not reflect economic importance of the counties, therefore despite of the North and Northeast of the state manifest values elevated, you have localities also concentrate the majority of the counties with social and economic problems in Minas Gerais.

Figure 1 - Index of Agricultural Aptitude of the Counties of MG


Map basic: GEOMINAS (1996)
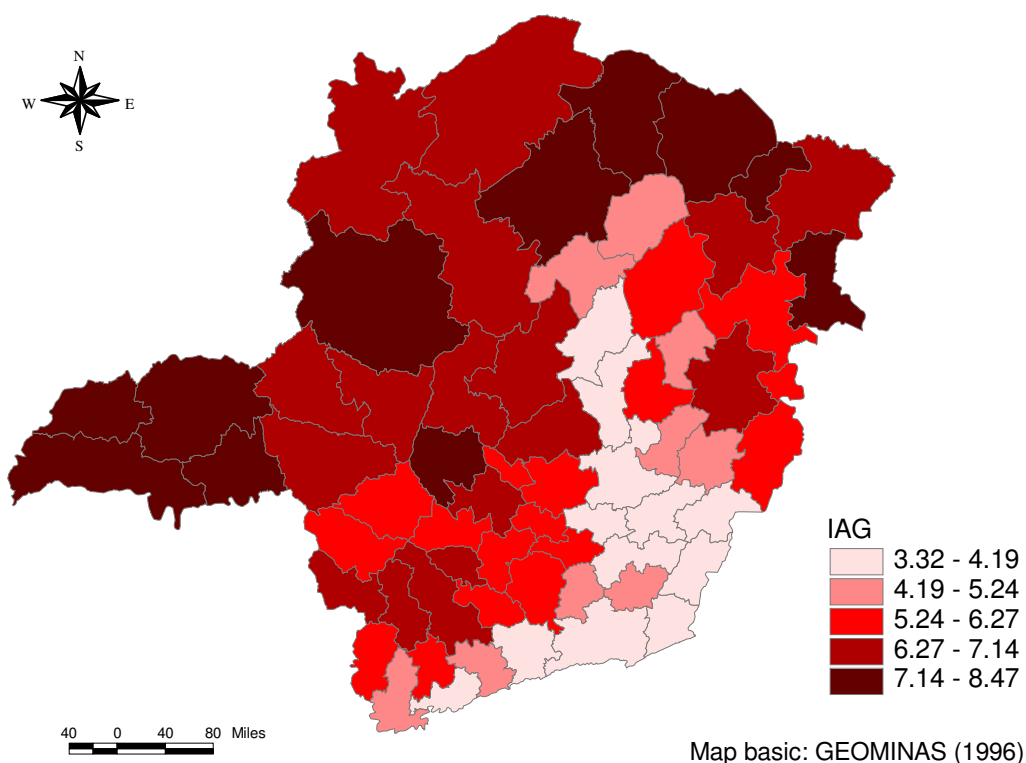
Technological Index (ITE)

The Technological Index (ITE) was built by means of the values establishment for the use of the following technological practices: use of technical aid, of fertilizers and correcting, of control of pests and illnesses, of practices of conservation of soil, use of irrigation and of electric energy.

The availability of the technology is distributed agreement with the percentage of the informers of the farm establishments that arrange of the practical one in question. The peculiar technologies can occur or not simultaneously in all the counties. This caused to be built an index for each technology, in function of the percentage of the informers with the availability of the same one in each county, and in function of the value attributed for the respective technology.

The ITE consisted of the sum of the diverse indexes of the technologies of the counties. The Figure 2 presents the ITE, distributed in the 66 counties of the State of Minas Gerais. The ITE, similar to the IAG, also varies of 0 to 10. The counties with the biggest values of the ITE are representatives of the best technological conditions, second the indicator adopted in the index.

Figures 2 - Technological Index in the Counties of MG

ITE
	1.3 - 2.6
	2.6 - 3.9
	3.9 - 5.2
	5.2 - 6.5

40   0   40   80   Miles

Map basic: GEOMINAS (1996)
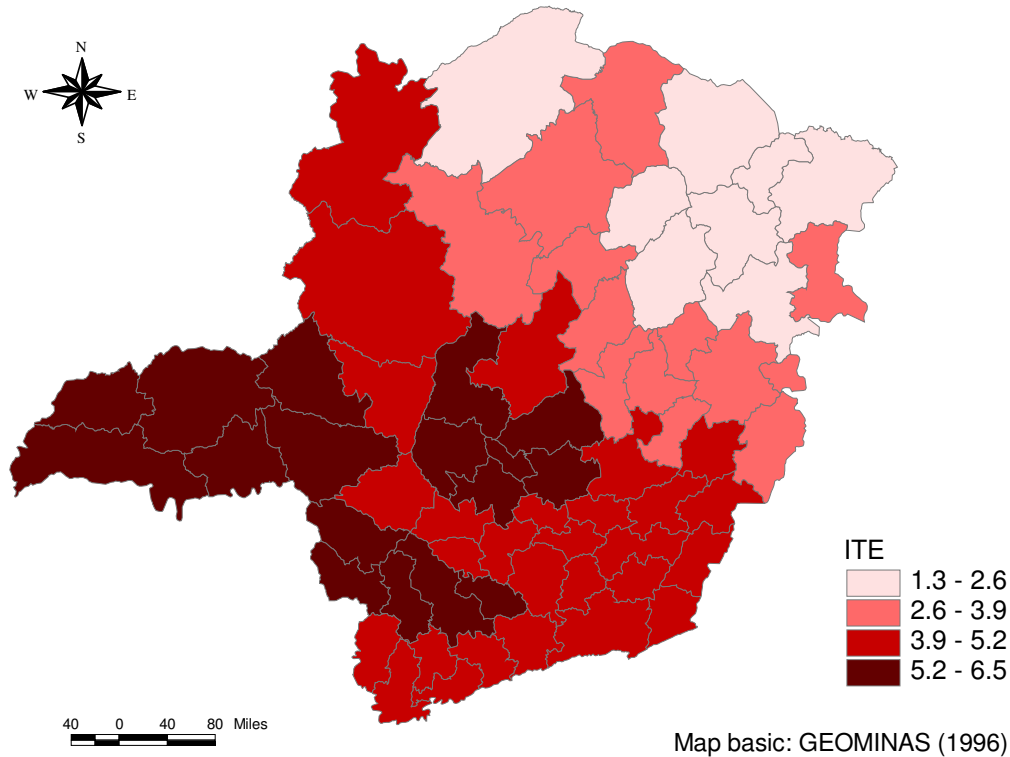
The biggest technological indicator in the counties, between 5.2 and 6.5, situate itself in Araxá, Frutal, Ituiutaba, Patrocínio, Uberaba and Uberlândia, fit in the region Triângulo Mineiro/Alto Paranaíba; Bom Despacho and Três Marias, situated in the region Central Mineira; Belo Horizonte, Pará de Minas and Sete Lagoas, located in the region Metropolitana de Belo Horizonte; Divinópolis, member of the region Oeste de Minas; and Alfenas, Lavras, Passos, São Sebastião do Paraíso and Varginha, components of the region Sul/Sudoeste de Minas.

The counties with the smaller values of the ITE, between 1.3 and 2.6, are Grão Mogol, Januária and Salinas, members of the region Norte de Minas; Almenara, Araçuaí, Capelinha and Pedra Azul, situated in the region Jequitinhonha and Teófilo Otôni, located in the region Vale do Mucuri.

The disparities regarding the agricultural output can walk for a bigger divergence, therefore an expressive spatial concentration of the technological factors in some part of the State of Minas Gerais, as is the case of the Southwest, West, Center and Northwest. This technological concentration reflects clearly in the output and agricultural productivity,

interfering considerably in the behavior of yield of the diverse regions of the state, extending the disparities between them.

Water Index (IHI)

The IHI was calculated in function of the Water Index of Thornthwaite and Mather (1955) that consists of a relation between the excesses and the deficiencies of water in the year. They were attributed values that pierced of 0 to 10 for the six classes of the water index. The IHI was calculated in function of his busy area in the counties and of the value attributed. The Figure 3 shows the IHI in the 66 counties of the State of Minas Gerais.

Figure 3 - Water Index (IHI) in the Counties of MG

Map basic: GEOMINAS (1996)
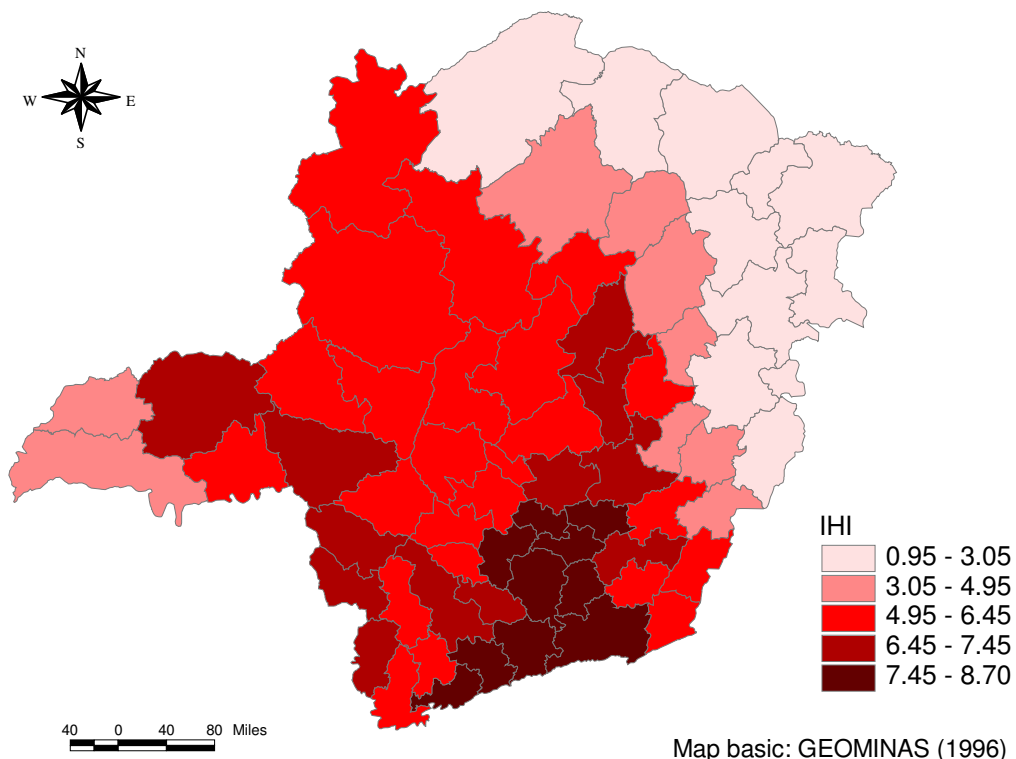
The IHI varies of 0 to 10, with the biggest values indicating the biggest ranks of humidity of the climate. The counties of the North, Northeast and extreme East of the state, which be, Aimorés, Almenara, Araçuaí, Governador Valadares, Januária, Janaúba, Mantena, Nanuque, Pedra Azul, Salinas and Teófilo Otôni possess the biggest values for the IHI, while the counties associated to the mountain range of the Mantiqueira, Espinhaço and Canastra, with highlight for the counties of Andrelândia, Barbacena, Conselheiro Lafaiete, Itaguara,

Itajubá, Juiz de Fora, Oliveira, Ouro Preto, São João Del Rei e São Lourenço are representatives of the most greatest values of the IHI.

Despite of some counties of the state will exhibit IHI enough high, is necessary to relativize, therefore others factors can act in the contrary sense of this importance. As example, appointment itself the counties marked by the mountain range of the Espinhaço, that despite will present high IHI, the agricultural development is limited by the aptitude of the land, generally belonging to the group 6, of more worse quality for farmings, being necessary high technological cost for cultivate in those local.

Pedologic Index and of Management of Solos (IPMS)

The Pedologic Index and of Management of Solos consisted of the union of three indexes built in that study: the Index of Agricultural Aptitude (IAG); the Technological Index (ITE); and the Water Index (IHI). The IPMS was concocted by means of the attribution of percentages differentiated to the peculiar indexes components. The equation it follow presents the final composition of the IPMS:
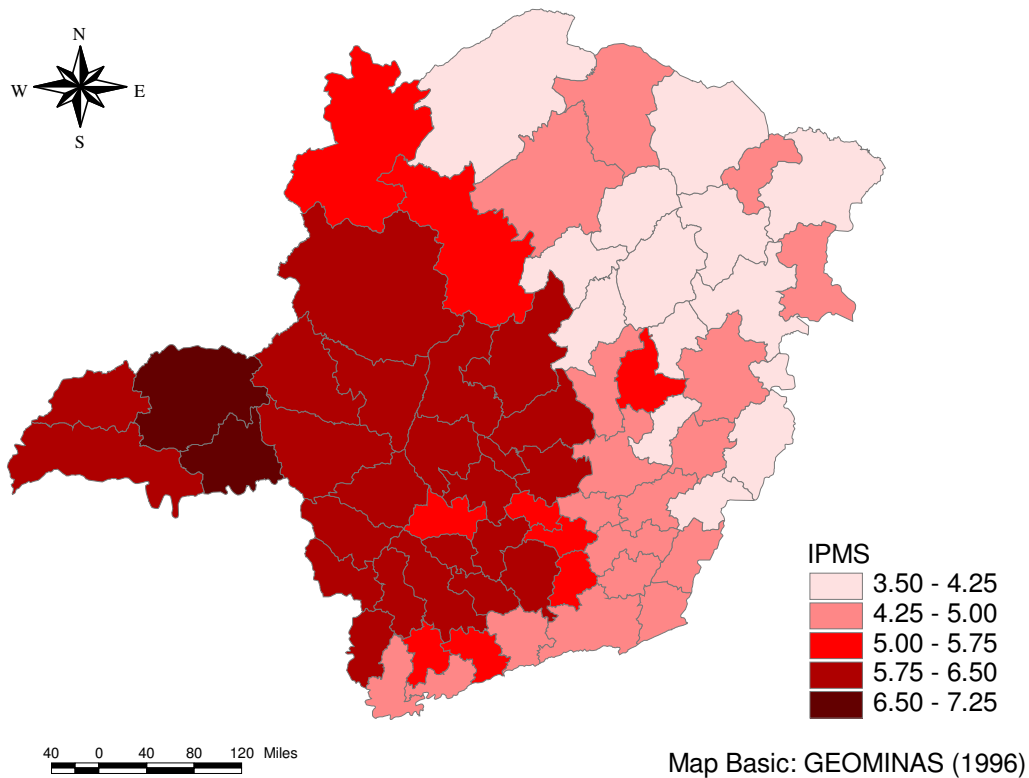
$$\mathbf{IPMS = (IAG * 40\%) + (ITE * 40\%) + (IHI *20\%)}$$

The Figure 4 exhibits the spatial distribution of the IPMS in the counties of the State of Minas Gerais. The IPMS is understood in the intermission of 0 to 10, with the biggest values indicating the best situations of the point of sight of the indicator selected.

The counties of Uberlândia and Uberaba (West of the state) itself detach for the bigger values of the IPMS, being successions by the counties of Patrocínio, in the part Northwest of the state; Araxá, Frutal, Ituiutaba, Paracatu and Patos de Minas, in the part West; Belo Horizonte, Bom Despacho, Curvelo, Divinópolis, Pará de Minas, Sete Lagoas and Três Marias, in the part Central; and Alfenas, Campo Belo, Lavras, Oliveira, Passos, Piumhi, Poços de Caldas, São João Del Rei, São Sebastião do Paraíso and Varginha, in the part Southwest and South of the state.

On the other hand, the counties Aimorés, Almenara, Araçuaí, Bocaiúva, Capelinha, Diamantina, Grão Mogol, Ipatinga, Januária, Manhuaçu, Mantena, Peçanha, Salinas and Teófilo Otôni, located in the Northeast, North and East of the state, possess the smaller values of the IPMS.

Figure 4 - Pedologic Index and of Management of Solos in the Counties of MG

IPMS
	3.50 - 4.25
	4.25 - 5.00
	5.00 - 5.75
	5.75 - 6.50
	6.50 - 7.25

40   0   40   80   120 Miles

Map Basic: GEOMINAS (1996)

The biggest values of the IPMS, fruit of the action combined of the IHI, IAG and ITE, show important characteristics in the definition of the biggest outputs and agricultural productivity and, consequently, of the income of the regions of the state where are located.

It noticed himself a strong positive correlation between the productivity of grains in 1995/96 and the IPMS, so that the biggest productivity of the culture of grains were situated in the counties holders of the biggest values of the IPMS. Of the same way, the smaller productivity of grains also were situated in the counties with the smaller values of the IPMS. Separating the IPMS from his components, the technological variable (ITE) is to that I possessed the bigger influence in the productivity of the culture of grains.

Deserves highlight the negative relation of the IPMS with the division of the percentage of poor persons in the counties of the state[1]. Or be, the counties with the biggest percentages of poor persons correspond to those with the smaller values of the IPMS.

All those expositions show to big importance of the knowledge of the IPMS, therefore

[1] Poor persons corresponds the individuals responsible by the permanent private residences with yield lower to 1 minimum salary in 2000.

is big to her influence and, in highlight of the ITE, in the agricultural productivity and, consequently, in the income. In this way, the IPMS can be an important instrument by his capacity of be subject the changes and technical alterations in the sense of collaborate for diminish the inequalities of yield in the State of Minas Gerais.

CONCLUSIONS

The present paper had as main objective the construction of the Pedologic Index and of Management of Soils (IPMS) for use in studies that allow to reduce the regional inequalities in Minas Gerais. To scale adopted was to of the 66 counties of the state. The analytic procedures consisted on cartographic analysis, developed in the ambit of the Geographical Information Systems, and correlation analysis and regression.

IPMS is divided between active geographical variables and passive. The active geographical variables are those which are susceptible to technical alterations along the time, while the passive geographical variables are not submitted to any alteration for the human action. IPMS consisted on the union of the Index of Agricultural Aptitude (IAG) and on the Technological Index (ITE), characterized as active geographical variables, and on the Water Index (IHI), a passive geographical variable.

The largest values of IPMS are placed in the counties of the parts West, Northwest, Central, Southwest and South of the state, while the counties located in the North, Northeast and East of the state exhibited the smallest values.

The paper reveals the importance of acting more incisively in the active geographical variables in some counties of Minas Gerais, because such variables are susceptible to technical alterations, permitting a substantial contribution to the reduction of the regional disparities in the state.

The variables that constitutes the IPMS, particularly the technological ones, are susceptible of alterations through the public politics, being an important instrument to change the use and management of the soil and, consequently, to elevate the agricultural income in the counties out of the dynamics of development of Minas Gerais.

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