

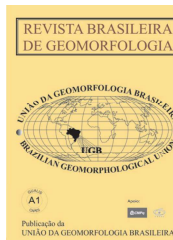


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ROCK-LANDFORM-SOIL RELATIONSHIP FOR GEOMORPHOPEDOLOGICAL CHARACTERIZATION IN THE REGION OF LAVRA VELHA, OCCIDENTAL CHAPADA DIAMANTINA, BAHIA

RELAÇÃO ROCHA-RELEVO-SOLO PARA CARACTERIZAÇÃO GEOMORFOPEDOLÓGICA NA REGIÃO DE LAVRA VELHA, CHAPADA DIAMANTINA OCIDENTAL, BAHIA

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Abstract:

The Lavra Velha region is situated on the western edge of the Chapada Diamantina and comprised of a crystalline basement and a metasedimentary cover that corresponds to the Ibitiara Granitoid and the Espinhaço Supergroup, respectively. The Chapada Diamantina is internationally recognized for mineral production and tourism, and because of that it has become a constant target for novel research that aims at characterizing its main geological and physiographic aspects. The present work aims at pointing out geomorphopedological associations of the Lavra Velha region by analyzing the interdependence between rock, landform and soil. To this end, geology, geomorphology and pedology data were obtained from literature, remote sensing

Palavras-chave:

Relação Relevo-Rocha-Solo;
Região de Lavra Velha; Chapada
Diamantina Ocidental.

data and field expeditions. In the studied area, we recognized metasedimentary and crystalline rocks, on which flat to gently undulating landforms beside crests and cliffs developed. Oxisols occur on flat to gently undulating landforms while Entisols, Inceptisols and rock outcrops appear in the aligned crests, cliffs and undulating hills. Alfisols predominate in undulating hills associated with mafic rocks. Features of the

landscape show landforms resembling the Appalachian geomorphological model as first described by William Morris Davis, and they suggest landform evolution by geochemical and mechanical erosion under a strong litho-structural control. The geomorphopedological associations allowed the understanding of the relationship between the major elements of the physical environment from Lavra Velha region and, consequently, a predictive model of the rock-landform-soil distribution that can be useful for geomorphopedological mapping of the western edge of the Chapada Diamantina.

Resumo:

A região de Lavra Velha está localizada na borda oeste da Chapada Diamantina e contempla um embasamento cristalino e uma cobertura metassedimentar que correspondem a rochas do Granitoide Ibitiara e do Supergrupo Espinhaço respectivamente. A Chapada Diamantina é reconhecida internacionalmente pela produção mineral e turística e, por isso, é alvo constante de pesquisas direcionadas à caracterização dos seus principais aspectos geológicos e fisiográficos. O presente trabalho visou apontar as principais associações geomorfopedológicas da região de Lavra Velha a partir da análise de interdependência dos elementos relevo-rocha-solo. Para a compreensão desses vínculos, levantaram-se dados de geologia, geomorfologia e pedologia tanto da literatura especializada quanto de sensoriamento remoto e campo. Na área de estudo, modelados de relevo planos a suave ondulados, bem como geoformas onduladas, cristas alinhadas e escarpas desenvolveram-se sobre as rochas cristalinas e metassedimentares. Latossolos são sustentados por relevo plano a suave ondulado enquanto neossolos, cambissolos e afloramentos rochosos ocorrem vinculados aos modelados ondulados e às cristas alinhadas e escarpas. Luvisolos predominam sobre geoformas onduladas associadas à presença de rochas máficas. Características funcionais da paisagem configuram relevo semelhante ao modelo apalachiano descrito pioneiramente por William Morris Davis e sugerem rebaixamento de terreno via erosão geoquímica-mecânica por meio de um forte controle litoestrutural. A repartição geomorfopedológica permitiu a compreensão das relações dos principais elementos do meio físico da área de estudo e, conseqüentemente, a distribuição e relação relevo-solo-rocha nessa região da Chapada Diamantina Ocidental.

Introduction

The analysis of the rock-landform-soil association is essential for the study of landscape evolution. According to Torrado *et al.* (2005), the pedogenetic processes are controlled by the dynamics of several factors, among which stand out are climate, geomorphology, and geology. The climate influences soil development, both through the availability of water that acts as a weathering agent and a chemical leaching of minerals, as well as by temperature which works as a catalyst for chemical reactions leading to degradation of rocks. The landform directly influences the pedogenetic evolution, since it controls the amount of water infiltrated through the terrain, and consequently, the speed of the chemical reactions that promote rock weathering (CURI & FRANZMEIER, 1984). Typically, soils that come from quartz-rich rocks tend to present medium to coarse texture and acidic pH (MEDEIROS *et al.*, 2013). In contrast, soils resulting from the decomposition of

basic/ultrabasic rocks tend to be clayey and alkaline (TORRADO *et al.*, 2006).

Research focused on the understanding of the rock-landform-soil relationship and its influence on several types of natural phenomena have been developed throughout the world since the 1960s (e.g. TROEH, 1964; LEPSCH *et al.*, 1977; TRICART & KILLIAN, 1979; THOMAS *et al.*, 1999; CASTRO & SALOMÃO, 2000; LACERDA *et al.*, 2008). However, surveys involving these three landscape components simultaneously in association with litho-structural variables are still limited. Despite this, the geomorphopedological characterization, in which there is a soil-landform-rock analysis associated with litho-structural elements, has been approached as an important mechanism to understand the landscape evolution and soil distribution, as shown in the works conducted by Villela *et al.* (2013) and Villela *et al.* (2015).

In the Brazilian regions where research is focused on the integrated analysis of landscape components,

generally, present economic, touristic, socio-environmental and scientific value; thus, the efforts to develop research centered on geological, geomorphological and pedological characterization are strategic. Thereby, the Physiographic Domain of the Chapada Diamantina, historically recognized as a significant producer of gold and national tourism heritage, has become the target of several studies aimed at characterizing its main physiographic aspects (BATTILLANE *et al.*, 1996; NÓBREGA *et al.*, 2006; SEVERO & MELO, 2018). However, few works directly approach the geomorphopedological relationship in that region, which would be a useful study for producing models capable of understanding soil distribution according to its geological, geomorphological and structural settings. Furthermore, the outcomes could be used for socio-environmental, socio-economic and land-use planning.

Therefore, this study is focused mainly on the recognition of rock-landform-soil association and its correlation with litho-structural factors for the geomorphopedological characterization of the Lavra Velha region. This region is located on the occidental portion of the Chapada Diamantina in Brazil and has

an increased level of mineral and tourism activities. The result is a precursor model archetype for integrated modeling of the geomorphopedological setting in this physiographic domain.

Study Area

The study area is situated north of Ibitiara, in the mid-west of the state of Bahia, Brazil (Figure 1). It corresponds to a quadrant of 150 km², between latitudes 12° 29' 20" and 12° 37' 05" S, and 42° 18' 59" and 42° 10' 22" W. Starting from Salvador, the state capital, access to the area can be achieved by land via highways BR- 324, BR-116 and BR-242. The landform of the region is represented by the Sertanejo Pediplain made up of elongated, parallel ridges running in a north-south direction, belonging to the Espinhaço Supergroup of Pre-Cambrian age (Ribeiro, 1974). The predominant vegetation is the open arboreal caatinga, without palms. The climate is semi-arid, hot and dry, corresponding to the BSh climate in the Koppen (1936) classification. The annual average temperature is 26.5 °C and the average annual rainfall is only 746 mm, with higher rainfall volumes from October to April.

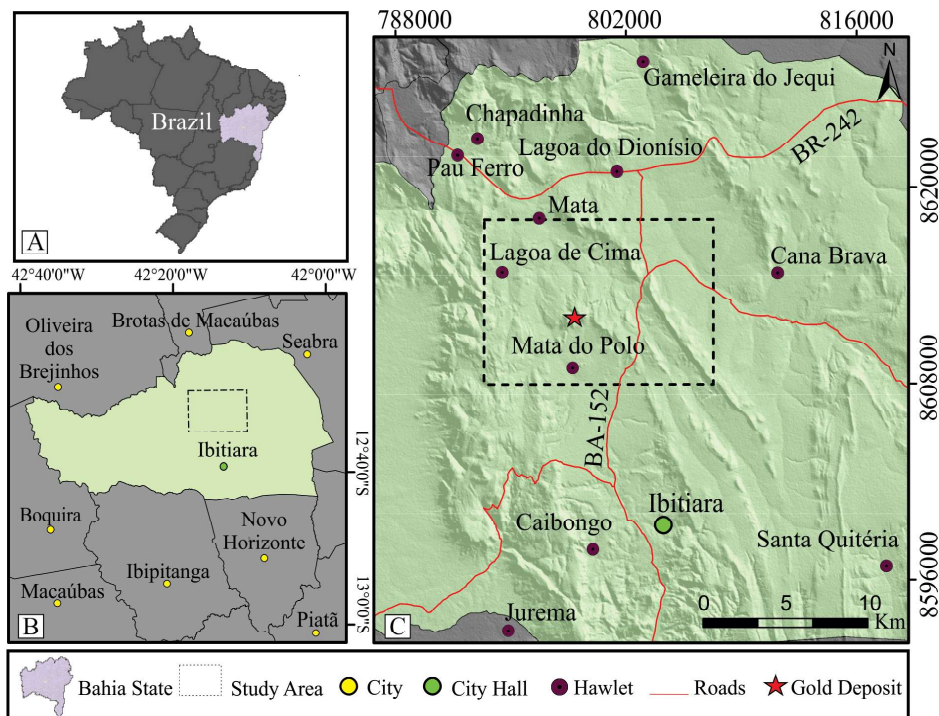


Figure 1 - Map indicating the study area location. (A) Location of Bahia state in Brazil; (B) Main cities located around the city of Ibitiara where the study area is (box outlines area shown in B and C). (C) Focus on the study area (the green background is part of the city of Ibitiara).

Materials and Methods

Aiming at delineating the geomorphopedological units, we gathered information such as geology, geomorphology, pedology, drainage, hypsometry, slope and topography from the specialized literature, along with office and field data. Studies conducted by Tricart & Killian (1979), Castro & Salomão (2000), Lacerda *et al.* (2008), and Villela *et al.* (2013, 2015) were considered in order to approach the morphopedological setting and, consequently, to make the final geomorphopedological map. Steps and different sources of data will be presented as follows.

Geological data was obtained from the research developed by the Geological Survey of Brazil for the Ibitiara-Rio das Contas Project (2005), as well as the geological mapping conducted by Campos (2013) and Carlin *et al.* (2018). In addition, a field expedition was undertaken to describe outcrops and collect rock samples from the region.

The techniques used by Nascimento *et al.* (2018) were followed for the geomorphological mapping due to the satisfactory outcome achieved by their approach in an area with a similar geomorphological setting of the study site. The cartographic base included topographic maps from the SEI on the scale of 1:100,000, and Digital Elevation Models (DEM) from the PALSAR sensor aboard the ALOS satellite, with the spatial resolution of 12.5 meters. This data was adjusted to assist in the elaboration of hypsometry, slope declivity, slope aspect, geology, pedology and geomorphology maps. These maps were overlapped and used for understanding rock-landform-soil relationships. The digitization and elaboration of the cartographic base, as well as the models presented in this work, were done in the Georeferenced Information Processing Laboratory (LAPIG) of the University of Campinas (IG/UNICAMP).

The survey, characterization, and spatialization of soils relied on the research developed by Ribeiro (1974) in the city of Ibitiara, as well as data from the Brazilian Agricultural Research Corporation (EMBRAPA, 2001), and the Bahia Environment and Water Resources Institute (INEMA, 2014). Moreover, a field expedition was carried out to recognize and describe morphological attributes of soil profiles. In the present study, laboratory analyses were not performed

to get physical and chemical attributes of the soil. In the field the soil was classified up to the second level and additional attributes can be found in the sources mentioned previously.

Geomorphopedological units were determined based on the maps previously mentioned, mainly on the geological, geomorphological and pedological maps, which were integrated by overlaying their records. Geomorphopedological units were differed from each other mostly through the rock-landscape-soil combination.

Results

Geology

The study area consists of rocks corresponding to Granitoid Ibitiara, Espinhaço Supergroup and intrusive mafic rocks as shown in the geological map (Figure 2).

The Ibitiara Granitoid includes rocks of 2.091 ± 6.6 Ma, dated by the U-Pb method in zircons (GUIMARÃES *et al.*, 2005), which were affected by epidotization, potassification, sericitization and hematization (CAMPOS, 2013; CARLIN, 2018). It prevails in a structural window, in the nucleus of an antiformal structure of direction NNW-SSE, surrounded by rocks of the Espinhaço Supergroup (CAMPOS, 2013).

In the study area, the main rocky outcrops occur as blocks (Figure 3A), along structurally aligned hills, mainly in the northern end of the Ibitiara anticline. The granitoid is fine to medium grained, hololeucocratic, and vary from granitic to granodioritic composition. The most mineral constituents are quartz, altered plagioclase, altered K-feldspar (orthoclase), as well as muscovite, tourmaline, chlorite, hematite, magnetite and epidote. In general, these rocks are foliated, following the NNW-SSE regional trend, with inflections to NNE-SSW and a high angle of dip.

The Espinhaço Supergroup encompasses rocks of the Rio dos Remédios Group, represented by Lagoa de Dentro and Ouricuri do Ouro tectosequences and by metasedimentary rocks of the Paraguaçu Group.

According to Guimarães *et al.* (2005), the formations of the Lagoa de Dentro and Ouricuri do Ouro corresponds to tectosequences of metasediments with interdigitated lateral contact.

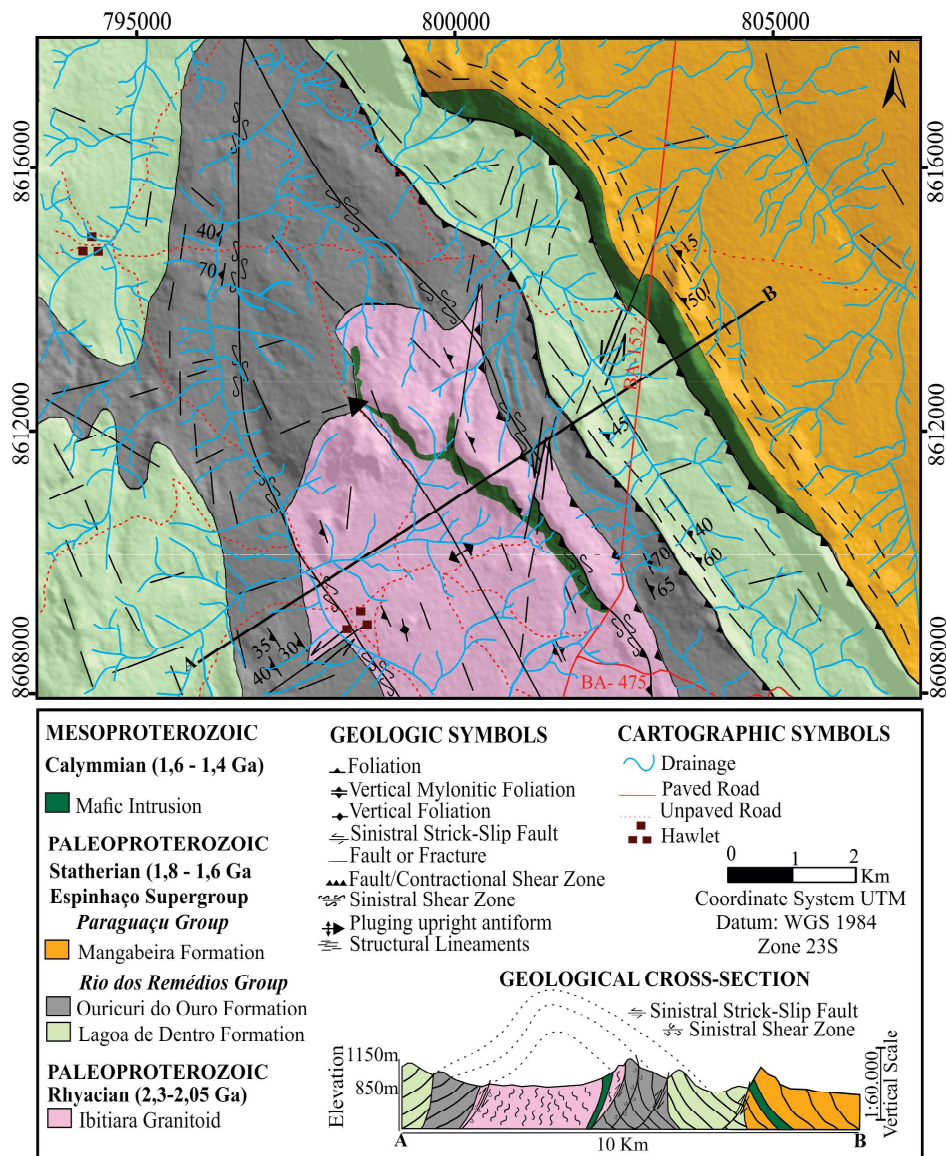


Figure 2 - Simplified geological map of the study area along with geological cross-section. Map modified from Guimarães et al., (2005); Campos (2013) and Carlin (2018).

In the surveyed region, the best rocky exposures of the Lagoa de Dentro/Ouricuri do Ouro tectosequences are located at the top of undulating hills, as well as at the top of the Mangabeira ridge and some roadcuts. Outcrops are mainly in blocks or flagstone and are comprised mostly metasandstones and polimitic metaconglomerate with rounded pebbles and boulders related to basement rocks, as well as lithic metasandstones, metarkoses and meta-graywackes (Figura 3B).

The Paraguaçu Group is represented by rocks of low metamorphism and deformation degree from the

Mangabeira Formation, composed of metasandstones, impure metachert, and metasiltstone, and from the Araçuai Formation, composed mainly of meta-graywacke (GUIMARÃES et al., 2005). In the investigation area, those rocks are exposed mainly on the top of hills and escarpments of the Boqueirão de Fogo ridge. The outcrops occur as both blocks and flagstones and are comprised mainly of metasandstones (Figure 3C).

Mafic rocks are intrusive into the rocks mentioned above, mostly in the form of dykes and sills. In general, they consist of gray to green isotropic gabbros with thick plagioclase crystals (Figure 3D).

Geomorphology

In the study area, the elevation ranges from 850 meters to 1,150 meters. Most area is represented by flat landform and gently undulating hills surrounded

by elongated, narrow and steep slope ridges. The drainage patterns consist mainly of trellis and rectangular, varying according to the litho-structural control. The geomorphological compartmentalization of the area encompasses three large units (Figure 4).

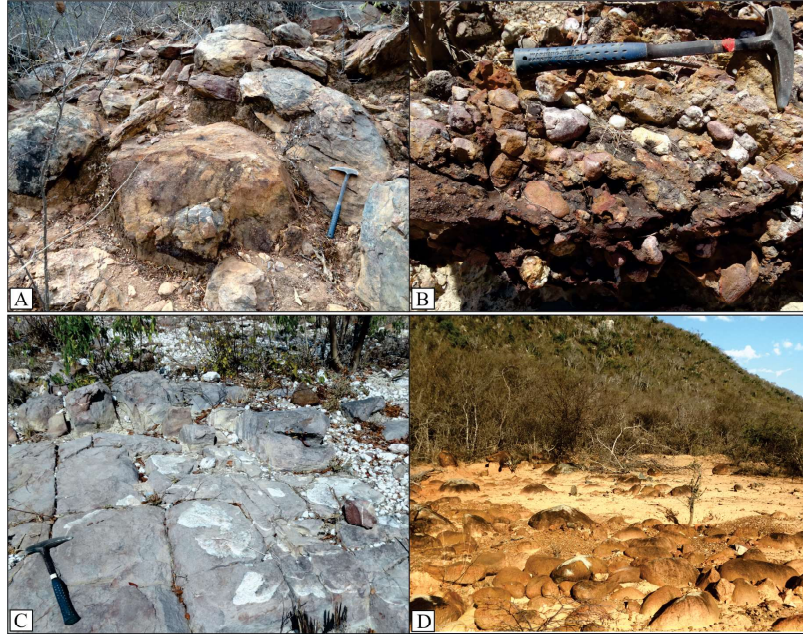


Figure 3 - Outcrop photographs of main lithologies distributed in the study area. (A) Ibitiara Granitoid; (B) Metaconglomerate of the Ouricuri do Ouro Formation; (C) Fractured Metasandstone of the Paraguaçu Group; (D) Blocks of isotropic metagabbro.

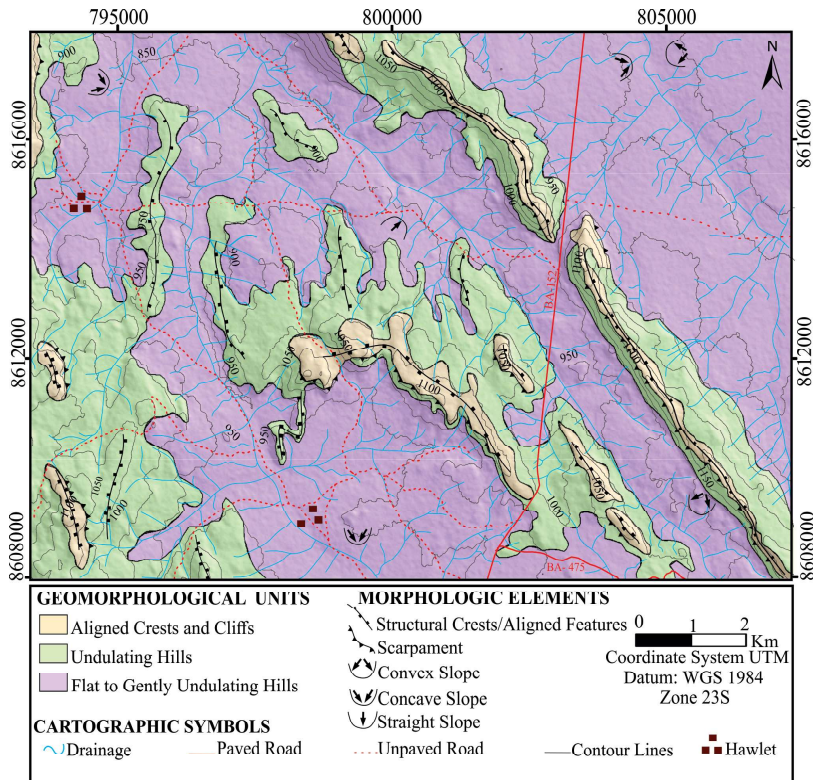


Figure 4 - Simplified geomorphological map showing the major geomorphic compartments in the study area.

Unit I is comprised of parallel and aligned ridges and escarpments with steep slopes (> 45%) and low drainage density (Figure 5A). Unit II consists of undulating hills with slope top-bottom roughness less steep than Unit I (8% < slope < 45%). In general, the geomorphic features show

convex or rounded top hills and medium to high drainage density (Figure 5B). Unit III encompasses a flat landform to gently undulating hills with predominantly rounded tops and medium to high drainage density (Figure 5C). In this unit, locally, rocky outcrops and relict features of rounded to flat hills top at higher altitudes arise (Figure 5D).

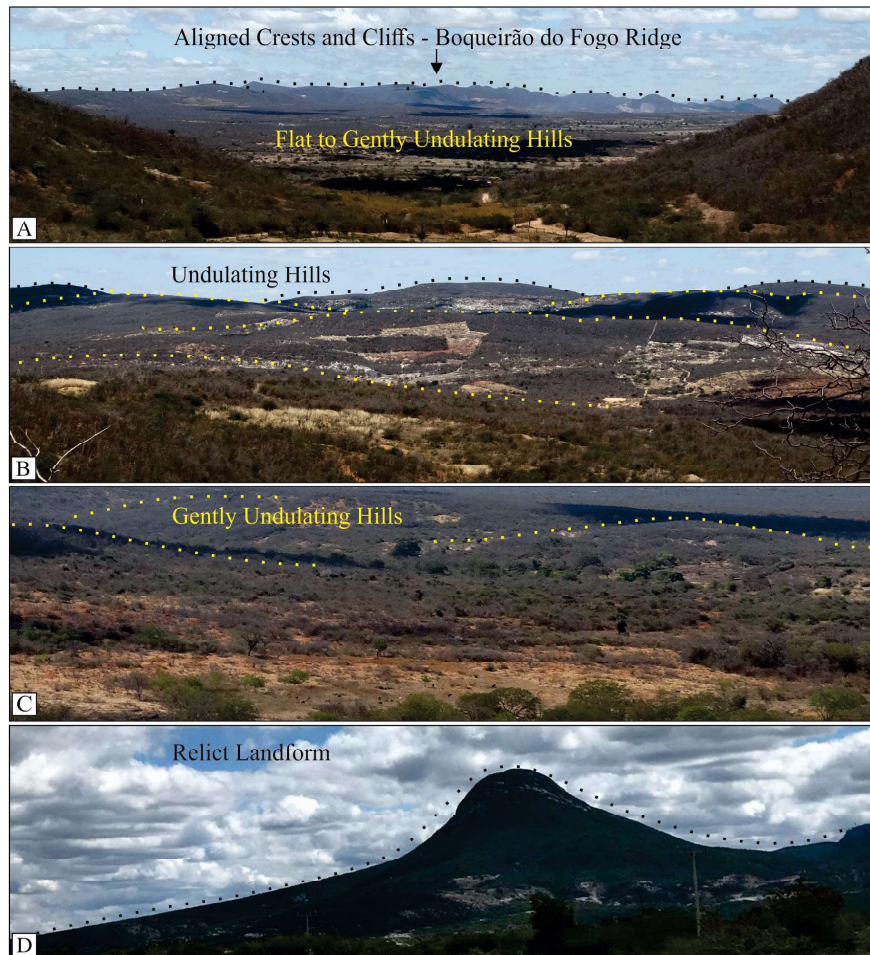


Figure 5 - Field photographs of the landforms within the study area. (A) Undulating hills and flat to gently undulating terrain in front of aligned and parallel crests and cliffs of the Boqueirão do Fogo Ridge (Background); (B) Set of undulating hills; (C) Gently undulating hills to flat topography; (D) Relict landform made of metasedimentary rock.

Pedology

Soils in the Lavra Velha region consist predominantly of Oxisols, Alfisols, Entisols and Inceptisols as shown in the soil orders map (Figure 6).

The Oxisols (Figure 7A, B, C) are deeper than 200 cm and shows little differentiation into horizons. They occupy 50% of the study area and consist generally of moderate A horizon with yellow-brown colors, and porous B horizon with sandy clay to clayey sand textures and colors ranging from yellow, red-yellow and red (variations 10R; 10YR; 7.5YR; 5YR and 2,5 YR in the Munsell color chart).

Concerning the Alfisols (Figure 7D), they are shallow and occupy only 1% of the study area. In general, they present an A horizon often marked by a cover with rock fragments of different sizes that characterize desert paving or surface stoniness. The B horizon is textural type with reddish colors (5YR and 2.5 YR in the Munsell color chart). In addition, cracks can be observed in this horizon in function of the presence of 2:1 clay mineral.

Entisols is dominantly litholic and occurs constantly associated with Inceptisols and rock outcrops (Figure 7E and F). Because of this characteristic, we have chosen

to group spatially these two soil orders. The Entisols are shallow, with moderate A horizon developed directly on C horizon. The texture is mainly sandy-loam and, occasionally, stony. It differs from the Inceptisols because

of the absence of B horizon. Thus, the set (Entisols and Inceptisols) occupies 49% of the study area, in which the main profile exposures occur in the Boqueirão do Fogo, Mangabeira and Lavra Velha ridges.

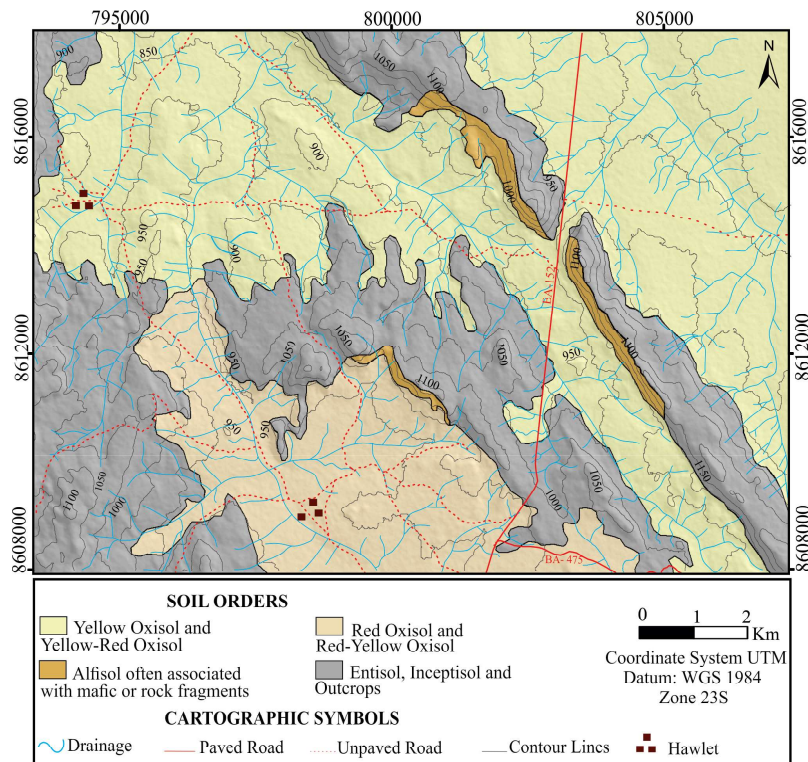


Figure 6 - Soil orders map of the study area.

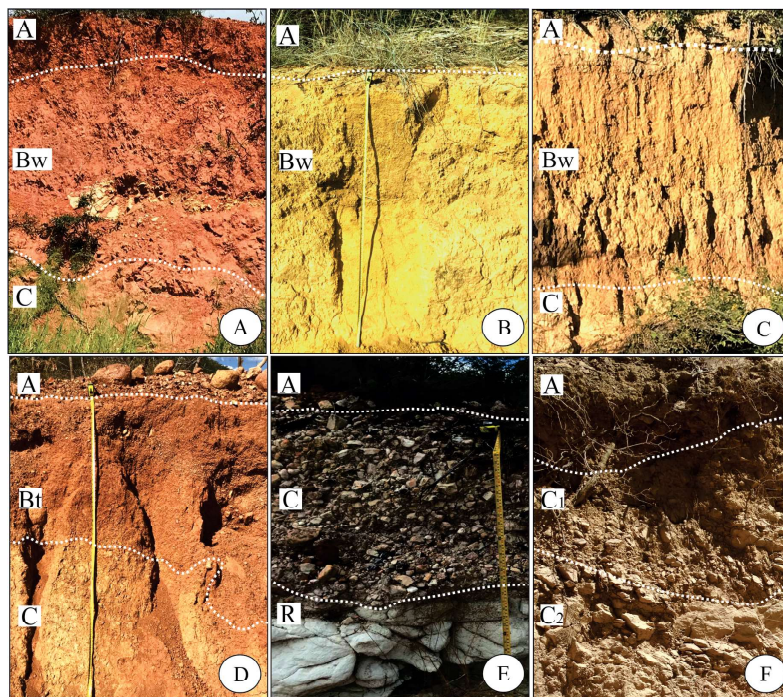


Figure 7 - Soil profiles of the study area. (A), (B) and (C) red, yellow and red-yellow Oxisols respectively; (D) Alfisol showing a surface stoniness; (E) and (F) Entisols formed on metasandstones and granite respectively. Abbreviations are from the Brazilian Soil Classification System: A = A Horizon, Bw=Weathered B horizon, Bt= Textural B horizon, C = C Horizon/saprolite, R= Bedrock.

Geomorphopedology

The geomorphopedological model established for the region of interest is a consequence of the integrated analysis of geological, geomorphological and pedological data along with structural meanings obtained from laboratory and field works. Therefore, these units

are not only a function of combined and overlapped rock-landform-soil data (morphopedological elements), but also of litho-structural factors in accordance with the work conducted by Villela *et al.* (2015). From this analysis, five main geomorphopedological units were defined (Figure 8).

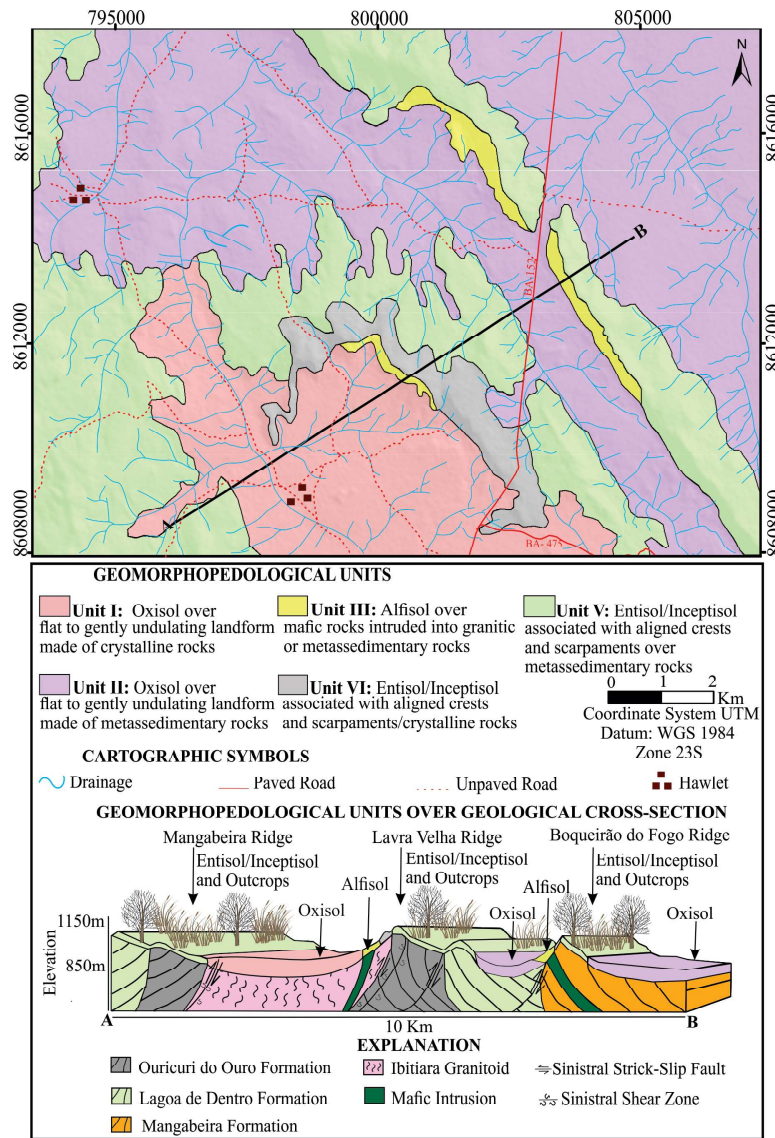


Figure 8 - Geomorphopedological map of the study area along with a combination of relief-rock-soil cross-section.

Units I and II consist of Oxisols, which are associated mostly with gently undulating hills and flat landform present in open valleys. Locally, undulating hills may occur. While Unit I is supported by crystalline rocks corresponding to the Ibitiara Granitoid, Unit II is composed of metasedimentary rocks of the Ouricuri do Ouro and Lagoa de Dentro formations beside metasedimentary rocks of the Paraguaçu Group.

Unit III is composed of Alfisols associated to un-

dulating hills. It mainly occurs at the bottom of slopes developed on the Ibitiara Granitoid and the Paraguaçu Group, in which mafic intrusion occur. On this unit, there is often pebbles and boulders from gabbroic rocks in different stages of decomposition.

Units IV and V correspond to Entisols and Inceptisols associated with rock outcrops, which occur at parallel and aligned crests, and cliffs. The Unit IV is maintained by crystalline rocks related to the Ibitiara Granitoid, whilst Unit V

is supported by metasandstones and metaconglomerates of the Ouricuri do Ouro and Lagoa de Dentro formations, as well as by metasandstones of the Paraguaçu Group.

Discussion

Rock-Landform Relationship and Pedogenetic Implication

The Entisols and Inceptisols, developed on more pronounced landforms (slope > 45%), are located at the highest topographic levels (950m < altimetry > 1150m). Hence, the topography seems to have strong influence on the pedogenetic evolution of those soil types in the Lavra Velha region by controlling weathering agents and development of weathered materials. This is because areas with a steep slope influence water infiltration, thus the soils are predisposed to less intense leaching and to become shallow. Therefore, by this mechanism, those soil types were possibly developed toward the top of the Lavra Velha, Boqueirão and Mantiqueira ridges. This perspective is agreed with in the work carried out by Benites *et al.* (2007). These authors also reported Entisols and Inceptisols associated with rock outcrops toward the top of the Espinhaço mountain range, whose development is a function mainly of topography and lithology.

Regarding bedrock influences on Entisol and Inceptisol formation, the presence of muscovite/sericite on soil profiles developed on granitoid; quartz and clay minerals on soil profiles developed on rocks from the Espinhaço Group; and along with rock fragments from the lithology right under the soil profile, indicates incipient pedogenic processes which depend largely on primary minerals composition and their transformation into secondary minerals.

The Alfisols are associated with undulated landforms (8% < slope < 45%) in the sectors of altitudes which range from 900m to 1000m mostly. The occurrence of this soil order and litholic Entisols are quite common in these landforms in the northeast of Brazil (AGBENIN & TIESSEN, 1995). In the study area, the main occurrences of Alfisols are associated with mafic rocks intruded into the Ibitiara Granitoid and metasandstones of the Paraguaçu Group. The development of these soils seems to be influenced not only by the strong rock-landform relationship, but also by the composition of the parent material. The landform controls surface weathering agents while mafic rocks are the main sources of raw material for soils' development. The mineralogy of those rocks, composed of calcium feldspar and ferromagnesian silicates, once transformed into secondary minerals, generated soils with 5YR and 2.5YR shades and high activity clay. This result is consistent with the work

conducted by Ribeiro (1974) in Ibitiara that describes similar soils developed on mafic rocks.

The yellow, red-yellow and red Oxisols are formed in the flat and gently undulating landforms, at topographic levels that rarely exceed 950m and slopes often less than 20% steep. These landforms favor the infiltration of water and make the action of weathering agents more effective with more intense weathering down in the soil profile and close to bedrocks, including the formation of deeper soil. The development of these soils occurs on both meta-sedimentary and crystalline substrates. In the crystalline substrate, the Oxisols tend to be predominantly red-yellow or red, perhaps due to the abundant presence of hematite resulting from the hydrothermal alteration that affects the Granitoid Ibitiara, which were reported by Campos (2013) and Carlin (2018). On the other hand, when these soils are developed on rocks of the Espinhaço Supergroup, they are predominantly yellowish Oxisols, indicating the presence of goethite and smaller proportions or absence of hematite. This interpretation is based on Fontes (1991) and Resend (1976), who reported that goethite and hematite are not only the main Fe forms present in Brazilian Oxisols, but also the reason for their yellow and red colors.

Structural Setting of Landscape and Soil Distribution

The configuration of the landscape and the distribution of the soils of the Lavra Velha region seem to be strongly conditioned by litho-structural factors.

The drainage and the landform patterns developed in the old folded and exhumed geological setting, when associated with local and regional sections, along with litho-structural components, reveal the controls exerted by the compressive tectonic that affected the area reported by Guimarães *et al.* (2005), and in line with Campos (2013). The landscape shows a parallel and aligned ridge-and-valley landform displayed as a well typical Appalachian-style folded relief as mentioned in De Barros *et al.* (2019). Figure 9 (A, B and C) shows schematic and simplified block diagrams, adapted from Suertegaray (2003), in which are illustrated a generic evolution of a folded landform from the Appalachian landscape.

The geological setting, of which the Lavra Velha region is included, was affected in varying degrees by NNW-SSE-trending shear zones and by dissimilar folding developed during the Brasiliano orogeny (GUIMARÃES *et al.*, 2005; CRUZ & ALKIMIN, 2006). As a result, in the late proterozoic, the landscape was marked by a setting of anticline and syncline folds. De Vries & Benthem (2013) and Cawood & Bond (2019) report that

during compressive structural events, the development of a series of fracture families (longitudinal and transverse joints) is common in the closeness of the anticline hinge. Hence, those joint fractures would facilitate the ingress of weathering agents, such as water and plant roots and, consequently, effect landform evolution, as stated in the works conducted by Graham *et al.* (1994) and Oilier & Pain (1996). From this perspective, at the end of the Brasiliano orogeny, the Lavra Velha region would be affected by weathering more intensively near the anticline hinges because of the deformational structures that would increase the permo-porosity of the rocks in these areas. The weathering and geochemical erosion could be also heightened due to paleoclimate oscillation over geological time, which would contribute to the deeper soil formation (RIBEIRO, 1974), as well as to the collapse of anticlinal hinge areas.

In this respect, the configuration of the Lavra Velha landscape region would be pronounced by ridges, represented mostly by limb portions or perhaps synclines, and valleys, represented mainly by anticlines, along a NNW-SSE direction as indicators of the litho-structural control.

From the perspective of analyzing the landscape configuration, it becomes easier to understand patterns

of soil distribution in the Lavra Velha region. The more developed soils are in the lower area of the terrain, which among others include the fold hinge zone of the Ibitiara Granitoid anticline. These areas, as mentioned previously, was probably more susceptible to the geochemical erosion that led to the collapse of the mineral structures present in the original rocks and, as a result, the lowering of the land-surface together with the development of deeper soils. This perception is in accordance with works conducted by Hill (1995), Oilier & Pain, (1996), and Frazier & Graham (2000). These previous studies showed the differential weathering of fractured rocks, and consequently, the influence of fractures on pedogenic processes in addition to their role in the transformation of bedrocks into soils.

Relative to less developed soils, these are distributed in areas with sharp landforms that reflect the structural crests aligned to the axis of the anticlinal fold, beside the shear zones. These soils also occur at the top of residual geological bodies that were shaped by old planation surfaces and thus recording differential erosion processes. These landforms are often found in Brazilian semi-arid regions, and they represent portions of the substrate resistant to the processes of pediplanation and pedogenesis in the northeastern region (DOS SANTOS *et al.*, 2010).

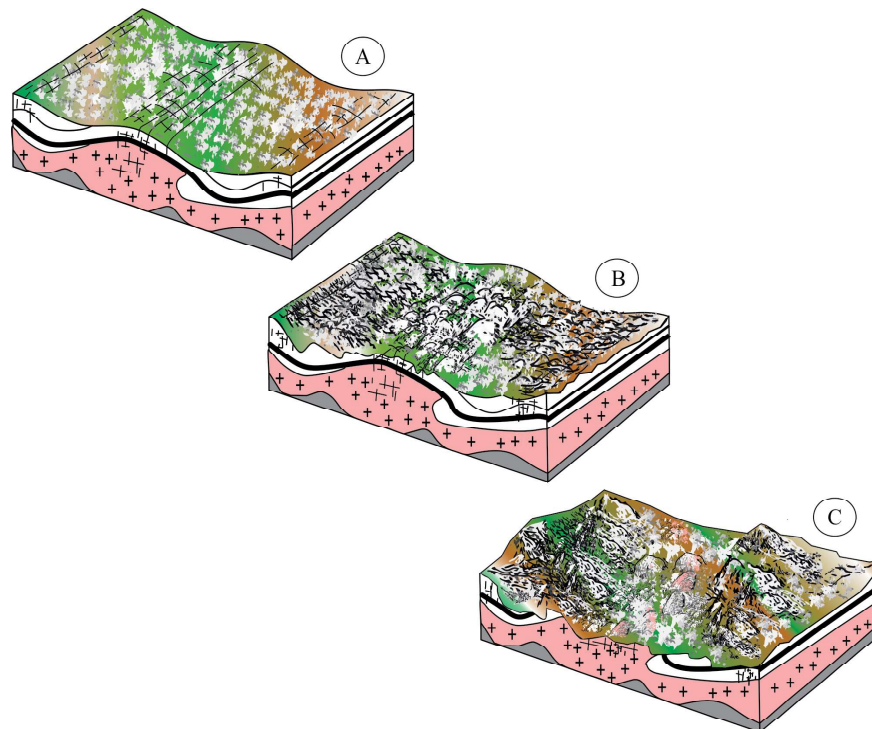


Figure 9 - Schematic block diagrams illustrating a general landscape setting evolved from folded landform. The current landscape setting of the Lavra Velha region could be attributed to the general stages of this geomorphological evolution model. (A) Folded landforms with longitudinal and transversal joints associated to the anticline hinge. This area is most favorable for weathering since it has its permo-porosity increased by the set of fractures; (B) Lowering of the land-surface, mainly around the fold hinge. Rocky bodies may outcrop and remain as relict landforms; (C) Ridge and valley topography formed as result of the dissected landforms. Stages A, B and C are based on the Appalachian-style folded landform as described by Suertegaray (2003).

Conclusion

The rock-landform-soil relationship associated with litho-structural attributes allowed the definition of the main geomorphopedological units in the Lavra Velha region. The five mapped units are composed of Entisols, Inceptisols, Alfisols and Oxisols maintained by landforms and rocks associated with the Ibitiara Granitoid, the Espinhaço Supergroup and the mafic intrusions.

The structural landscape framework resembles the Appalachian-style folded landform as initially proposed by William Morris Davis and illustrated later by Suertegaray (2003).

Landscape setting controls the development and distribution of soils, in which deep soils (Oxisols) are associated with flat and gently undulating landforms, which denotes sectors intensively affected by deformational structures. On the other hand, shallow soils (Entisols and Inceptisols) are associated with higher altitude terrain that correspond mostly to parallel and aligned ridges.

The distribution of Alfisols is mainly associated with lithology. These soils are developed from intrusive mafic rocks.

Other sectors in the western region of the Chapada Diamantina does not present mapping of the rock-landform-soil association. Thereby, the geomorphopedological model proposed in this work can be used for the prediction and individualization of similar units in other portions of this physiographic domain, in order to assist in technical and scientific studies. Higher altitude areas are favorable for the identification and mapping of lithologies and deformational structures, while areas associated with the lower landforms present the best exposures of soil profiles that could be useful to pedological and pedogeochemical surveys.

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