

Development of National Soil Science Societies in the BRICS group of countries: An overview¹

Background

Soil science spread around the world through the individual actions of soil scientists and joint activities of universities, research institutes and scientific societies, established on a national and international scale (Churchman, 2010; Hartemink, 2015). Currently, there are at least 74 national soil science societies in the world (ESDAC, 2016; IUSS, 2016), indicating that soil science followed the trend of organizing societies in various scientific fields. In this paper we draw a parallel with respect to the development of national soil science societies from countries of the BRICS group (Brazil, Russia, India, China and South Africa), in order to impart a portion of the soil science history of these countries.

Russia



In 1888 in St. Petersburg, the Soil Commission, affiliated to the Free Economic Society of Russia was founded. The commission was founded and headed by Vasily Vasilievich Dokuchaev and had Gavriil Ivanovich Tanfilyev as first secretary (Teplyakov et al., 1998). In 1912, the Russian imperial government approved the establishment of the Dokuchaev Society of Soil Science (DSSS), which was endowed with legal and financial rights. From the formation of Union of Soviet Socialist Republics (USSR) in 1922 and the founding of the International Society of Soil Science (ISSS; now IUSS) in 1924, the former DSSS became known as the Soviet Section of ISSS. In 1938, the Soviet Section of the ISSS was transformed into the All-Union Society of Soil Science, attached to the USSR Academy of Sciences. The institution was maintained until the collapse of the USSR in 1991, being that in December a conference was held where it was decided that the All-Union Society of Soil Science would be reorganized in the Russian Society of Soil Science, attached to the Russia Academy of Sciences. The founding congress of the new SCS was held in 1992, in Moscow, although it

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was officially registered with the Russian Academy of Sciences in 1993. However, at the Second Congress of the Society held in St. Petersburg in 1996, on the occasion of the 150th anniversary of Dokuchaev, it was decided to rename the institution with its first name, DSSS, which was formalized in 1997. In 2004, the DSSS was no longer affiliated with the Academy of Sciences of Russia and became independent as a non-governmental organization (DSSS, 2016).

Currently, the DSSS has 1557 members, which corresponds to 10.9 soil scientists per million inhabitants of Russia (DSSS, 2016; US Census Bureau, 2015) (Figure 1). The administrative structure is divided into Congress (73 members), Central Council (president, six vice presidents, executive secretary, scientific secretary and 27 councilors) and Financial Audit Commission (three members). In addition, the DSSS has 43 regional chapters in the Russian Federation and three international chapters (Azerbaijan, Belarus and Uzbekistan) (DSSS, 2016).

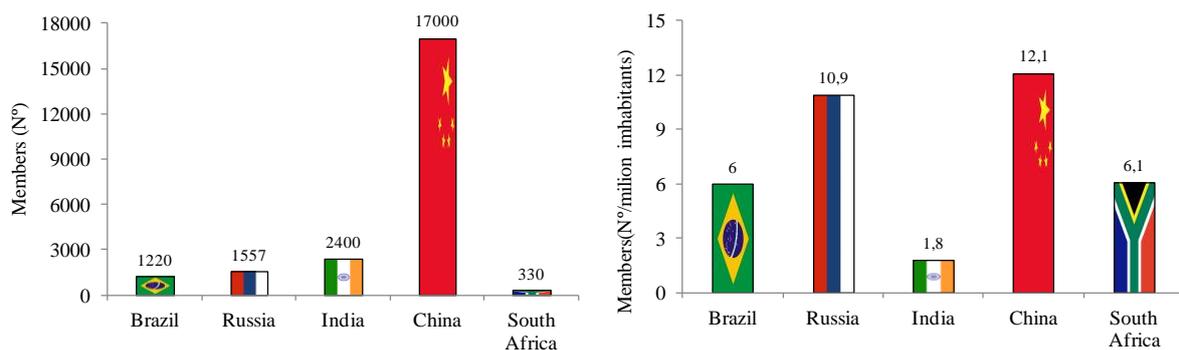


Figure 1. Members and members per million inhabitants in soil science society of Brazil, Russia, India, China and South Africa.

On the other hand, regarding the scientific structure, DSSS contains 11 committees, 12 subcommittees and 7 working groups (DSSS, 2016) (Figure 2). The subcommittee of the Red Data Book of Soils draws attention for its history and contribution. Between 1979 and 1989, still in the All-Union Society of Soil Science (USSR), there was the formulation of the theoretical and methodological aspects of creating a book on soils, with emphasis on soils that require special protection (e.g., rare, virgin, with archaeological value, high fertility models for agriculture, historical or scientific significance). Even in 1989, a working group was created to develop the book, and in 1996, in the DSSS, the group was transformed into a subcommittee. Between 2000 and 2012 books were published on a regional scale and the first edition (2009) on a national scale, and also an article on the special soil protection was

included in the National Environmental Protection Act. Currently, the DSSS and other research groups are preparing a book covering the Russian soil and neighboring countries (Nikitin et al., 2014).

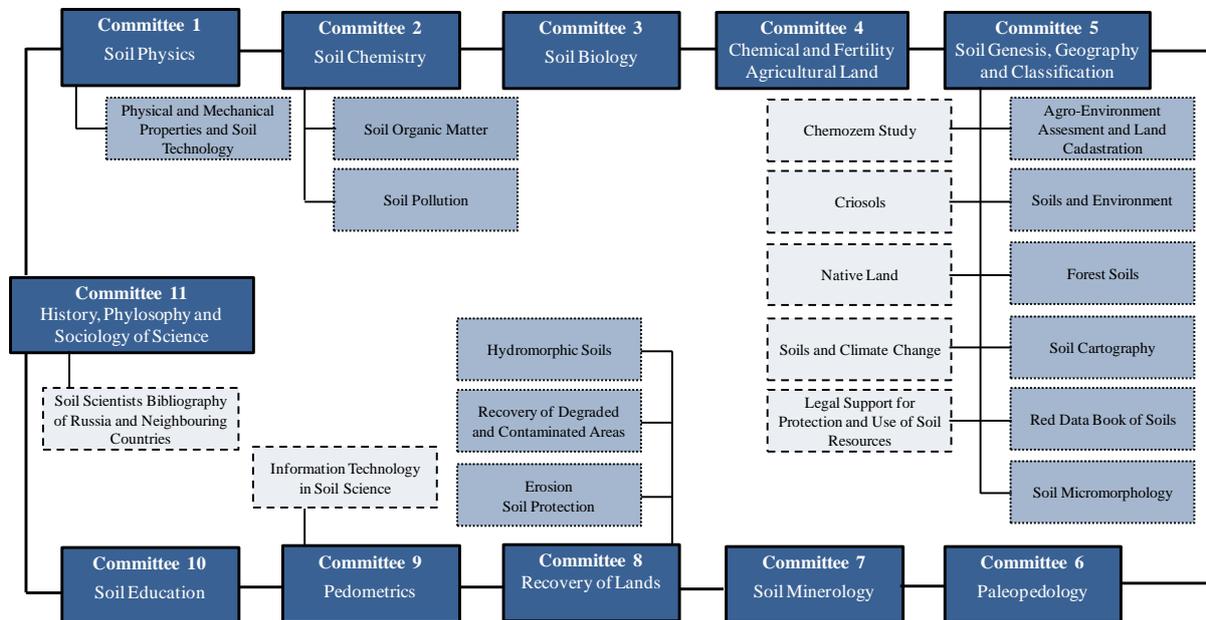


Figure 2. Schematic representation of the scientific structure of the Dokuchaev Society of Soil Science. Rectangles: solid, dotted and dashed lines represent, respectively, committees, subcommittees and working groups.

The DSSS conducts international, national and regional events, and, largely in partnership with other institutions (scientific societies, research institutes and universities). Regarding the main events, the DSSS Congress is the most traditional national event. Held since 1992, every four years, the event covers the various areas relating to soil science (DSSS, 2016). Two events that include the participation of the society may be highlighted: the Dokuchaev Conference for Young Scientists, which has taken place since 1998 and which has as its main participants scientists up to 35 years of age, post-graduate students, undergraduates and high school students from Russia and other countries (IUSS, 2015a); the International Forest Soil Science Soil Conference, an event organized since 2005 covering various aspects related to soils in forest ecosystems (Fedorets and Bakhmet, 2006). The DSSS also organizes or participates in organization of scientific conferences to cover certain topics and/or celebrations of milestones in the history of Soil Science in Russia and, international periodic events (DSSS, 2016; FESSS, 2016). In time, the main and most traditional event held by national societies in partnership with IUSS is the World Soil Science Congress. Of the

twenty previous editions of the World Soil Science Congress, two were in Russia/USSR (2nd edition, Leningrad, 1930; 10th edition, Moscow, 1974) (van Baren et al., 2000).

The DSSS has re-edited classic works of Soil Science, published a seminal monograph of famous Russian scientists, manuals, literature about the history of Soil Science, as well as documents and event summaries (DSSS, 2016). Through the Federation of Eurasian Soil Science Societies, DSSS participates in the edition of the magazine entitled "Eurasian Journal of Soil Science." Furthermore, general information about the DSSS is published in the newsletter of the Federation of Eurasian Soil Science Societies (FESSS, 2016). Also, there is information published about DSSS and texts published on specific dates, mainly related to the Russian soil scientists, in a special section of the Eurasian Soil Science, published by the Russian Academy of Sciences. Regarding the Eurasian Soil Science, it is interesting to note that this magazine is also published in Russian under the name Pochvovedenie (meaning Pedology). It turns out that Pochvovedenie was the first magazine dedicated to Soil Science worldwide, created in 1889 by the Soil Commission, affiliated of Free Economic Society of Russia (Editorial Board, 2009).

Scientists with important contributions to the DSSS and Soil Science receive the title of honorary members, or receive honorary medals on certain dates, such as the 5th DSSS Congress (18 to 22 August 2008), where members of the organizing committee received a medal to honor the 100th anniversary of the book "Russian Chozem", from Dokuchaev (Lyubimova and Pogodina, 2009).

India



The Indian Society of Soil Science (ISSS) was founded on December 22, 1934 in Calcutta, with 28 members. The first president was Bryce C. Burt, who was the Agriculture Commissioner in the Imperial Council of Agricultural Research, as the first secretary was Professor Jnanendra Nath Mukherjee (ISSS, 2016). Tamhane and Mukherjee (1964) emphasize that the design and foundation of ISSS arose from the effort, organizational capacity and imposing personality of the teacher J. N. Mukherjee, who managed the initial support of the Congress of the Indian Association of Science and later, Bryce C. Burt. In the

period in which ISSS was founded, India was a British colony. Thus, from the country's independence in 1947, the scientific institution reduced its operating area and there was probably a loss of some members due to the territorial division of British India into India and Pakistan (later East Pakistan became Bangladesh) (Huq and Shoaib, 2013).

Currently, ISSS has 2400 members, which corresponds to 1.8 soil scientists for every million inhabitants of India (ISSS, 2016; US Census Bureau, 2015) (Figure 1). The administrative structure of ISSS contains: President; two vice-presidents; three secretaries (general, deputy and assistant); treasurer; Chief editor of the journal and 34 other members). In addition, ISSS has 45 chapters throughout the territory of India (ISSS, 2016).

The ISSS conducts international and national events and support events held by its chapters. On an annual basis and without interruption since 1935, the most traditional national event is the Annual Convention (ISSS, 2016). In short, the event addresses the various areas of interest to Soil Science, has the presentation of scientific papers and lectures, in addition to making decisions about the institution. A point that can be highlighted is that during the event, memorial lectures are held titled with names of prominent Indian soil scientists, for example, teacher Jnanendra Nath Mukherjee (ISSS, 2014/2015). International events are often international conferences on specific topics. However, ISSS has its history marked by the organization of XII World Congress of Soil Science, in 1982, in New Delhi (ISSS, 2016).

The ISSS is responsible for editing the journal, newsletters, and special publications. The newsletters, the first (established in 1938) is used to display the state of the art in various topics related to Soil Science, while the second (created in 1996), is used for reporting the main activities of the institution. As for the scientific journal, since 1953 the ISSS has edited the journal entitled "Journal of the Indian Society of Soil Science". In parallel, special publications include five books, three editions containing international work and event information, and abstracts of the Annual Convention (ISSS, 2016).

To leading scientists the ISSS grants: Honorary Members title; ISSS Fellow; Award in celebration of the XII World Congress of Soil Science; Young Scientist Award to commemorate the Golden Jubilee; Award for Best Presentation Doctoral Research; Zonal Award; Award for Best Poster Presentation; Doctor S. P. Raychaudhuri Gold Medal (ISSS, 2016).

China



The Soil Science Society of China (SSSC) was founded on December 25, 1945 in Chongqing, with 58 members. The first president of SSSC was Li Lian Jie and the first secretary was Zhu Lian Qing (SSSC, 2016a). Prior to the institution's foundation, both Jie and Qing worked with renowned soil scientist James Thorp and studied soil science in US universities (Gong et al., 2010).

Currently, the SSSC has 17000 members, which corresponds to 12.1 soil scientists for every million inhabitants of China (SSSC, 2016b; US Census Bureau, 2015) (Figure 1). The administrative structure of the SSSC has its Management Board composed of: president; honorary president; nine vice-presidents; secretary; six deputy secretaries; Executive Board (57 members); General Board (177 members). In addition, in 1950 the SSSC started the formation of chapters, and has 31 such chapters around China (SSSC, 2016a).

As to the scientific structure, the SSSC has 14 special committees and 5 working committees (SSSC, 2016a) (Figure 3). The main activities of the SSSC involve the delivery of prizes, organizing events, publishing of publications and dissemination of general information via the Internet. Scientists who excel in their fields of study receive awards, the Science and Technology Award of SSSC, and awards to authors of highly relevant papers presented at events (SSSC, 2016b).

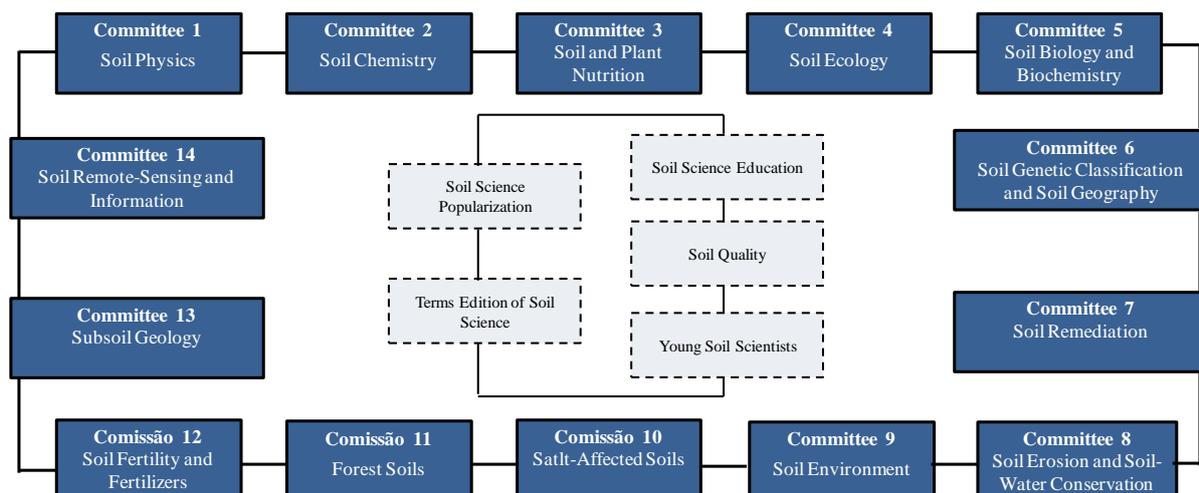


Figure 3. Schematic representation of scientific structure of the Soil Science Society of China. Rectangles: solid and dotted lines represent, respectively, specialty committees and working committees.

The SSSC conducts international and national events, individually or in partnership with other institutions. Among these, there is the SSSC congress, in which issues are discussed regarding the SSSC and there are presentations of papers and lectures. Another important event is the National Conference of Young Soil Scientists. This event has themes related to science and the development of the country, aiming to inspire young people to scientific and innovative thinking, as well as promote contact among them. In addition, the SSSC holds commemorative events, international conferences and eventually participates in the organization of periodic international events, such as the International Conference of the East and Southeast Asia Federation of Soil Science Societies (SSSC, 2016b).

Regarding publications, the SSSC is responsible for editing (or co-publishing) several scientific journals and a newsletter. The first journal was established in 1947 with the name of Soil Communications, which aimed to introduce the activities of soil scientists around China. However, in 1957, it became a formal journal and was renamed Soil Bulletin. Then came the magazine Bulletin of the Soil Science Society of China (established in 1948 and renamed in 1952 to Acta Pedologic Sinica). While this is an official journal of the SSSC, it also has the support of the Chinese Academy of Sciences and the Soil Science Institute. From 1955 until 1963 Soil Science Translation was published, which aimed to incorporate the advances of Soil Science obtained in the USSR. Decades later, there were other scientific journals, Arid Zone Research (1984 - co-edited by the Institute of Ecology and Geography of Xinjiang and, the Chinese Academy of Sciences), Journal of Soil and Water Conservation (1987, co-edited by the Chinese Academy of Sciences and Soil Conservation Institute and Water) and Pedosphere (1991). Among these journals, it is worth mentioning that only Pedosphere is fully published in English. The Bulletin of the SSSC is an internal publication that provides general information about the institution and its activities, and any other matters that are raised by its members (SSSC, 2016b).

Brazil



The founding of the Brazilian Society of Soil Science (SBCS) was due to a series of discussions initiated in 1945, at the Fourth Inter-American Conference on Agriculture, held in Caracas, Venezuela. The event recognized the need to create an Inter-American Society of Soil Science, which would be consolidated through the creation of National

Societies of Soil Science. After one year, in the II Pan American Congress of Mining and Geology (held in Petrópolis, Rio de Janeiro), some professionals defended the need to group soil area researchers in specific scientific meetings. The idea won fans and was widely discussed in the V Brazilian Chemical Congress, held in February, 1947 in Porto Alegre, where the date was established for a meeting for the creation of SBCS (SBCS, 1950). With 31 members, the SBCS was founded in the I Brazilian Meeting of Soil Science, held between 6 and October 20, 1947, in Rio de Janeiro. The meeting was held at the Institute of Agricultural Chemistry and organized by the National Center for Education and Research Agronomic with the support of the Ministry of Agriculture, Federal University of Rio de Janeiro and other institutions. Álvaro Barcelos Fagundes was the first president of the SBCS, while the first secretary was Raul Edgard Kalckman (Oliveira et al., 2015). Moreover, it is noteworthy that the SBCS was the first national soil science society founded in Latin America, coinciding with the date of the founding of the Spanish Society of Soil Science, founded on October 10, 1947 (SLCS, 2016).

Currently, SBCS has 1220 members, which corresponds to 6.0 soil scientists for every million inhabitants of Brazil (SBCS, 2016; US Census Bureau, 2015) (Figure 1). The administrative management of SBCS is carried out by the board, involving: President; vice president; executive secretary (general secretary, assistant secretary and treasurer); two former presidents; editor in chief of the journal of the society; president of the congress at the beginning of the period of the current administration; directors of specialized divisions (four) and chapter directors (nine members). Furthermore, throughout the national territory the SBCS has nine chapters comprising regions or states. Regarding the scientific structure, SBCS has four divisions and 15 specialized committees (Oliveira et al., 2015) (Figure 4).

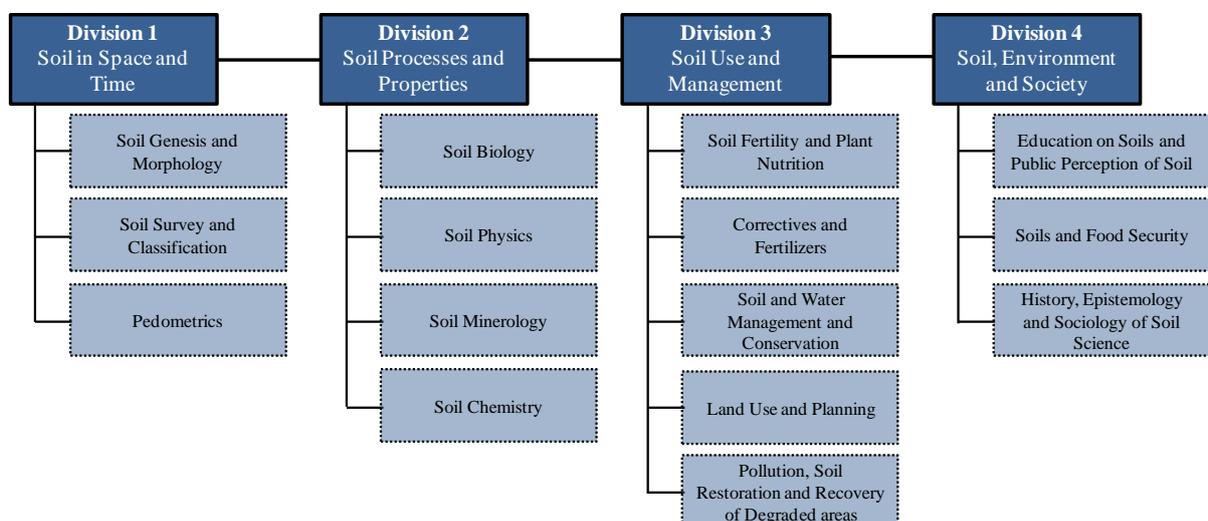


Figure 4. Schematic representation of the scientific structure of the Brazilian Society of Soil Science. Rectangles: solid and dotted lines represent, respectively, divisions and commissions.

The current model of scientific organization began in 2009 when, after a thorough statutory reform, the SBCS started to adopt a structure similar to the International Union of Soil Science (IUSS). This model was implemented in 2011, when there were also changes in the administrative structure, especially with the creation of chapters throughout the national territory (although there were already a few) and the incorporation of the chapter directors and divisions coordinator to the Board of SBCS (Oliveira et al., 2015).

The SBCS hold national events and support a number of other events held by the chapters. Among these, the Brazilian Soil Science Congress is the most traditional event and one that has a greater number of participants. Two facts call attention regarding the event: (I) from the first congress in 1947 (called 'Meeting', until 1953) until today, there never occurred interruption or alteration in the conduction standard (every two years); (II) in the VIII edition of the congress (15 to 30 of July, 1961, Belém, Pará) the headquarters of the event was a ship. Other national events are FertBio, Brazilian Meeting of Management and Soil-Water Conservation, Brazilian Meeting of Classification and Soil Correlation and Brazilian Symposium on Education in Soils. On two occasions (1965 and 1996), the SBCS also organized the Latin American Congress of Soil Science (Oliveira et al., 2015). Still, although the SBCS has not organized any of the twenty previous editions of the World Soil Science Congress, the twenty-first edition will be held in 2018 in Rio de Janeiro, Brazil, organized by the SBCS in partnership with the Latin American Society of Soil Science (IUSS, 2015b).

Regarding publications, the SBCS is responsible for issue of the Brazilian Journal of Soil Science (BJSS), the bulletin of the SBCS and two book collections, among others. The first periodical published by the SBCS was the Newsletter, whose first number is the January/April 1976 issue. The bulletin, which is still published today, aims to disseminate news, articles (informative and opinionated) and activities of the SBCS (Oliveira et al., 2015). The society Journal, published without interruption since 1977, is intended for publication of scientific papers totaling 3743 works published up to volume 39 in 2015 (Cantarutti and Reichert, 2015). Regarding the two collections of books, the first entitled "Topics in Soil Science", began in 2000 and so far has nine volumes, while the second, titled "Textbooks in Soil Science", started in 2007 and contains six books to date (Soil Fertility, Soil Physics, Chemistry and Soil Mineralogy - Parts I and II, Mineral Nutrition of Plants; Pedology -

Fundamentals; Handbook of Description and Soil Collection in Field). Additionally, the SBCS published 30 different publications such as "Soil Science Vocabulary" and "Brazilian Society of Soil Science: A look at its history" (Oliveira et al, 2015).

The awards, honors and titles are intended for researchers with important contributions to Soil Science, namely: Soil Science Commendation (currently no longer granted); Honorary Members; Benefactor Members; Tributes; Posthumous honors and of Antonio Carlos Moniz Soil Science Medal (Oliveira et al., 2015).

On the internet, the SBCS has maintained a website since 1999, containing relevant information about their activities, general news and acting as an interactive channel of communication among the partners. In the website there is also a virtual shop where publications, accessories (shirts, jackets, key chains, mugs and buttons with reference to Soil Science) and CD's with event proceedings can be purchased. In addition, the SBCS have two pages on social media, one on Facebook (since 2012) and the other on Twitter (since 2015) (Oliveira et al, 2015; SBCS, 2016), indicating that the information disclosure trends and promotions are up to date.

South Africa



Finally, the Soil Science Society of South Africa (SSSSA) was the last scientific society dedicated to Soil Science established among the countries of the BRICS group. The SSSSA was founded on April 27, 1953 in Pretoria, with 16 members. The first president was Christiaan Rudolph van der Merwe (SSSSA, 2016).

Currently, the SSSSA has 330 members, which corresponds to 6.1 soil scientists for every million inhabitants of South Africa (SSSSA, 2016; US Census Bureau, 2015) (Figure 1). The Board of SSSSA involves 12 members, namely: president; vice president; secretary; assistant secretary; newsletter editor, and five other members. The SSSSA has one working group (System Update Soil Classification of South Africa) (SSSSA, 2016).

The most traditional SSSSA event is its Congress, held since 1965. In the event themes interesting to the country's soil scientists are presented and it also serves to settle issues related to its activities and management. Although the timing of the event has been variable since its first edition, from 2005 it has been held annually. However, in the 31th edition, in 2011, the event had to be held in a Combined Congress format, involving three other scientific societies of the same country (South African Crop Production Society, South

African Weed Science Society and South African Horticulture Sciences Society). The SSSSA also organizes regional and international events. Moreover, SSSSA organizes a photo competition on South African soils, and the twelve best photographs are used for the establishment of a calendar, which is marketed by SSSSA (SSSSA, 2016).

The South African Journal of Plant and Soil, established in 1984, is jointly edited by the SSSSA and other scientific societies (South African Crop Production Society, South African Weed Science Society and South African Society Horticulture Sciences). The scope of the journal covers all aspects of soil science and plant science, therefore, among the scientific societies dedicated to Soil Science in the countries of the BRICS group, SSSSA is that which does not have a journal exclusively about soil science. Nevertheless, aiming at sharing information, the SCSAS publishes a newsletter (SSSSA, 2016).

The awards and honors are intended for leading researchers, as follows: Honorary Members; Gold Medal; Silver Medal for contributions to SSSSA; Silver Medal for contributions to Soil Science; Silver Medal for Best Annual Soil Science Student; Best Paper; Best Junior Paper; Best Paper in Innovative New Technology; Omnia Student Award; Best Poster; Best Contribution to the Development of Research in Soil Science; Best Soil Science article published in the South African Journal of Plant and Soil; Eskom Expo Award for Young Soil Scientist (SSSSA, 2016).

On the internet, the SCSAS has a website that provides information on its activities, organization and other relevant information on Soil Science. In addition, SSSSA has a page on Facebook social media (SSSSA, 2016).

Highlights from the International Union of Soil Sciences (IUSS)

In 1998, due to statutory changes, the International Soil Science Society changed to IUSS. However, in general, objectives, activities, administrative structures and science have remained more or less the same since 1924, with its foundation in Rome (Hartemink, 2015). Thus, henceforth only the abbreviation "IUSS" will be used. It is also worth noting that in eight years IUSS will complete its centenary, constituting one of the great traditional and scientific societies of the world.

The Russian soil science society exerted a strong influence on the IUSS formation. In the period between 1909 and 1922 there occurred international meetings (Budapest, Hungary; Stockholm, Sweden; Prague, Czech Republic) used to envision the need for a global scientific society dedicated to Soil Science. Russia would have hosted one of these meetings in 1914,

but due to World War I, it was not possible to hold the meeting. Nevertheless, they always had active participation in other meetings (van Baren et al., 2000).

Regarding the development of IUSS, it was no different, which can be perceived because of the number of IUSS presidents and honorary members from Russia or the USSR (Table 1). To avoid confusion, it is worth noting that although some of these presidents and honorary members are under the USSR regime, the majority were Russian, direct disciples or followers of Dokuchaev (Kovda and Dobrovolsky, 1974). Still, the only honorary member of IUSS from Brazil, Leandro Vettori, was also one of the founders of SBCS (Oliveira et al., 2015).

Table 1. Members of national soil science societies from countries of the BRICS group that were IUSS presidents or honorary members

Country	IUSS	
	Presidents	Honorary members
Brazil	-	L. Vettori (1978)
		K. D. Glinka (USSR; 1924)
		S. Winogradsky (USSR; 1924)
Russia/ USSR	K. K. Gedroiz (2 ^o ; USSR; 1927-1930)	A. A. Rode (USSR; 1968)
	V. A. Kovda (10 ^o ; USSR; 1968-1974)	M. K. Kononova (USSR; 1974)
		V. A. Kovda (USSR; 1982)
		S. V. Zonn (Russia, 1998)
		G. V. Dobrovolsky (Russia, 2002)
		V. Targulian (Russia, 2010)
India	J. S. Kanwar (12 ^o ; 1978-1982)	S. K. Mukherjee (1986)
		J. S. Kanwar (1990)
		J. S. P. Yadav (2010)
China	-	-
South Africa	-	-

Source: Hartemink (2015).

Final Considerations

In general, scientific societies dedicated to Soil Science in the countries of the BRICS group have very different historical and organizational profiles, but have similar activities. Loosely speaking, a factor which is common in soils (Targulian and Goryachkin, 2004) and humans is that, unlike rocks, both accumulate information as they age, that is “memorized”.

The preservation of memories is undoubtedly an important link between generations of soil scientists and the advancement of their knowledge, which, in varying intensity, has been valued by soil science societies from countries of the BRICS group. Thus, in addition to diffusing a portion of soil science history of the five countries, it is hoped that this paper will contribute to highlight the value of belonging to a scientific society and "be more soil and less rock"

Acknowledgments

We acknowledge the soil scientist Gonçalo Signorelli de Farias for suggestions for improvement of this text, and Garry Paterson for some information about SSSSA.

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