



A Tribute to Jaume Porta Casanellas and His Influence on Soil Science

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This article provides personal and professional assessments from disciples, colleagues and friends of Jaume Porta Casanellas (Barcelona, 1944; Lleida, 2023), a prominent soil scientist. He began his agricultural engineering studies at the Polytechnic University of Madrid (UPM) where he met Marta López-Acevedo, his wife and outstanding collaborator. At UPM, he started his early work in soil science under the guidance of Professor Carlos Roquero who became his mentor and friend. Jaume Porta was a dedicated, passionate soil scientist who engaged extensively in teaching and research in Soil Science, while also excelling as a manager. He emerged as a leader due to his initiatives in promoting Soil Science in Catalonia and Spain, and for his forward-thinking vision, evident in his decisions as Rector of the University of Lleida, which have significantly contributed to the city's development. From the beginning, he advocated for detailed (1:25,000) soil mapping of Catalonia to enhance territorial planning and agricultural progress. His primary research focus was on salt-affected soils and soils with gypsum, alongside soil erosion and conservation. Porta devoted a lot of effort to improve soil field descriptions with his *Agenda de campo*. He played a key role in standardizing soil analytical methods, establishing large series laboratories in Spain, notably the LAF in Sidamon (Lleida), and aligning Spanish soil labs with the international GLOSOLAN network. As president of the SECS, he energized activities and encouraged member participation. His educational publications, mainly his comprehensive textbook *Edafología*, are considered fundamental in Soil Science across Spanish-speaking countries, as is the Multilingual Dictionary of Soil Science, representing the pinnacle of his efforts to rigorously disseminate soil science concepts and terms in Spanish, Catalan, Galician, and Portuguese. He contributed significantly to international Soil Science courses in Mexico and played a key role in establishing the JADE postgraduate training program. He facilitated the creation and international visibility of the Spanish Journal of Soil Science. Additionally, he advocated for the establishment of the Soil Sciences Documentation Centre

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(Ce.SECS) to preserve historical publications and the legacy of soil scientists. Jaume Porta's enduring impact, both professionally and personally, will be felt for years to come.

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INTRODUCTION

During the history of Soil Science, certain individuals emerge as milestones, shaping the landscape of knowledge and practice with their contributions. Among these figures stands Jaume Porta Casanellas, a distinguished leader whose influence has left an indelible mark on both research and academia. As we embark on this review paper, it is imperative to set the stage, providing context for the reader to appreciate the magnitude of Porta's impact.

This paper serves as a tribute to Jaume Porta. Unlike traditional research articles, this review paper is written by Porta's disciples, colleagues and friends, individuals whose lives and work have been profoundly touched by his mentorship and guidance. Here, we honour his legacy, celebrating his remarkable journey and the manifold ways in which he has advanced our understanding of soils.

As we delve into the various facets of Porta's contributions, it becomes evident that his influence transcends the boundaries of academia, from pioneering research to mentoring the next-generation of soil scientists and guiding policies and initiatives. Each section of this review paper offers insight into different aspects of his work, shedding light on the depth and breadth of his achievements.

THE EARLY YEARS

Jaume Porta Casanellas was born in Barcelona in 1944 and completed his secondary school in the *Lycée Français* in the same city. Despite being raised in an urban environment, he used to spend his summer holidays in a village in La Cerdanya, a valley in the Catalan Pyrenees (NE Spain). This exposure to the rural environment likely motivated him to pursue agricultural studies. After completing his Agronomy Engineer degree, he decided to specialize in Soil Science under the guidance of Professor Carlos Roquero de Laburu, Chair of Soil Science at Polytechnic University of Madrid. Around the strong personality of Carlos Roquero, a self-made man in Soil Science according to Jaume Porta, several agronomy engineers engaged in Soil Science. Some of them became Chairs of Soil Science in the Agronomy Schools across Spain in the 1980s and 1990s. Jaume Porta was one of them. With a Juan March fellowship, he undertook an advanced research stay (DEA) in Nancy (France), under the guidance of Professor Duchaufour. He later completed his PhD on salinity, vegetation and soils with gypsum in Alcázar de San Juan (La

Mancha). Salt-affected soils and gypsum would remain central themes throughout his scientific career. During this period, he was in contact with the CSIC in Madrid, where Professor Covadonga Rodríguez Pascual was one of his mentors and supporters.

He was always mindful of the difficulties in studying soils, both in terms of approaches and methods, a perspective that likely dates back to these early years. Like his mentor Carlos Roquero, he believed that the study of soils should begin and end in the field. At a time when soil genesis and mineralogical studies were more appreciated than they are now, he often adopted a practical, applied approach to the study of soils. Initially, his studies focused on agronomy and soil conservation, eventually evolving into a more holistic approach. This "engineering" view on Soil Science was a consistent feature in his scientific and teaching activities.

Regarding methods, three aspects merit mention: field description, laboratory work, and soil classification. One of his early publications (1979), co-authored with Roquero, was the first version of field guide *Agenda de Campo*, which included a systematic description of the soil profile and many other relevant information for field soil characterization.

Professor Roquero was a key promoter of the use of Soil Taxonomy (Soil Survey Staff, 1975) in Spain, instead of other classification systems more common at a time (e.g., Kubiëna and the French CPCS system). Jaume Porta, despite or perhaps because of his knowledge of French, became a strong proponent of Soil Taxonomy. Throughout his career, he sought ways to teach it, clearly explaining the reasons for its use (Porta-Casanellas, 1985). In this task, he was always supported by his wife Marta López-Acevedo.

His tenure in the network of agronomy labs of the Spanish Ministry of Agriculture, though short, was very intense. It allowed him to understand the scientific and material weaknesses of the system and work to overcome them, by implementing adequate lab methods and developing large capacity labs useful for agriculture and Soil Science. This period also helped him to establish long-lasting scientific contacts, such as in Galicia. His interest in soil micromorphology dates from this period, recognizing from his PhD work that chemical analysis was not the best way to study soils with gypsum.

He always aimed to take an interdisciplinary approach to the study of soils, especially with Geology and Botany. For instance, his insistence on recruiting geologists and botanists for soil inventories and mapping studies, and his friendship with Professor Santiago Castroviejo, former Director of the *Real Jardín Botánico* in Madrid, date from this time.

RESEARCH AND UNIVERSITY CAREER IN CATALONIA: FROM THE GROUND TO THE RECTORATE OF LLEIDA UNIVERSITY AND THE STRUGGLE TO DEVELOP AND CONSOLIDATE SOIL SCIENCE

After his arrival to Lleida in 1977 he began working in the Higher Technical School of Agricultural Engineering (ETSEA), which at that time belonged to the Polytechnic University of Barcelona (UPB). His goal was always to make Soil Science influential in society. During that period, it seemed that everything was possible. His generation was in a privileged position, and he actively pursued this potential both in academia and in society. From the outset, he aimed to identify lines of work and/or research relevant to his territorial and social environment, engaging with them while also positioning his followers in a global context.

He devoted significant effort to attracting and engaging promising students in the field of Soil Science and later did the same with talented individuals for his projects. He succeeded in teaching the importance of soil to his agronomy engineering students, emphasizing its essential role in all their future engineering activities. In the early years, he put considerable effort into training graduate students in Soil Science through specific *ad hoc* courses featuring numerous outstanding lecturers.

Recognizing that Soil Science was not a main focus at the ETSEA, he worked hard to make professors in related areas sensitive to the importance of Soil Science. We now recognize all these actions as a long-lasting, strategic project that was one of the main strengths of his career.

A hardworking and reserved man, he pursued his aims, ideas, and objectives with great tenacity for many years, convinced of their correctness. Although he was not always easy to work with, his actions and ideas resulted in many devoted followers, as well as disagreements that sometimes lasted too long and were not fully understood.

The Academic Career

In the 1977/78 academic year, two young professors, Jaume Porta and his wife Marta López-Acevedo, joined the ETSEA. From the very beginning, both were highly active trying to consolidate an academic project in Soil Science. They created the Department of Soils and Climate, where they worked on research projects involving soil salinity and drainage, soil erosion and conservation, and soil fertility in various areas of the region. This included a focus on the nutrition of hazelnut (*Corylus avellana* L.) and its pedoclimatic environment as well as practical applications of Soil Science such as soil assessment, soil inventories and mapping. They were diligent about publishing their results in *ad hoc* publications, which were carefully -and painstakingly- prepared with the limited resources at the time.

From the start, both professors dedicated their efforts to training agronomists in Soil Science (soil fertility, soil classification, soil mapping, land evaluation) and organizing courses in land use planning. Recognizing that Soil Science

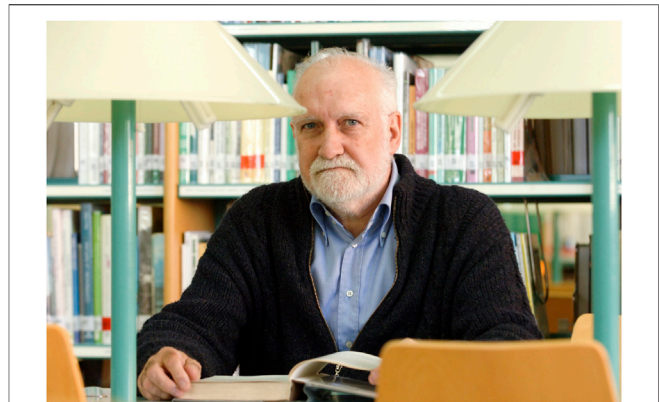


FIGURE 1 | Libraries were one of Jaume Porta greater passions. Image at the ETSEA library of the University of Lleida (Photo by Toni Prim).

was often seen as secondary to other sciences, they worked to strengthen the connections and actions of soil practitioners in Catalonia and abroad.

In 1978, Jaume Porta joined the ETSEA board of directors as vice-director of research, and in 1984 he was elected director of the ETSEA, a position he held until 1987. During this period, he focused on consolidating existing degree programs, planning new ones, and developing infrastructure from the initial stages of the “*Agrònoms*” campus (Porta et al., 2013). In 1986, he became Full Professor of Soil Science with a dissertation on the genesis of petrocalcic horizons.

In 1992, a “*Comisión Gestora*,” led by Professor Víctor Siurana, was appointed to manage the creation of the University of Lleida (UdL). Jaume Porta was one of the three vice-presidents of this commission until his election as the first Rector of the UdL in May 1993. He remained in this position for 10 years, from May 1993 to May 2003.

It is interesting to note that the University of Lleida, founded in 1300, was the oldest university in Catalonia. It was closed in 1717 after the War of Succession, and it was not until 1991 that the UdL was reestablished. Jaume Porta took advantage of this circumstance to organise the celebration of the 700th anniversary of the University of Lleida (1300–2000), as the oldest in the Crown of Aragon, repositioning it in the national and European university landscape (Porta, 1996). This allowed presenting it as a first-rate asset for the city of Lleida and obtaining significant resources for its development. Jaume Porta defined himself as a “university professor who likes to look far ahead” (Andreu-Gasa and Villar-Mir, 2018). Those of us who had the good fortune to work closely with him, especially during his tenure as Rector of the University, would emphasize his leadership, his innovative and creative character, and his great working capacity, always with a long-term vision and with the decisive mission of educating people in a holistic manner.

Among his passions were architecture and libraries. The libraries of the University of Lleida were a priority subject of his governance (Figure 1). The main library of the UdL, now called the “*Biblioteca Jaume Porta*,” was the result of an

international competition organised by the UdL to commemorate the 700th anniversary of its foundation. The winners were the Finnish architects Kristian Gullichsen and Timo Vormala, the authors of a unique and emblematic building at the entrance to the *Cappont* campus (Benedito and Benedito, 2001). On the same campus, the Faculty of Education Sciences is located, designed by Alvaro Siza, an outstanding and renowned Portuguese architect. The involvement of important architects was another result of Rector Porta's determination to leave an architectural legacy to the University and to the city of Lleida, his adopted city as he always remembered. His university vision and his love for the city of Lleida, combined with his tenacious character, made it possible to achieve a legacy of excellent architecture. A virtual tour can be enjoyed at the following link.¹

Jaume Porta loved books. In addition to his teaching books on Soil Science, he coordinated collective works such as *La universidad en el cambio de siglo* (Porta and Lladonosa, 1998), the *Biblioteques Imaginàries de la Universitat de Lleida* (Porta, 1997), *Descobrir Lleida passejant per l'arquitectura del segle XX* (Porta, 2005) and *Álvaro Siza a la Universitat de Lleida* (Cornadó and Porta, 2007). The government team led by Jaume Porta supported from the beginning the cultural and artistic promotion that culminated with the ten artists project around the 700th anniversary of the UdL (Porta, 2001). Promoting the internationalisation of the university and student mobility were also priority actions of his mandate (Porta, 2003). He created, for instance, the JADE program to facilitate exchanges with Mexican universities (see *Activity in Mexican Universities. International Soil Science Course, UNAM* section).

In 2014 he was appointed Professor Emeritus of the University and until his retirement in 2019 he was an outstanding member of the Department of Environment and Soil Sciences, continuing with his teaching, research and knowledge transfer activities.

Research

Since the early 70s of the XX Century, different research topics on soil genesis and soil degradation and conservation aroused the interest of Jaume Porta. Compiling all his works is a difficult task since some of them are unpublished reports, engineer final projects or PhD theses he supervised. Later, during the time as rector of the UdL, his main dedication was management, although he never abandoned his commitment with doctoral students, lecturers, and colleagues eager for his knowledge. Below there is a summary of the main research topics in which Jaume Porta worked, although, as it has been said, it is by no means a complete list.

Soils With Gypsum

One of the main research topics of Jaume Porta was the study of soils with gypsum, to which Soil Science had paid little attention until that time, leading to misconceptions on their composition and behaviour. One of his first works was his PhD thesis about ionic redistributions in saline soils, the influence on halophytic vegetation and the possibilities of reclamation of halomorph

soils, and soils with a gypsic horizon (Porta, 1975). This work involved a deep revision of the main methodologies and techniques used to characterise gypsum in soils in the field and in the laboratory on soils of semiarid and arid regions (Porta, 1998).

Together with Juan Herrero and Nicolas Fedoroff, Jaume Porta contributed to define and coining specific terms with precise meanings for gypsum forms in soils. Examples are *lenticular gypsum*, *microcrystalline gypsum*, *gypsic fabric*, *lenticular gypsic fabric*, *microgypsic fabric*, *isles fabric* and *queras* (Porta and Herrero, 1990; Herrero et al., 1992; Herrero and Porta, 2000). From then on, these terms were joined to those already existing for the description of secondary accumulations of gypsum (vermiform accumulations, noduli, rhizcretions and cemented horizons), helping to better describe the wide range of forms that gypsum can adopt in horizons of arid and semi-arid soils. Among the study methodologies, particular attention received the micromorphological approach (Porta and Herrero, 1990). They described lenticular crystals, as the most common form of pedogenic gypsum, which in more advanced stages could become a continuous or massive accumulation. He experimentally demonstrated that the lenticular habit develops in the presence of organic matter. Moreover, Porta and Herrero (1990) found that the weathering of outcropping gypsum rock may lead to a microcrystalline gypsum mass that is easily transported by mudflows. Herrero et al. (1992), in his PhD thesis supervised by Jaume Porta, contributed to the study of hypergypsic soils and the development of terminology describing these soils. In this research, they concluded that the introduction of the hypergypsic diagnostic horizon to the taxonomic classification system would be helpful for the accurate classification of these soils. Later, the co-supervision of the PhD thesis of Rosa M Poch (Poch, 1992) enlarged the knowledge of soils with gypsum in Quaternary materials. In short, in this research field Jaume Porta and his collaborators made significant advances to better reflect the genesis of soils with gypsum as well as their behaviour under both natural and artificial conditions, helping to understand the role of gypsum in local and global earth-surface processes (Herrero and Porta, 2000; Casby-Horton et al., 2015).

Soil Erosion, Degradation and Conservation

Another research line of interest for Jaume Porta was soil erosion and conservation in different environments, such as the stone wall terraces of the Catalanian Meridional Area, vineyard soils of the Anoia and Penedès region and surface-mined soils of the pre-Pyrenees. Porta and Julià (1983) published a study covering 90,000 ha of the Catalanian Meridional area highlighting the importance of the stone wall terraces for soil and water conservation and as a soil forming process.

In the vineyard soils of the Anoia-Penedès region, Porta and his collaborators initially focused on soil conservation in the early 1980s. Later, their interest shifted to quantify and estimating soil and nutrient losses due to hydric erosion, driven by the economic impact of this crop in the region. Rainfall intensities exceeding 100 mm h⁻¹ in 5-min periods are common in the area, giving rise to high runoff rates and significant erosion processes in fields (rill

¹<https://biblioguies.udl.cat/passejararquitectonic>



FIGURE 2 | Jaume Porta measuring a trapezoidal hillside ditch (locally named “*rasa*”) in the Penedès vineyard area (Photo courtesy of M.C. Ramos Martín, dated in 1990).

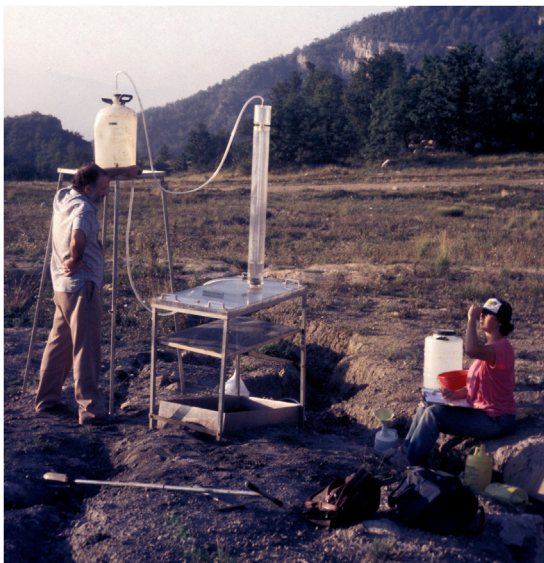


FIGURE 3 | Jaume Porta and Rosa M. Poch measuring soil losses with a rainfall simulator in Sant Corneli, a restored mine located in the Berguedà county (North of Catalonia) (Photo by José A. Martínez-Casasnovas, dated 1985).

erosion) and at the heads and sidewalls of gullies (Ramos and Porta, 1994). Porta and Ramos (1993) documented substantial soil losses, ranging from 10 to 100 Mg ha⁻¹, resulting from single autumn rainfalls. Nutrient losses were also important, with N losses between 9 and 90 kg ha⁻¹. They later evaluated the effectiveness of conservation measures like hillside ditch terraces, locally named “*rases*”, which were common in vineyards before massive land transformations began in the 2000s. They found that empirical criteria used by farmers were inefficient, requiring a reduction in inter-terrace distance from

40 m to about 28 m (Ramos and Porta, 1997) (**Figure 2**). Regarding gully erosion in this region, Martínez-Casasnovas and Porta (1999), found gully retreat rates of 0.2 m y⁻¹ and soil losses of 917.9 Mg ha⁻¹, which are comparable to catastrophic landslides.

In restored surfaced-mined areas, Porta’s interest in studying erosion processes was driven by the opportunity to implement and test erosion control practices. These included bench terraces to infiltrate water on the lowest part of the restored surface and sowing grasses and legumes over the spoil banks. Research beginning in 1983 (Porta et al., 1983), showed that when conservation measures were used without a good understanding of surface hydrological processes, erosion occurred from the start of rehabilitation, rendering conservation measures useless and sometimes exacerbating the problem (Porta et al., 1988) (**Figure 3**).

In addition to the research carried out on salt-affected soils and erosion, Jaume Porta, along with Rosa M. Poch studied land degradation caused by human activities using the DPSIR framework (Porta and Poch, 2011). This framework describes interactions between driving forces, pressures, states, impacts and responses to long-term land use changes associated with each specific land and soil degradation problems (Porta, 2009). Their work revealed that socioeconomic and sociocultural driving forces increased pressure on the analysed systems and that technical measures alone were insufficient to prevent or control land and soil degradation. Effective responses needed to address driving forces and apply scientific principles of soil behaviour in response to land use changes, otherwise, pressures would persist, and problems would reoccur.

Irrigation and Salt Affected Soils

Jaume Porta’s research on salt-affected soils (salinization and alkalization) began with his PhD thesis, where he studied these soils by means of soil analysis and of halophytic vegetation communities (Porta, 1975; Porta et al., 1980). This research expanded to include salt-affected soils in Huesca province (Aragón, Spain), where irrigation led to salinization and alkalization processes (Porta et al., 1986a). Initially, they applied the USBR and FAO evaluation systems for land evaluation for irrigation in the Flumen-Monegros system. They concluded that salinization, alkalization or drain siltation were mainly due to soil characteristics and, to some extent, the quality of irrigation water, which was not initially considered. Subsequent studies by Herrero et al. (1989) and Rodríguez et al. (1990) used micromorphological methods to validate indices for predicting soil suitability for drainage, and to characterize the drain siltation processes in the Flumen-Monegros area. All these research works provided a general overview of the vulnerability of soil degradation under irrigation (Porta and Herrero, 1996).

Land Evaluation

Noteworthy contributions in land evaluation date from the 1980s. The Cadastral Management and Tax Cooperation Centre of the Spanish Treasury promoted the development of a method for the assessment of the value of the land in relation to its agricultural



FIGURE 4 | Jaume Porta and Jaume Boixadera during the field excursion of the "XVI Reunión de la Sociedad Española de la Ciencia del Suelo" (Lleida 1989) explaining the characteristics of a typical soil profile of the semi-arid soils of the meridional area of Lleida (Photo by Rosa M. Poch).

use. Boixadera and Porta (1991) developed the "Index Value Method" based on the FAO (1976) framework for land evaluation. This method evaluates land productivity potential and suitability for different uses, allowing for more objective and uniform application across territories.

Soil Genesis and Classification

In soil genesis and classification, Porta and Julià (1983) described the main soil-landscape relationships, the genesis of petrocalcic horizons, the pedological and geomorphological processes in the slopes and ancient terraced slopes, and the origin and mobilization of gypsum and more soluble salts in the soils and in the landscape of the Catalan Meridional area (Figure 4). They identified limitations in existing models for determining the water regime of soils in arid or semi-arid areas, such as the southern area of Catalonia. Jarauta (1989) in his PhD thesis supervised by Jaume Porta, improved Newhall's model for determining soil moisture regimes. This was a key issue for characterizing soils developed in semiarid areas of Catalonia, where the transition between the xeric and aridic regimes depends on soil properties (Jarauta et al., 1989). This method is still used today to define the soil moisture regimes in Catalonia (ICGC, 2019).

Soil Mapping and Soil Inventories

Els sòls de Catalunya: àrea meridional de Lleida (Porta and Julià, 1983) is one of Jaume Porta's first works of on soil inventories. At that time, knowledge of these soils was so limited and resources so scarce that presenting a soil map of any scale was impossible. Nevertheless, this work contained the main features of a soil inventory and later served as a model for soil surveys in this and other surrounding areas of western Catalonia. From the outset, key issues for the mapping tasks promoted by Porta included fundraising, the availability of trained staff and access to soil laboratories.

The soil map of Barcelona Province, promoted by Barcelona Provincial Council, represented a significant step forward, though

few municipal maps were created and only two were fully published. At that time, Jaume Porta became convinced that soil maps should be useful, which in a small country like Catalonia, is only possible with detailed-scale (at least 1:25,000) soil maps.

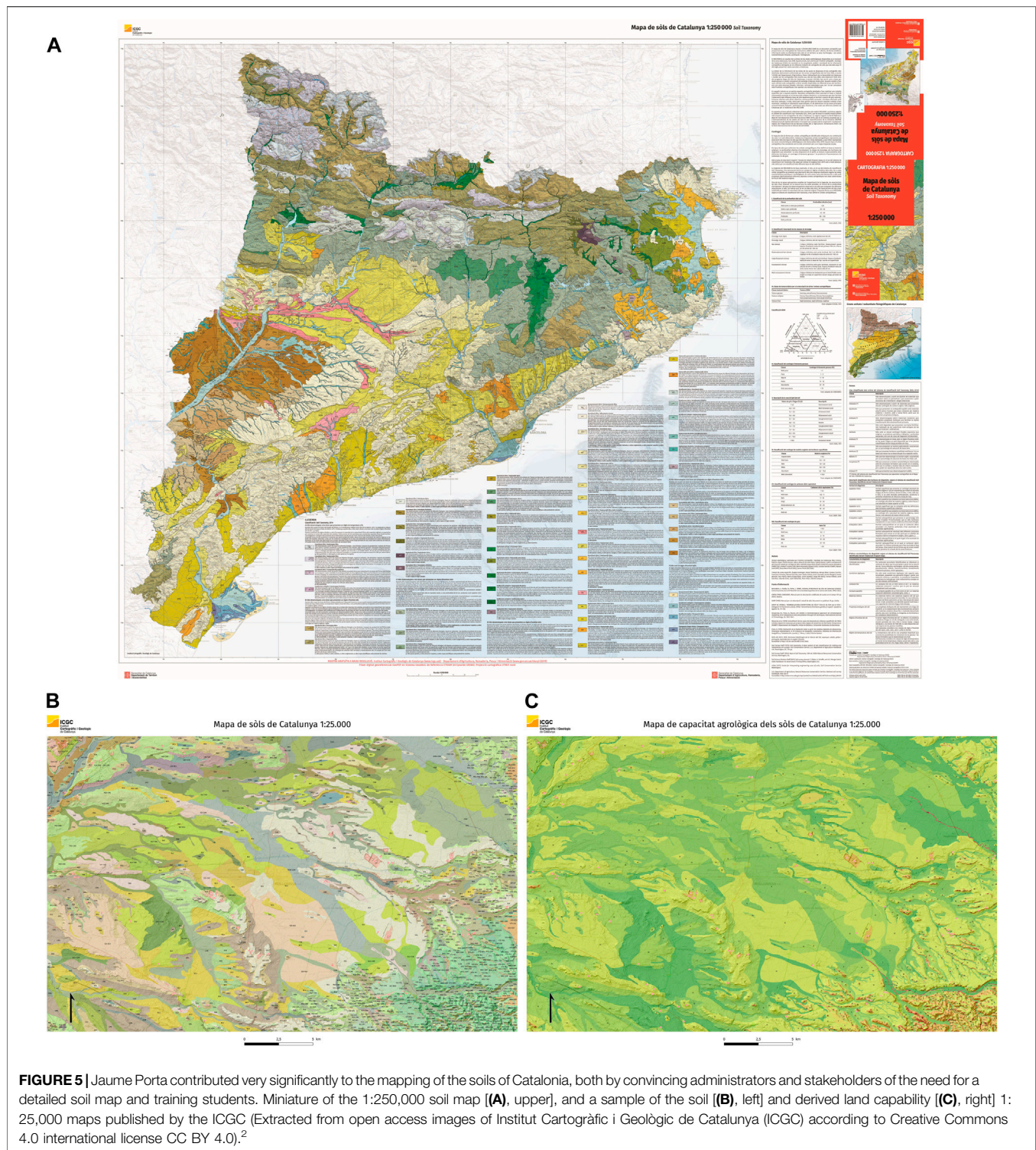
These and other soil mapping exercises highlighted several key requirements from the beginning: the need for a manual to describe the soils, the importance of storing information digitally despite limited computer facilities, and the necessity of a properly equipped laboratory for analysis. To address the first issue, Porta developed a comprehensive manual from the "Agenda de Campo" (Roquero and Porta, 1979) with codified information for digitalization. This was a novel approach at the time when computers were just emerging. To ensure consensus, a commission comprising prominent Spanish pedologists and soil mappers was established, and the Spanish Ministry of Agriculture supported this effort. The resulting manual was published as SINEDARES (Comisión del Banco de Datos de Suelos y Aguas, 1983). In Catalonia, a regional Soil Data Bank was created using an adapted SINEDARES system (CatSIS). Despite the sound idea, resources were insufficient, and awareness of the importance of soil surveys was limited, leaving most of Spain still needing comprehensive soil mapping.

Another soil mapping project initiated by Jaume Porta began in 1984 under the *Generalitat* of Catalonia, which is now proved fruitful. By the time it started, some challenges related to soil description and analysis had been partly addressed. In 1994, the first sheet of the Soil Map 1:25,000 of Catalonia was published (Herrero et al., 1993). Later, it became necessary to find a suitable institution for conducting the soil mapping exercise to ensure quality and accuracy. This role was first taken on by the *Servei Geològic de Catalunya* and later by the *Institut Cartogràfic i Geològic de Catalunya* (ICGC) (Figure 5). In these organisations, Emilio Ascaso Sastrón and his team found the appropriate environment to create the Soil Map 1:250,000 of Catalonia, gather new information at 1:25,000 and make all of it accessible online and useful. During this period, Porta played a crucial role in transferring the Soil Map of Catalonia to the ICGC, overcoming many obstacles with his invaluable assistance, support, and guidance, including the essential training of soil surveyors.

Jaume Porta and the Impulse of Soil Analysis Laboratories

Soil analysis laboratories are a strategically valuable asset in the development of Soil Science. Their proper functioning allows the characterization of physical, chemical, and biological properties through the collection of analytical data generated by specific, validated, and standardized procedures.

In the late 1960s and early 1970s, Jaume Porta recognized the need for facilities with sufficient capacity and reliability to meet the demands of research, mapping, fertilisation recommendations and soil characterization work (Porta et al., 1994). He was closely involved in the creation of the Regional Agricultural Laboratories, a project driven by agronomic engineer Rafael García Faure under the Directorate General of Agriculture, led by Ramón Esteruelas, from the Ministry of Agriculture of



Spain. As an agronomic engineer, Porta began his professional career at the Regional Agricultural Laboratory of Guísamo (A Coruña), later moving to the Regional Agricultural Laboratory of Ebro (Zaragoza) and the Regional Agricultural Laboratory of Madrid, before joining ETSEA as a Soil Science professor. This experience provided him with first-hand knowledge of the

laboratories' needs in terms of design, construction, staffing, and technological equipment (Porta, 1974).

²<https://www.icgc.cat/en/ICGC/Public-Information/Transparency/Re-use-information>

In the 1980s, alongside the creation of soil laboratories, the publication of the book “*Técnicas y experimentos en Edafología*” (Porta et al., 1986b) comprehensively detailed classical analytical procedures used in soil laboratories. It embodied the didactic and accessible style that characterized Jaume Porta’s later works, facilitating access to Soil Science for students, professors, scientists, researchers, and various professionals. The work of the “*Comisión de Métodos Oficiales de Análisis de España*” is also notable for its impact on analytical procedures, establishing methodologies for the main soil analytical determinations (MAPA, 1986).

In Lleida, Jaume Porta, with support from the Provincial Council, established a suitable soil laboratory to meet educational, research, and experimentation needs in soil and plant analysis. In 1980 this laboratory was equipped with a powerful atomic absorption spectrophotometry device, under the guidance of Marta López-Acevedo, serving as an excellent training ground for laboratory work. Numerous analytical vocations originated from these facilities.

Recognizing the need to advance Soil Science in support of the agricultural sector, Jaume Porta developed the idea of creating a high-performance soil laboratory capable of processing large volumes of soil samples with high reliability. Through intense efforts and perseverance, in 1987, together with agricultural engineer Josep María Villar, he presented a project for an automated soil laboratory to the Provincial Council of Lleida (Porta and Villar, 1987). The designed centre envisioned a future with a high degree of automation, innovative design, and equipment matching the sector’s needs. With support from agricultural engineer Francisco Juárez, also a professor at the University of Lleida, a laboratory development program was designed, considering the need for active sample collection to ensure the laboratory’s long-term economic sustainability. This development model was inspired by laboratories in France and the Netherlands, characterized by a network of private or public-private laboratories coexisting with powerful state laboratories (Baize, 2000).

Designing an economically sustainable laboratory was a key challenge that required a new approach, considering not only quality criteria but also analytical response speed, promotion of services, and integration into a sector with little inclination to pay for analytical services. This context spanned the late 1980s and early 1990s.

Finally, in 1992, the “*LAF, Laboratori d’Anàlisi i Fertilitat de Sòls*” was inaugurated in Sidamon (Lleida). This laboratory, operating as a joint-stock company (*Servei d’Anàlisi de Sòls-Diputació de Lleida S.A.*), was promoted by the Provincial Council of Lleida with the participation from the agricultural cooperative sector and the University of Lleida, turning previous projects into reality. The laboratory included advanced equipment, semi-automated analysis lines, and a strategy for service promotion and analytical result interpretation. ETSEA significantly supported the project through Jaume Porta’s initiative, providing crucial institutional support during the start-up and implementation period. This laboratory successfully achieved its growth and sample volume projection plan. Years later, it was acquired by the certification company

Applus+ (2005), and subsequently by the Eurofins analysis group (2014). The laboratory has analysed large volumes of soil samples and played a significant role in soil mapping, fertilisation recommendations, implementation of analytical control regulations in the agricultural sector, plant nutrition advice (Villar and Aran, 2008), and various projects, constituting an interesting analytical development model.

Despite his prominent role in the governing bodies of the University of Lleida (1993–2003), Jaume Porta continued to participate in areas related to soil laboratories, offering his experience and network of contacts, and participating in numerous initiatives, maintaining a close connection with the development of the Sidamon laboratory.

One of his objectives in recent years was the establishment of a National Reference Laboratory (LNR) in Spain to act as a centre for support, connection, coordination, testing new analysis methodologies, method harmonization, and as a reference for the public and private soil analysis laboratories ecosystem in Spain. This objective aligns with the GLOSOLAN project (Global Soil Laboratory Network) (FAO, 2020) under the framework of the Global Soil Partnership. In essence, Porta envisioned GLOSOLAN as an excellent initiative to connect Spanish laboratories and the LNR with this international network.

For his work and projects in the conception, development, and support of soil laboratories, Jaume Porta made a significant and decisive contribution to this branch of Soil Science. His influence was crucial in advancing soil analysis as a fundamental support in soil studies.

Jaume Porta, a Leading Figure of Soil Science in Catalonia

In 1977, he arrived in Catalonia as a professor at the newly established ETSEA, during a time of significant changes and opportunities. From the outset, he recognized the need to create spaces, resources, and activities to develop Soil Science in Catalonia, a field deeply connected to the region. He aimed to engage soil scientists by seizing every possible opportunity or creating new ones.

The dispersion of soil scientists across various institutions and geographical locations in Catalonia posed challenges in fostering connections among them, promoting knowledge of Catalan soils and exchanging experiences. In the early 1980s, most Catalan soil scientists associated with the agricultural sector belonged to the Catalan Institution of Agrarian Studies (ICEA, 2024), linked to the Institute of Catalan Studies (IEC). Jaume Porta, with the support from his colleagues Ricard Danés and Narcís Teixidor, initiated the creation of a Soil Group within the ICEA in the mid-1980s. As its activities expanded, this group became the Soil Section of ICEA in 1991 (Secció de Sòls de la ICEA, 2024).³

However, ICEA did not encompass all individuals interested in Catalan soils, particularly those in academia or research, who

³<https://icea.iec.cat/seccions/sols/>

were mostly members of the Spanish Society of Soil Science (SECS). SECS focused on organizing congresses, courses, and field trips across Spain, but direct contact between members was somewhat limited. To address this, Jaume Porta, pioneered the establishment of regional groups in 2012, creating the first Territorial Delegation (TD) of SECS in Catalonia, which was followed by those of other regions in Spain. This proximity facilitated the organization of in-person activities.

Identifying the individuals interested in Soil Science in Catalonia, the next step was to strengthen the bonds through joint activities. Since 1985, documented conferences, technical sessions, visits to centres, and field trips to study or observe soil-related issues have taken place. Among these activities, the “*Transcatalonia*” stand out. It consists of a field day to observe the soils of a specific locality or region in Catalonia, including their use and management, supported with a field guide and a friend lunch. A significant step was appointing the same person to lead both the Soil Section of ICEA and coordinate SECS members in Catalonia, even before the creation of respective TD. This role was assisted by another member acting as secretary, ensuring maximum coordination. Jaume Porta served in this role from 1988 to 1991, before being elected president of SECS. Another noteworthy initiative was the creation in 1989 of a list of books and journals related to Soil Science available in Catalan universities and other institutions’ libraries, long before internet portals appeared. This list, distributed among Catalan SECS and ICEA Soil Section members, included journal titles, issues, locations (e.g., Soil Science library at the Faculty of Pharmacy), and conditions for consultation. In some cases, photocopies of desired articles could be requested by mail or phone from colleagues at those institutions. This initiative helped alleviate the economic constraints faced by universities and public research centres for journal subscriptions, avoiding duplications and coordinating new subscriptions across different entities where Catalan soil scientists worked.

Jaume Porta stood out for his leadership and initiative, resulting in a period of heightened activity in the Soil Section of ICEA and TD of SECS. He succeeded in bringing together most soil scientists in Catalonia through these initiatives, particularly the younger ones in their scientific growth phase.

An example of his leadership was his role as coordinator of a collective book on soils, involving eight soil scientists from five different institutions in Catalonia and the University of Valencia, published in 1985. This extensive chapter on soil was part of Volume 3 of the encyclopaedia “*Història Natural dels Països Catalans*,” a comprehensive, well-edited and illustrated work, serving as a reference for many years. Due to its quality, this chapter was also published as an independent book by the College of Agricultural Engineers of Catalonia under the title “*Introducció al Coneixement del Sòl: sòls dels Països Catalans*” (Porta et al., 1987). This work, along with many of his other publications, demonstrated his commitment to disseminating the Catalan language and culture with precision.

From 1997, he became a member of the Science and Technology Section of the Institute of Catalan Studies, contributing valuable efforts to compile and disseminate terminology specific to Soil

Science. He also created the website “*Protecció de Sòls*,”⁴ containing historical soil maps, links to current cartography, and other relevant soil information.

Even when other positions of greater responsibility demanded his attention, Jaume Porta remained an active member of ICEA and SECS in Catalonia, participating in the organization of national and international congresses and scientific meetings, and engaging in most activities held in Catalonia.

JAUME PORTA: A VISIONARY EDUCATOR AND PIONEERING IN SOIL SCIENCE

Jaume Porta, a dedicated scholar and educator, left an indelible mark on the field of Soil Science, particularly through his relentless efforts to develop teaching materials that catered to students at all levels. His passion for education was evident in his focus on creating practical and useful manuals and books, rather than chasing citations or scientific indices. A list of his main educational publications is found in **Table 1**.

One of his earliest contributions was the co-authorship of the “*Agenda de Campo para el Estudio del Suelo*” alongside Carlos Roquero. This project, initiated with local editions in 1979 by the Polytechnic University of Madrid, was much more ambitious than the FAO Guidelines for soil profile descriptions and aimed to be the Spanish equivalent of the Soil Survey Manuals of the USDA. By 1995, the “*Agenda*” had reached its 7th edition and 191 pages. Later a very much expanded version (541 p) was published by Mundi-Prensa in 2005, with Marta López-Acevedo joining as a co-author (**Figure 6**).

Recognizing the absence of a comprehensive textbook on Soil Science in Spanish, Porta, along with Roquero and López-Acevedo, published “*Edafología para la agricultura y medio ambiente*” in 1994. This textbook, which went through three editions by 2003, filled a crucial gap in the educational resources available to Spanish-speaking students.

Porta’s visionary approach extended to addressing the evolving landscape of education. With the launch of the European Higher Education Area (EHEA) in 2010, he identified the need for materials that allowed students to engage in independent learning. Collaborating with Marta López-Acevedo and Rosa M Poch, he proposed an interactive book titled “*Introducción a la Edafología. Uso y protección del suelo*” (**Figure 6**). This groundbreaking work, published in 2008 and 2010, later evolved into “*Edafología. Uso y protección de suelos*” in subsequent editions (2014 and 2019). It became a cornerstone for several generations of soil scientists in Spain and Latin America.

Porta’s commitment to linguistic precision was evident in his endeavours to standardize Soil Science terminology. In 1989, he promoted and co-authored the “*Lèxic de la Ciència del Sòl*” in Catalan, providing equivalents in Spanish, English, and French. He was particularly meticulous about using the term “*edafología*” in Spanish to accurately represent Soil Science, as opposed to the

⁴<https://www.iec.cat/mapasols/Ang/Inici.asp>

TABLE 1 | Main educational publications of Jaume Porta Casanellas.

Porta, J., López-Acevedo, M. and Poch, R.M. (2019). *Edafología. Uso y protección de suelos*. Ed. Paraninfo. 3rd ed. ISBN: 978-84-8476-661-2; 4th Ed. ISBN: 978-84-8476-750-3

Porta, J., López-Acevedo, M. and Poch, R.M. (2010). *Introducción a la Edafología. Uso y protección del suelo*. Mundi-Prensa, 2008, ISBN: 978-84-8476-342-0; 2nd Ed. 2010, ISBN: 978-84-8476-405-2

Porta, J., López-Acevedo, M. and Poch, R.M. (2009). *Introducció a l'Edafologia. Ús i Protecció de Sòls*. Mundi-Prensa, 507 pp. ISBN: 978-84-8476-385-7

Porta, J., López-Acevedo, M. and Roquero de Laburu, C. (2003). *Edafología: Para la Agricultura y el Medio Ambiente*. Mundi Prensa Libros, 1994 ISBN: 84-7114-468-9; 1999 (2nd Ed.). ISBN 84-7114-784-X; 2003 (3rd Ed.) ISBN: 84-8476-148-7

Porta, J. and López-Acevedo, M. (2005). *Agenda de Campo de Suelos. Información de Suelos Para la Agricultura y el Medio Ambiente*. Mundi Prensa Libros, 541 p. ISBN 84-8476-231-9

Roquero de Laburu, C. and Porta, J. (1995) *Agenda de campo para el estudio del suelo*. Universidad Politécnica de Madrid, 1979 (2nd Ed.). ISBN 84-7401-058-6; 1995 (7th Ed.). ISBN 84-7401-058-6

Porta, J., López-Acevedo, M. and Rodríguez-Ochoa, R. (1986). *Técnicas y Experimentos en Edafología*, Col·legi Oficial d'Enginyers Agrònoms de Catalunya. ISBN 84-600-4341-X

Porta, J., Rodríguez-Ochoa, R. and López-Acevedo, M. (1993). *Laboratori d'Edafologia*. Universitat Politècnica de Catalunya, 1993. ISBN 84-7653-252-0

Porta, J., Ferret, M., Teixidor, N. and Poch, R.M. (1989) *Lèxic de la Ciència del Sòl, Català/Castellà/Francès/Anglès*. Universitat Politècnica de Catalunya, 115 pp. ISBN 84-7653-038-2

Porta, J. and Villanueva, D. (2012). *Formación de Neologismos en Ciencia del Suelo*. Spanish Journal of Soil Science, 2012, vol. 2 (2), p. 90–103

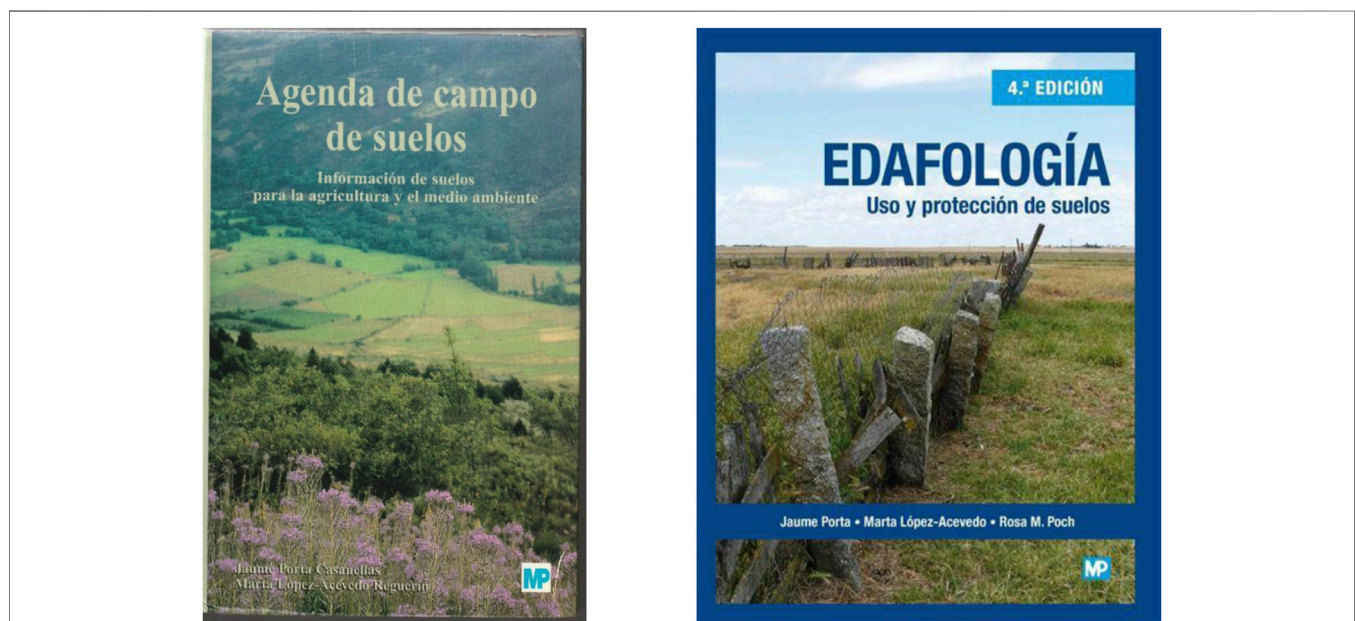


FIGURE 6 | Cover of the two remarkable books of Jaume Porta, coauthored with Marta López-Acevedo and Rosa M. Poch, edited by Mundi-Prensa: A, the *Agenda de campo de suelos*; B, the 4th edition of *Edafología, Uso y Protección de suelos*.

potential confusion with the term “edaphology.” This dedication to linguistic clarity led him to publish a paper with Darío Villanueva from the Real Academia de la Lengua Española in 2012, where they clarified the different meanings and equivalences of terms like Soil Science, pedology, and edaphology.

Among his many influential works, “*Técnicas y Experimentos en Edafología*” (1986b) stands out as a widely cited and utilized resource detailing basic soil analyses in standard laboratories. Porta’s commitment to linguistic accuracy extended to this work with a partial translation into Catalan in 1993.

Jaume Porta’s legacy in the realm of Soil Science education is marked by his unwavering dedication to providing accessible and practical resources for students at every stage of their academic journey. His vision, commitment to linguistic precision, and

passion for teaching continue to shape the education and understanding of Soil Science in Spain and beyond.

JAUME PORTA’S CONTRIBUTION TO THE MULTILINGUAL DICTIONARY OF SOIL SCIENCE (DICCMCS)

The Multilingual Dictionary of Soil Science (DiccMCS), initially known as the Multilingual Glossary of Soil Science, is an international project initiated by the Spanish Society of Soil Science (SECS) and the Institute for Catalan Studies (IEC). It involves the participation of various societies and entities, including the Latin American Society of Soil Science, TERMCAT (Catalan Terminology Centre), TERMIGAL (Galician Service of

TABLE 2 | Soil science tree used in the multilingual dictionary of soil science (DiccMCS) and number of terms of each domain.

Domains or branches of DiccMCS	Number of terms
General concepts of the soil system	75
Origin of soil and soil organizations	3,500
Soil mineral components	1,100
Organic soil components	258
Physical properties and soil behaviour	1,300
Physicochemical and chemical properties and soil behaviour	770
Soil atmosphere and soil water	624
Biochemical, biological properties and soil ecology	423
Soil chemical fertility	1,231
Soil classification, taxonomy, and correlation	1,200
Soil information and spatial representation of the soil system	875
Soil quality, evaluation, degradation, and protection	1,063
Sustainable land use and management	700

Total number of terms: 7,000 (some terms belong to more than one branch).

Terminology) and the Royal Galician Academy (RAG), the Catalan Institution for Agrarian Studies (ICEA) and several universities and research centres.

The DiccMCS was promoted and directed by Jaume Porta, who conceived it as an original, synchronous, and online, open access terminological dictionary of Soil Science (Creative Commons CC BY NC license). At present it includes more than 7,000 entries. The four linguistic versions (Catalan, Spanish, Galician, Portuguese) are presented as independent dictionaries (Porta et al., 2017).

As promoter and co-author of the DiccMCS, Jaume Porta did not want to make a mere compilation task, but to do an in-depth analysis of the state-of-art of Soil Science. The DiccMCS had a precursor in the Multilingual Vocabulary of Soil Science (2010 online edition), authored by Jaume Porta and Rosa M. Poch, developed within the “CiT (Terminology of Sciences and Technology)” program of the Institute for Catalan Studies. This Vocabulary, in turn, traces its roots to the work published by the Polytechnic University of Catalonia back in 1989, titled “*Lèxic de la Ciència del Sòl*” (Porta et al., 1989). These works provided a terminological database as a starting point, gradually expanding as needed during the development. The Catalan version of the dictionary adheres to the new orthographic standards of the Institute for Catalan Studies.

Entries are categorized into branches (domains) of the Soil Science tree (Table 2), defined after consulting members of the Spanish Society of Soil Science on a voluntary basis. Contents are derived from primary sources (author criteria, manuals, doctoral theses, and scientific journals) and secondary sources (specialized glossaries and dictionaries). Thus, the DiccMCS is an original work with known authors. The content drafting began with the formulation of a preliminary definition for each entry, including corresponding linguistic equivalents. The review process involved submitting content for review in packages of eight entries (or octets) to multiple authors. This series of successive revisions by a minimum of three individuals allowed for the incorporation of suggested improvements, resulting in the final version of each entry (Porta et al., 2023).

The content is intended to achieve maximum objectivity, providing readers with elements to understand without difficulty.

For instance, terms like “Soil Science” and “Pedology” in English correspond to the entry “*Edafología*,” introduced by Emili Huguet de Villar, explaining the distinctions. This is also evident in entries related to different types of agriculture, latifundia, or terms associated with the environment and natural resources, fields with widely varying sensitivities. While achieving complete objectivity may not always be possible, the working methodology, involving successive revisions by different authors, contributed to reducing the impact of personal views in the DiccMCS. The DiccMCS is organized into articles, each consisting of an entry (monolexical or multilexical), the domain or domains it belongs to, content in the dictionary language, and equivalents in Spanish, French, Galician, English, Portuguese, and occasionally Basque. Entries are alphabetically ordered, although in the digital world and with web access, this is secondary. Homographic forms are followed by a numeric superscript to differentiate them.

The Catalan version coordination was led by Rosa M. Poch, member of SECS and IEC, alongside Jaume Porta. Equivalencies in Galician were coordinated by Eduardo García-Rodeja, a professor at the University of Santiago de Compostela and a member of SECS. Equivalencies in Portuguese were coordinated by Gonçalo Signorelli de Farias, former president of the Brazilian Society of Soil Science.

As coordinator of the project, Jaume Porta successfully integrated the work of individuals from over sixty institutions, serving as co-authors, specialty advisors, or coordinators for various languages. Additionally, he coordinated the linguistic revision, design development, and interface development, involving multiple institutions that make the DiccMCS possible.

At present (beginning 2024), while the Catalan and Spanish dictionaries are complete, the Galician and Portuguese ones are partly finished, partly in translation, with approximately 50% of the entries completed (Table 3). We hope that the institutions initially involved will allow this corpus of Soil Science to be completed soon, also as a tribute to its promoter.

ACTIVITY IN MEXICAN UNIVERSITIES. INTERNATIONAL SOIL SCIENCE COURSE, UNAM

Jaume Porta began his collaboration with the National Autonomous University of Mexico (UNAM) in 1980 as an invited Research-Professor to a Conference Cycle in the

TABLE 3 | Multilingual dictionary of soil science: links (Accessed January 15, 2024) and degree of completion.

Language	Link	Completion
Catalan	https://cit.iec.cat/DMCSC	100%
Galician	https://cit.iec.cat/DMCSG	Soil organic components, biological and biochemical properties, soil ecology, physical, physicochemical and chemical properties
Portuguese	https://cit.iec.cat/DMCSP	
Spanish	https://cit.iec.cat/DMCSE	100%

Agricultural Engineering career at the National School of Professional Studies (later Faculty of Higher Studies), Cuautitlán (UNAM). But it was only from 1993 that he started his activities as a regular invited professor in the International Soil Science Courses, starting from the XI International Soil Science Course, offered at the Autonomous University of Guerrero in 1993 (Figure 7). Simultaneously, he strengthened the teaching-research collaboration between Spain and Mexico through the UNAM as the founding venue for these courses coordinated by UNAM and *Consejo Superior de Investigaciones Científicas* of Spain (CSIC). The transformation into Diplomas occurred at the beginning of the millennium, promoted by both institutions. We must highlight his participation in eleven editions, up to the XXVI at the Autonomous University of Querétaro in 2008.

The book *Una oferta de educación a lo largo de toda la vida* (Porta et al., 2008), provides further information about these courses. In this book, the history of the course's inception is presented, along with the analysis of its academic approach, its evolution into a Diploma Courses, its potential, and externalities and its contribution to itinerant teaching and research, training professionals and postgraduates. At this point, he also proposed actions and solutions to decision-makers at local, national, and international level. In summary, it reflects Jaume Porta's tireless work in disseminating and promoting Soil Science in all its approaches.

The International Soil Science Courses and Diplomas, founded by Master Nicolás Aguilera, Emeritus Professor of UNAM and Doctor Honoris Causa of the Colegio de Postgraduados (CP), were created within the framework of the agreement between Mexico (UNAM) and Spain, serving as coordinating researchers of the CSIC from 1980 to 2009. The course was itinerant through some of the country's main universities. In the 11th edition of the International Soil Science Course, the collaboration of Jaume Porta at the Universidad Autónoma del Estado de Guerrero began (Figure 7). In its opening speech, Francisco Velasco de

Pedro emphasised the threats to soil functioning in ecosystems and welcomed Jaume Porta. In six of these diploma courses Porta's wife, Marta López-Acevedo, also participated as a guest professor (Figure 8). Since joining as a lecturer in these courses, his contributions were not limited to lecturing, but also encompassed various collaborative actions in student training at the different universities hosting the courses, through specific mobility agreements with the UdL, from the final stage of undergraduate studies to the doctoral level. Simultaneously, he fostered the exchange of knowledge with participating academics, creating enduring bonds of friendship and collaboration.

JADE Program

Recognizing the reverence for jade in pre-Hispanic cultures, where knowledge was safeguarded and slowly released, this program was named to establish mobility agreements for high school and undergraduate students from the host universities of the Courses-Diplomas to undertake short-term bilateral stays starting from 2002. Sponsored by the University of Lleida-Santander Group-Mexican Universities, the notable participants included: Benemérita U. Autónoma de Puebla (BUAP), U. Autónoma Chapingo (UACH), U. Autónoma de Chiapas (UNACH), U. Autónoma de Nayarit (UAN), U. Autónoma del Estado de Hidalgo (UAEH), U. de Guadalajara (UdeG), U. Michoacana de San Nicolás de Hidalgo (UMICH): with 25 students benefiting from 2002 to 2007. Furthermore, collaboration was intensified with other countries in the Americas, such as the collaboration with the Soil Survey Service of the US (NRCS), the Conchita Badía Chair, and the Academic Chair of UNAM.



FIGURE 7 | Jaume Porta, Nicolás Aguilera and Francisco Velasco, in the opening ceremony of the XI International Soil Science Course 1993 (Photo by N. García).

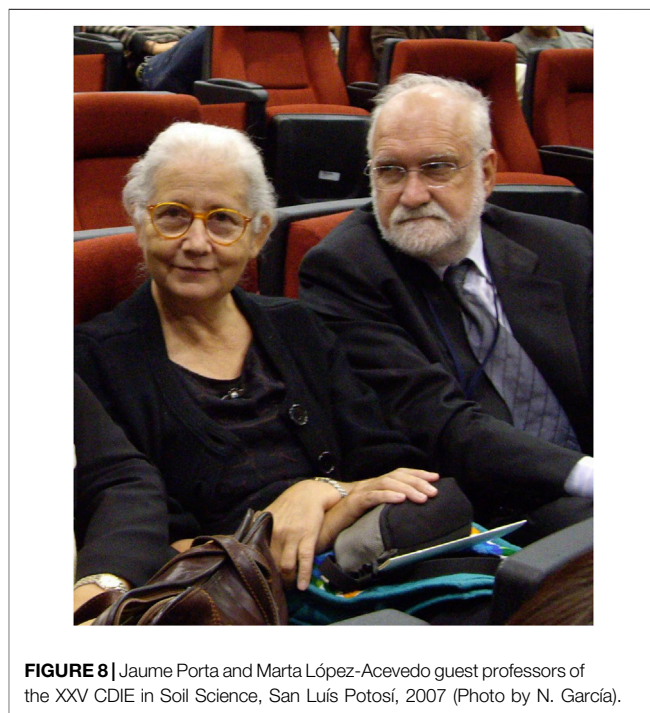


FIGURE 8 | Jaume Porta and Marta López-Acevedo guest professors of the XXV CDIE in Soil Science, San Luis Potosí, 2007 (Photo by N. García).

The opinions and impressions of Mexican students and colleagues of Jaume Porta show the long-lasting impact that he left in Mexican Soil Science, to the point that during the celebration of the 47th Mexican Congress in Soil Science (October 2023), held at the Congress and Exhibition Centre of UNAM at Ciudad Universitaria, on behalf of the Organizing Committee, it was decided to honour his memory by naming room 2 “*Jaume Porta Casanellas*” in recognition of his lifelong dedication to Soil Science. His Mexican friends mostly remember the field trips visiting and describing profiles, or the completion of PhD programs and scientific stages thanks to the JADE Program. His friendship with Luis Hernández (Regional Director at USDA-NRCS, Amherst, Massachusetts) led him to collaborate on several projects, such as the Soil Map of Catalonia through several visits to Lleida to provide training in soil mapping using the USDA Soil Survey field guides. He also contributed to the Multilingual Dictionary of Soil Science and participated in field trips and courses in Catalonia, and especially recalls his fascination with talking about geo-politics and soil classification. Also, Mario Antonio Guevara Santamaría remembered how Porta’s lectures stood out for their depth and clarity during the course. He seamlessly woven technical knowledge with philosophical insights, instilling in us a profound appreciation for the epistemology and transversality of Soil Science. His emphasis on viewing soil as a dynamic, interconnected system resonated deeply with us, setting the stage for a holistic approach to our future research. Moreover, he encouraged open dialogue and intellectual curiosity, fostering an environment where students felt empowered to explore and question. I distinctly remember engaging in lively discussions with him and other colleagues, exchanging ideas and insights that enriched our understanding of Soil Science. His wisdom, passion, and dedication continue to inspire us, serving as a guiding light in our pursuit of knowledge and understanding in the field.

WORK AS PRESIDENT OF THE SPANISH SOIL SCIENCE SOCIETY

In February 23, 2009, Jaume Porta was appointed President of the Spanish Society of Soil Science, position that he held until February 24, 2017 (SECS, 2024). Throughout those 8 years, his managerial experience, his excellence, and his great enthusiasm significantly energized a scientific society with over five hundred members and over 60 years of existence. At the beginning of his first term, the Strategic Guidelines of the SECS (2010–2020) were formalized, stemming from analyses, reflections, and debates held throughout 2009 within the framework of the Soil Science Encounters organized by Jaume Porta, which took place in Madrid, Murcia, Santiago de Compostela, and Granada. This project, coordinated by the SECS vice president at that time, Carmen D. Arbelo Rodríguez, involved the participation of over two hundred SECS members and resulted in a document that became the reference framework for future actions and decision-making within the SECS, translated into concrete initiatives through plans, programs, and projects.

During his presidency, various initiatives and projects were promoted and continue to be developed and consolidated: the Multilingual Dictionary of Soil Science [see *Jaume Porta’s Contribution to the Multilingual Dictionary of Soil Science (DiccMCS)* section], the creation of the scientific journal Spanish Journal of Soil Science (see *His Role in the SJSS and Universia* section), the SECS Documentation Centre for Soil Sciences in Spain [see *SECS Soil Science Documentation Centre (Ce.SECS)* section], the TeSECS database of doctoral theses in Soil Science, the harmonization project of soil spatial information in the INSPIRE Directive, the white paper on soil treatment in compulsory secondary education and high school textbooks in Spain, the Spanish soil cartographic information program, INFORCAS.es, the commemoration of the 70th anniversary of the SECS, the celebration of World Soil Day and the 2015 International Year of Soils, the publication of the biannual online NEWS-SECS bulletin, among others (Figure 9).

Additionally, he continued to promote other aspects such as the annual SECS calendar with various soil-related themes, the reissue of the 1931 book “*El Suelo*” in homage to Emilio Huguet del Villar (SECS, 2017), the SECS award for Best Doctoral Thesis in Soil Science, the SECS award for the best research papers by high school students, participation in international soil profile description competitions for students, encouragement of soil presence in science museums, and the successive editions of the National Soil Meeting of the SECS (RENS), the National Symposium on Soil Degradation Control and Recovery (CONDEGRES), and the Iberian Congress of Soil Science (CICS). For many of the mentioned projects, Jaume Porta signed various agreements with different entities such as CSIC, the Royal Spanish Academy (RAE), the *Institut d’Estudis Catalans*, TERMCAT, the *Instituto Geográfico Nacional*, the *Centro Nacional de Información Geográfica*, the University of Lleida, the member societies of the Latin American Society of Soil Science, Banco Santander, and Universia. Likewise, he promoted the creation of the figure of the Corporate Member of the SECS, aimed at offering the opportunity for interaction between the SECS and entities (institutions, public and private centres and companies, such as TRACASA, the ICGC or EUROFINs) and thus establishing synergies in the professional field in the areas represented within the SECS. On the other hand, Jaume Porta enhanced the role of territorial delegations and sections of the SECS, providing them with individual budget allocations so they could carry out their activities.

For all his dedication to the SECS and his tireless work aimed at the dissemination of Soil Science in Spain and beyond our borders, Jaume Porta was appointed an honorary member of the SECS in 2018 and honorary president in 2019.

HIS ROLE IN THE SJSS AND UNIVERSIA

Upon assuming the presidency of the Spanish Society of Soil Science, Jaume Porta decided to undertake the project of remodelling the SECS scientific journal “*Edafología*” which inherited from other soil publications edited by the CSIC that



FIGURE 9 | NEWS-SECS cover of the information bulletin for SECS members created by Jaume Porta during his presidency of this society, corresponding to 2015, the international year of soils.

had successively changed names in recent decades. For this purpose, an advisory committee was established with members of the SECS, chaired by Tarsy Carballas Fernández, to issue a report (the “Carballas Report”) on the future of the journal to adapt it to modern times. After various surveys and debates among committee members, several conclusions were presented. Among other aspects, it was noted the convenience of continuing to publish a journal sponsored by the SECS, preferably in electronic format, in English, with a quarterly periodicity, with rigorous peer review, guidelines for evaluation, thus becoming part of the Web of Science databases and being included in SCI,

Scopus, and others, and fundamentally with original research content on various aspects of Soil Science. The need to internationalize the editorial board of the journal was also indicated, to outsource its editing and management, and to obtain external sponsorship for its financing.

With these premises and after several negotiations, at the end of 2010, Jaume Porta, as president of the SECS, signed an agreement with Universia, represented by its CEO, Jaume Pagès i Fita, and the CSIC, under the presidency of Rafael Rodrigo Montero, to manage this publication of the society with the new name of Spanish Journal of Soil Science (SJSS).

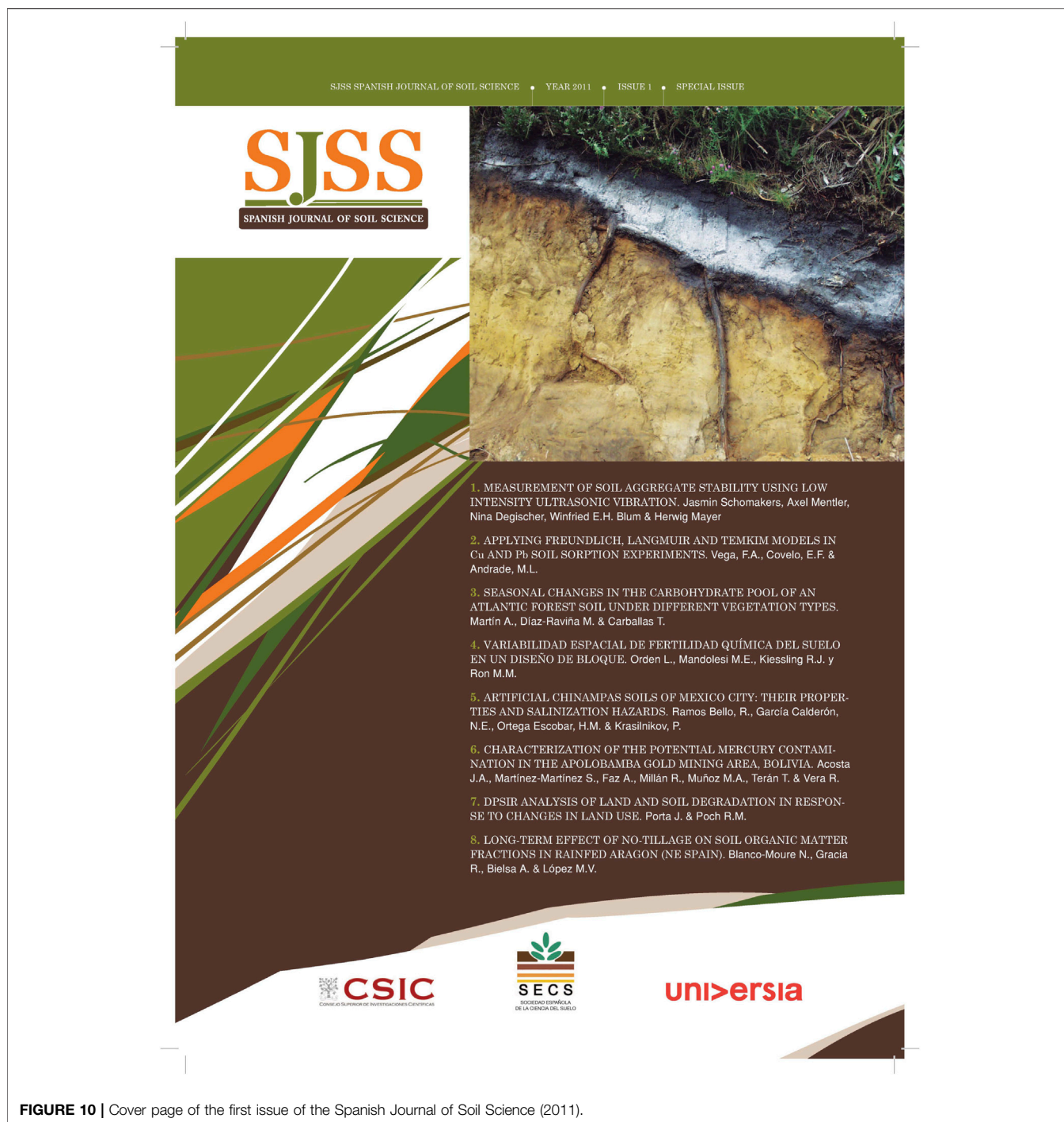


FIGURE 10 | Cover page of the first issue of the Spanish Journal of Soil Science (2011).

Universia then took over the editing of the journal in electronic format, providing technical advice and exercising sponsorship to make the edition economically viable. For its part, the CSIC became part of the editorial board and the scientific committee, in addition to advising on the drafting of the internal regulations of the SJSS through its Publications Department. After the resolution of the contest convened by the SECS for the selection of the scientific director of the journal, Rosa M. Poch Claret was chosen, who proposed the appointment of Irene Ortiz

Bernad as executive deputy director and Pedro Aranzadi (director of Universia Spain) as coordination deputy director.

After many efforts, on 15 November 2011, the first issue of the new electronic journal was published, and to give it more visibility, that first issue was also published in print and distributed to all members of the SECS, the presidencies of the Soil Science societies of Latin American countries, and other scientists from many parts of the world (**Figure 10**). From that moment on, the SJSS was published electronically on a quarterly



FIGURE 11 | The inauguration of the Centre, located in the library “Victor López Seoane” of the Faculty of Biology of the USC took place on 7 July 2022 (International Soil Conservation Day) with the assistance of Jaume Porta and relatives of the donors. At the table, from left to right: Jaume Porta, Francisco Javier Salgado (Vice Dean, Faculty of Biology), Vicente Pérez-Muñuzuri (Vice Rector of Science Policy, USC), Jorge Mataix-Solera (President of the SECS), M^a Isabel Casal (Director of the BUSC) (Photo by Eduardo García-Rodeja).

basis under the auspices of *Universia*, peer-reviewed, and open access, with scientific works mainly in English and abstracts in Spanish, English, and Portuguese. This responded to the desire for the journal to be a vehicle for union and communication among university communities and other research centres in Spain, Portugal, Latin America, and the Caribbean dedicated to soil research, study, teaching, and management. In this regard, the scientific committee of the journal was mainly composed of highly esteemed soil scientists from countries in these areas.

Thus, the primary objective of the Spanish Journal of Soil Science was to publish original, innovative, and high-quality scientific works related to field and laboratory research in all basic and applied aspects of Soil Science, as well as interdisciplinary studies, short communications, and invited literature reviews related to soils from all countries and geographical areas. With this approach promoted by Jaume Porta, efforts were made to compile studies that were sometimes published in special issues derived from the offer to congress organizers to edit research papers presented at them and always meeting all the quality requirements of the *SJSS*: two issues with selected works from those presented at the 14th International Meeting on Soil Micromorphology of the *IUSS*, with Irina Kovda (Institute of Geography, Russian Academy of Sciences) and Curtis

Monger (University of New Mexico) as guest editors and dedicated to micromorphologists Ulrich Babel and Nicolas Federoff; two issues with a selection of articles presented at the IV Iberian Congress of Soil Science, with María Teresa Barral Silva and Montserrat Díaz Raviña as guest editors; an issue with works presented at the VII Iberian Congress of Soil Science in 2016, with Manuela Abreu and Ana María Moliner as guest editors; and an issue with contributions to the 15th International Conference on Soil Micromorphology, held in Mexico in 2016, with Héctor Cabadas and Peter Kühn as guest editors and dedicated to Professor Georges Stoops on his 80th birthday.

From the beginning of the publication of the *SJSS*, international standards of scientific and editorial quality were scrupulously followed, in addition to having an audit process to ensure the quality of the English and Portuguese languages of the scientific articles. This bore deserved fruit, and since 2016, it has been indexed in many databases: *Agricola*, *Directory of Open Access Journals (DOAJ)*, *Ulrich's*, *Latindex*, *Redalyc*, *ICYT*, *Dialnet*, *Google Scholar*, *Academic Journals database*, *IUSS Soil Science Journals*, *GeoRef*, *InfoBase Index*, *Scopus*, and *Web of Science*, with the editorial quality seal of *FECYT*. In addition, at the end of 2015, it was included in the *Emerging Sources Citation Index (ESCI)* of *Clarivate Analytics*, and currently, now edited by *Frontiers*, it already has an impact factor. This has been the result of the effort of many people, but undoubtedly the drive of Jaume Porta was decisive and essential to establish the Spanish Journal of Soil Science in the position it occupies today within the international scientific publishing space.

SECS SOIL SCIENCE DOCUMENTATION CENTRE (CE.SECS)

One of Jaume Porta's concerns was, for some time, the dispersion of information on soils, particularly of Spain; from this arose the idea of centralizing this information in an official centre that would facilitate its conservation and access to those interested in it.

The first step for the development of this initiative, assumed by the Spanish Society of Soil Science (SECS) when Jaume Porta was Honorary President, was an attempt to sign an agreement with the Geological and Mining Institute of Spain in 2017 to be a repository of old and current maps. Since it was not possible, in June 2018, the then president of the SECS, Jorge Mataix Solera, asked the Conference of Rectors of Spanish Universities (CRUE) to identify public universities that might be interested in hosting this centre, a request that was accompanied by a document with the proposal for its creation.

In the above-mentioned documents, the reasons that lead the Spanish Society of Soil Science to propose the creation of the Soil Science Documentation Centre are stated. The aim is to create a reference centre, located in a Spanish public university, which will be the recipient and responsible for the custody, cataloguing and management of all the documentation accepted, donated by Spanish research centres and universities and individuals, natural and legal, who have developed their professional activity in this field. The need for its creation is justified by 1)

the current impossibility of being able to channel donations of Soil Science documentation to an efficient and safe final destination, 2) the interest in preserving such documentation in a catalogued and easily accessible form, which will improve the efficiency of public management of this type of documentation, and 3) the objective of satisfying the information needs of all interested groups, which should allow changing the current scenario in the access to Soil Science documentation in Spain.

In December 2018 the University of Santiago de Compostela (USC), at the request of the Department of Soil Science and Agricultural Chemistry, submitted to the SECS its proposal to host the centre, which in February 2019 was awarded to USC.

On 4 October 2019, the “Agreement between USC and SECS for the creation and management of the SECS Centre for Soil Science Documentation at USC” was signed (Figure 11). According to the aforementioned agreement, the centre aims to have a space in which a paper copy of the main works related to Soil Science is kept and its functions are to be the recipient of disinterested modal donations of documentation concerning Soil Science that the SECS obtains or processes and to efficiently manage the documentation of each donation (computerized cataloguing, preservation of documents and accessibility to such documentation). At present, the centre has more than a thousand monographs, twelve titles of scientific journals, doctoral theses (141), reports for different administrations (82), maps, among other contributions coming mainly from the donations of Carlos Roquero de Laburu (31 January 2020), Mariano Magister Hafner (10 March 2020), Jaume Porta Casanellas (23 December 2021) and, recently, Jorge Mataix Beneyto (19 February 2023).

Among the documentation, due to its historical value, it is worth mentioning the donation by Jaume Porta of the correspondence between Emilio Huguet del Villar and various CSIC officers between 1948 and 1949.

CONCLUDING REMARK

Jaume Porta stands as a rare individual whose contributions as a soil scientist and university manager have had a profound impact. His contributions to research and education have significantly

improved our understanding of Soil Science and have resulted in the growth of several generations of soil scientists. Porta’s dedication and vision show how one person’s efforts can lead to significant positive changes to shape a better world.

AUTHOR CONTRIBUTIONS

The alphabetical order of the authors indicates an equal contribution, without meaning greater relevance or prevalence of any of them. Given the nature of this article as a tribute to Jaume Porta, the authors’ participation has been voluntary, trying to reflect the personal and professional relationship we had with him. All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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REFERENCES

- Andreu-Gasa, M., and Villar-Mir, C. (2018). *El Consell Social de la UdL: 25 Anys Acompanyant la Universitat de Lleida*. Edicions de la Universitat de Lleida. ISBN: 8491440917.
- Baize, D. (2000). *Guide des analyses en pédologie*. Paris: INRA. ISBN: 2-7380-0892-5.
- Benedito, J., and Benedito, M. (2001). *Universitat, Arquitectura i Territori. Departament d’Universitats, Recerca i Societat de la Informació*. Barcelona: Generalitat de Catalunya.
- Boixadera, J., and Porta, J. (1991). *Información de Suelos y Evaluación Catastral – Método del Valor Índice*. Madrid (Spain): Centro de Gestión Catastral y Cooperación Tributaria. ISBN 8487505935X.
- Casby-Horton, S., Herrero, J., and Rolong, N. A. (2015). Gypsum Soils: Their Morphology, Classification, Function, and Landscapes. *Adv. Agron.* 130, 231–290. doi:10.1016/bs.agron.2014.10.002
- Comisión del Banco de Datos de Suelos y Aguas (CBDSA) (1983). *SINEDARES, Manual para la Descripción Codificada de Suelos en el Campo*. Madrid: Ministerio de Agricultura, Pesca y Alimentación de España. ISBN: 84-7479-226-6.
- Cornadó, M. P., and Porta, P. (2007). *Alvaro Siza a la Universitat de Lleida*. Lleida: Estudi Nix, Edicions de la Universitat de Lleida.
- FAO (1976). *A Framework for Land Evaluation. Soils Bulletin 32*. Rome: Food and Agriculture Organization of the United Nations. FAO editions.
- FAO (2020). *Red Mundial de Laboratorios de Análisis de Suelos, GLOSOLAN*. Roma: Food and Agriculture Organization of the United Nations. FAO editions.
- Herrero, C., Boixadera, J., Danés, R., and Villar, J. M. (1993). *Mapa de Sòls de Catalunya 1: 25,000 Bellví 360-1-2 (65-28)*. Barcelona: Direcció General de Producció i Indústries Agroalimentàries, i Institut Cartogràfic de Catalunya.
- Herrero, J., and Porta, J. (2000). The Terminology and the Concepts of Gypsum-Rich Soils. *Geoderma* 96 (1-2), 47–61. doi:10.1016/S0016-7061(00)00003-3

- Herrero, J., Porta, J., and Fedoroff, N. (1992). Hypergypsic Soil Micromorphology and Landscape Relationships in Northeastern Spain. *Soil Sci. Soc. Am. J.* 56 (4), 1188–1194. doi:10.2136/sssaj1992.03615995005600040031x
- Herrero, J., Rodríguez, R., and Porta, J. (1989). *Colmatación de Drenes en Suelos Afectados por Salinidad: Finca Experimental de San Juan de Flumen (Huesca)*. Zaragoza (Spain): Instituto Fernando el Católico. Available at: <https://ifc.dpz.es/publicaciones/ebooks/id/1582> (Accessed September 30, 2024).
- ICEA (Institutió Catalana d'Estudis Agraris) (2024). Institutio Catalana d'Estudis Agraris. Available at: <https://icea.iec.cat/> (Accessed March 15, 2024).
- ICGC (Institut Cartogràfic i Geològic de Catalunya) (2019). *Mapa de Sòls de Catalunya Soil Taxonomy 1:250,000*. Barcelona (Spain): Institut Cartogràfic i Geològic de Catalunya. ISBN 978-84-393-9836-3.
- Jarauta, E. (1989). *Modelos Matemáticos del Régimen de Humedad de los Suelos. Aplicación a la Determinación del Régimen de Humedad de los Suelos del Área Meridional de Lleida*. Barcelona (Spain): PhD, UPC, Departament de Matemàtica Aplicada III. ISBN 846898230X. doi:10.5821/dissertation-2117-94025
- Jarauta, E., Porta, J., and Boixadera, J. (1989). *Règims d'Humitat dels Sòls: Interès i Problemàtica en l'Aplicació als sòls de Catalunya*. Barcelona: Butlletí de la Institutio Catalana d'Història Natural, 87–96.
- MAPA (Ministerio de Agricultura, Pesca y Alimentación) (1986). Métodos oficiales de análisis. Madrid: Tomo III. ISBN-84-7479-532-X.
- Martínez-Casasnovas, J. A., and Porta, J. (1999). “Tecnologías de la Información Espacial (Fotointerpretación y SIG) en el Análisis de los Procesos de Erosión por Cárcavas y Barrancos en el Alt Penedès – Anoia (Cataluña),” in *Libro Homenaje a D. Ángel Ramos Fernández (1926 – 1998)*. Editor S. González-Alonso (Madrid: Real Academia de las Ciencias Exactas, Físicas y Naturales, Academia de la Ingeniería y ETSIM – UPM), 465–482. ISBN: 84-87125-425.
- Poch, R. M. (1992). *Fabric and Physical Properties of Soils with Gypsic and Hypergypsic Horizons of the Ebro Valley*. PhD. Thesis. Belgium: Univ. of Ghent.
- Porta, J. (1974). *Proyecto de Unidad Centralizada para Análisis Automático de Suelos*. Spain: Ministerio de Agricultura.
- Porta, J. (1975). *Redistribuciones Iónicas en Suelos Salinos, Influencia Sobre la Vegetación Halófila y las Posibilidades de Recuperación de los Suelos con Horizonte Gypsic y otros Suelos Halomorfos de las Márgenes del río Gigüela*. Tesis doctoral. Madrid: Escuela Técnica Superior de Ingenieros Agrónomos, UPM, 259.
- Porta, J. (1996). *Una Commemoració: Un Temps per la Reflexió*. Editor J. J. Busqueta 700 Aniversari. Universitat de Lleida. Edicions de la Universitat de Lleida.
- Porta, J. (1997). “Introducció. Les biblioteques imaginàries de la Universitat de Lleida,” in *Libre de les biblioteques imaginàries de la Universitat de Lleida*. Editors A. Bustamante and J. J. Busqueta (Lleida: Fundació 700 Aniversari. Edicions de la Universitat de Lleida).
- Porta, J. (1998). Methodologies for the Analysis and Characterization of Gypsum in Soils: A Review. *Geoderma* 87 (1-2), 31–46. doi:10.1016/S0016-7061(98)00067-6
- Porta, J. (2001). “Un patrimoni perdut, una ferma voluntat de reconstrucció,” in *Patrimoni d'obra artística de la Universitat de Lleida*. Editor F. Vilà (Lleida: Edicions de la Universitat de Lleida).
- Porta, J. (2003). *Doctorat Honoris Causa a l'exili català per la Universitat de Lleida*. Lleida: Edicions de la Universitat de Lleida.
- Porta, J. (2005). *Descobrir Lleida. Passejant per l'Arquitectura del Segle XX*. March editor. Spain: Vallbona de les Monges (Lleida). ISBN: 9788495608918.
- Porta, J. (2009). Quantification of Land Degradation Stress: An Overview. Reiskirchen: Catena Verlag. *Adv. Geoecol.* 40, 163176.
- Porta, J., Alcañiz, J. M., Castell, E., Cruañas, R., Danés, R., Felipó, M. T., et al. (1987). *Introducció al Coneixement del sòl: Sòls del Països Catalans (separated edition of Vol. 3: Història Natural dels Països Catalans)*. Barcelona: Col·legi Enginyers Agrònoms de Catalunya -Fundació Enciclopèdia Catalana. ISBN 84-398-8658-6.
- Porta, J., Ballesta, A., and Martín-Sánchez, J. A. (2013). *L'Escola Tècnica Superior d'Enginyeria Agrària de Lleida 1972-2012: Un valor al servei de la societat*. Lleida: Fundació pública Institut d'Estudis Ilerdencs.
- Porta, J., Castroviejo, S., and López-Acevedo, M. (1980). “Diagnosis of Salinization and Alkalinization Levels in Spanish Salt-Affected Soils by Means of Halophytic Community Studies,” in *International Symposium of Salt-Affected Soils, Karnal (India), February 8–21, 1980*, 39–47.
- Porta, J., Ferret, M., Teixidor, N., and Poch, R. M. (1989). *Lèxic de la Ciència del Sòl, Català/Castellà/Francès/Anglès*. Barcelona: Universitat Politècnica de Catalunya, 115. ISBN 84 7653 038 2.
- Porta, J., García-Calderón, N., López-Acevedo, M., and Almendros, G. (2008). *Una Oferta de Educació a lo Largo de Toda la Vida. Análisis de 25 Ediciones del Curso Internacional de Edafología Nicolás Aguilera de la UNAM*. Madrid: Ediciones Mundi-Prensa, 137. ISBN: 978-968-7462-58-5.
- Porta, J., and Herrero, J. (1990). Micromorphology and Genesis of Soils Enriched with Gypsum. *Dev. Soil Sci.* 19 (C), 321–339. doi:10.1016/S0166-2481(08)70344-1
- Porta, J., and Herrero, J. (1996). “Vulnerability of Soils under Irrigation,” in *Sustainability of Irrigated Agriculture. NATO Science Series E: Applied Sciences*. Editors L. S. Pereira, R. A. Feddes, J. R. Gilley, and B. Lesaffre (Dordrecht: Springer), 312, 85–96. doi:10.1007/978-94-015-8700-6_6
- Porta, J., Herrero, J., and Latorre, S. (1986a). “Evaluación de Suelos Para Riego: Criterios y Problemática en los Regadíos de Huesca,” in *Salinidad en los Suelos: Aspectos de su Incidencia en Regadíos de Huesca*. Editor J. Herrero (Zaragoza, Spain: Diputación General de Aragón), 119–146. ISBN 8450549485.
- Porta, J., and Julià, R. (1983). *Els sòls de Catalunya: Àrea meridional de Lleida*. Barcelona (Spain): Departament d'Agricultura, Ramaderia i Pesca de la Generalitat de Catalunya, 332.
- Porta, J., and Lladonosa, M. (1998). *La Universidad en el cambio de siglo*. Madrid: Fundación 700 Aniversario de la Universidad de Lleida y Alianza Editorial.
- Porta, J., and López-Acevedo, M. (2005). *Agenda de Campo de Suelos. Información de Suelos Para la Agricultura y el Medio Ambiente*. Mundi Prensa Libros, 541. ISBN 84-8476-231-9
- Porta, J., López-Acevedo, M., and Rodríguez-Ochoa, R. (1986b). *Técnicas y Experimentos en Edafología, Col·legi Oficial d'Enginyers Agrònoms de Catalunya*. Barcelona, Spain. ISBN 84-600-4341-X.
- Porta, J., López-Acevedo, M., and Roquero de Laburu, C. (1994). *Edafología para la Agricultura y el Medio Ambiente*. Madrid: Ediciones Mundi-Prensa. ISBN: 84-8476-148-7.
- Porta, J., López-Acevedo, M., and Roquero de Laburu, C. (2003). *Edafología: Para la Agricultura y el Medio Ambiente*. Mundi Prensa Libros, 1994 ISBN: 84-7114-468-9; 1999 (2nd Ed.). ISBN 84-7114-784-X; 2003 (3rd Ed.) ISBN: 84-8476-148-7
- Porta, J., López-Acevedo, M., and Poch, R. M. (2009). *Introducció a l'Edafologia. Ús i Protecció de Sòls*. Mundi-Prensa, 507. ISBN: 978-84-8476-385-7
- Porta, J., López-Acevedo, M., and Poch, R. M. (2010). *Introducción a la Edafología. Uso y protección del suelo*. Mundi-Prensa, 2008, ISBN: 978-84-8476-342-0; 2nd Ed. 2010, ISBN: 978-84-8476-405-2
- Porta, J., López-Acevedo, M., and Poch, R. M. (2019). *Edafología. Uso y protección de suelos*. Ed. Paraninfo 3rd ed. ISBN: 978-84-8476-661-2; 4th Ed. ISBN: 978-84-8476-750-3
- Porta, J., López-Acevedo, M., and Rodríguez-Ochoa, R. (1986c). *Técnicas y Experimentos en Edafología*. Barcelona, Spain: Col·legi Oficial d'Enginyers Agrònoms de Catalunya. ISBN 84-600-4341-X
- Porta, J., Mestres, J. M., and García-Rodeja, E. (2017). “Plurilingüismo Edafológico de la Península Ibérica: El Diccionario Multilingüe de la Ciencia del Suelo de la SECS,” in *Libro de Resúmenes XXXI Reunión Nacional de Suelos*, 8–9. Madrid, 6-9 de Junio de 2017.
- Porta, J., and Poch, R. M. (2011). DPSIR Analysis of Land and Soil Degradation in Response to Changes in Land Use. *Span. J. Soil Sci.* 1 (1), 100–115. doi:10.3232/SJSS.2011.V1.N1.07
- Porta, J., Poch, R. M., and Boixadera, J. (1988). “Land Evaluation and Erosion Control Practices on Mined Soils in NE Spain,” in *Soil Erosion Protection Measures in Europe: Proceedings of the European Community Workshop on Soil Erosion Protection*. Editors U. Schwertmann, R. J. Rickson, and K. Auerswald (Freising, Germany: E. Schweizerbartsche Verlagsbuchhandlung), 189–206. ISBN 9783510653843.
- Porta, J., and Ramos, M. C. (1993). Erosió Hídrica en Vinya per a Producció de vi d'Alta Qualitat en Zona Mediterrània (Anoia-Penedès): Quantificació de les Pèrdues de Nutrients per Erosió del sòl i Implicacions. *Quaderns Agraris* 16, 5–19.
- Porta, J., Rodríguez-Ochoa, R., and López-Acevedo, M. (1993). *Laboratori d'Edafologia*. Universitat Politècnica de Catalunya. ISBN 84-7653-252-0

- Porta, J., Serra, E., Aran, M., and Masalles, R. M. (1983). *Projecte de Rehabilitació de Sòls a l'Explotació a cel Obert de Coll de Pradell*. Carbones de Berga S.A. Technical Report.
- Porta, J., Torras, J., and Torrents, X. (2023). *Cómo se elabora un diccionario: caso del Diccionario Multilingüe de la Ciencia del Suelo*. Editor J. Arricibita, et al. (Pamplona/Iruña: Libro de Resúmenes de la XXXIII Reunión Nacional de Suelos), 122–123.
- Porta, J., and Villar, J. M. (1987). *Projecto de Laboratorio de Fertilidad de Suelos en la Partida de La Caparrella (Lleida)*. Universitat Politècnica de Catalunya. Escola Tècnica Superior d'Enginyers Agrònoms de Lleida. Diputació de Lleida. Lleida.
- Porta-Casanelles, J. (1985). Taxonomia Comparada de Sòls: Perspectives per a Catalunya. *Butll. Inst. Cat. Hist. Nat.* 50, 229–239.
- Porta, J., and Villanueva, D. (2012). Formación de Neologismos en Ciencia del Suelo. *Span. J. Soil Sci.* 2 (2), p. 90–103.
- Ramos, M. C., and Porta, J. (1994). Rainfall Intensity and Erosive Potentiality in the NE Spain Mediterranean Area - 1st Results on Sustainability of Vineyards. *Nuovo Cimento della Società Italiana di Fisica C-Geophysics and Space Physics* 17 (3), 291–299.
- Ramos, M. C., and Porta, J. (1997). Analysis of Design Criteria for Vineyard Terraces in the Mediterranean Area of Northeast Spain. *Soil Technol.* 10 (2), 155–166. doi:10.1016/S0933-3630(96)00006-2
- Rodríguez, R., Herrero, J., and Porta, J. (1990). Micromorphological Assessment of Drain Siltation Risk Indexes in a Saline-Sodic Soil in Monegros Irrigation District (Spain). *Dev. Soil Sci.* 19 (C), 41–52. doi:10.1016/s0166-2481(08)70314-3
- Roquero, C., and Porta, J. (1979). *Agenda de campo para estudio del suelo*. Madrid: Universidad Politécnica de Madrid.
- Roquero de Laburu, C., and Porta, J. (1995). *Agenda de campo para el estudio del suelo*. Universidad Politécnica de Madrid, 1979 (2nd Ed.). ISBN 84-7401-058-6; 1995 (7th Ed.). ISBN 84-7401-058-6
- Secció de Sòls de la ICEA (2024). ICEA – Secció Sòls. Available at: <https://icea.iec.cat/seccions/sols/> (Accessed March 15, 2024).
- SECS (Sociedad Española de la Ciencia del Suelo) (2017). *Homenaje a Emilio Huguet del Villar en el Octogésimo Aniversario de la publicación de "Los suelos de la Península Lusó-Ibérica"*. Madrid: Sociedad Española de la Ciencia del Suelo, 288.
- SECS (Sociedad Española de la Ciencia del Suelo) (2024). Available at: <https://www.secs.com.es/> (Accessed March 28, 2024).
- Soil Survey Staff (SSS) (1975). in *Agricultural Handbook* (Washington DC: U.S. Department of Agriculture, Soil Conservation Service), 436. *Soil Taxonomy: A Basic System of Soil Classification for Making and Interpreting Soil Surveys*
- Villar, P., and Aran, M. (2008). *Guia d'Interpretació d'Anàlisis de sòls i Plantes*, 2008. Lleida: Departament d'Agricultura, Alimentació i Acció Rural i Consell Català de la Producció Integrada.

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