



Food and Agriculture
Organization of the
United Nations

BLACK SOILS

Global Map





What are black soils?

According to the International Network of Black Soils (INBS), black soils are soils with thick, dark-coloured horizons, rich in organic carbon. Due to their very high fertility, they are usually used for intensive agriculture and are considered the food basket of the world. Unfortunately, black soils are also subject to degradation in the form of soil erosion, nutrient depletion, pollution, compaction, salinization and acidification.

The International Network of Black Soils

The International Network of Black Soils (INBS) was established in March 2017 during the Global Symposium on Soil Organic Carbon under the framework of FAO's Global Soil Partnership (GSP) to promote the conservation and sustainable management of black soils of the world. Currently, INBS includes 31 countries and European Union.

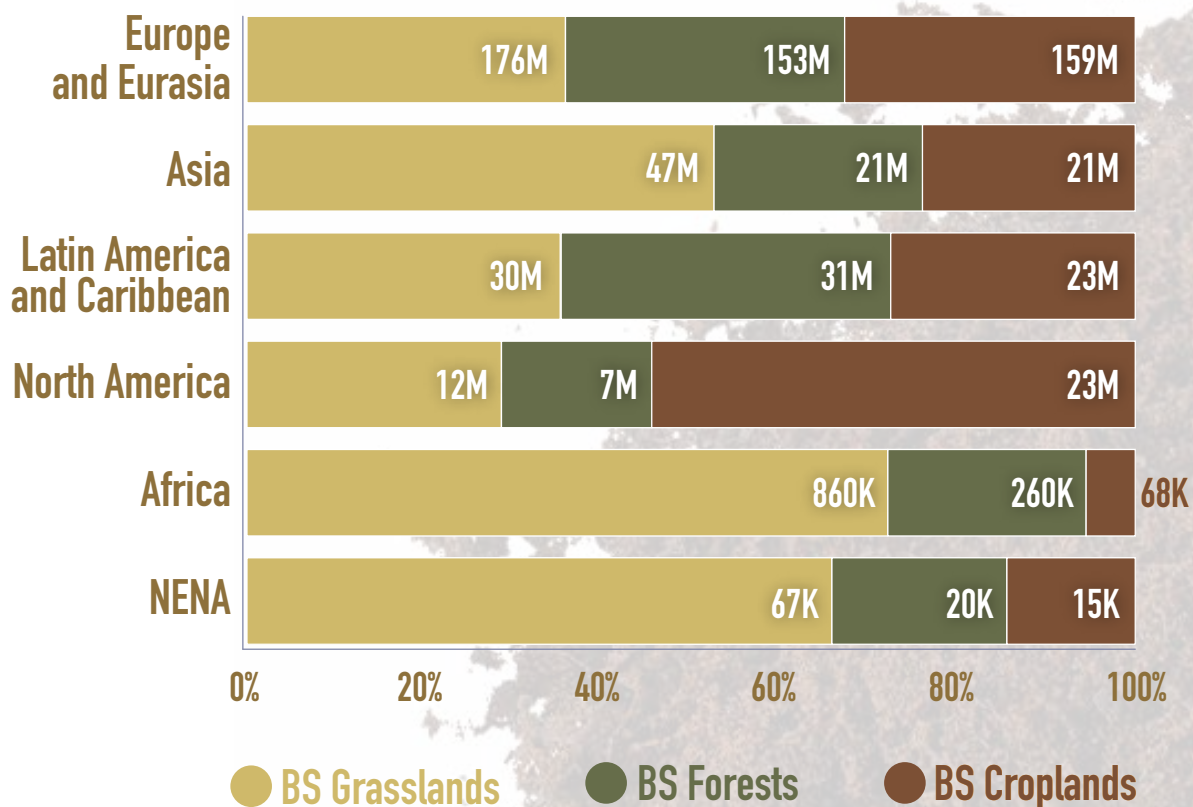
Considering the great importance of black soils and their risk of severe degradation, it has become crucial to develop a deeper understanding of the status of the black soils in the world including their distribution at national and global levels. During the second INBS workshop in 2019, members discussed and agreed to develop a Global map of Black Soils (GBSmap) using a country-driven approach based on the endorsed definition of black soils. Two training sessions were organized in 2021 to support INBS members in developing their national maps. Fourteen INBS countries subsequently developed and submitted their national black soil distribution maps.

Black soil distribution

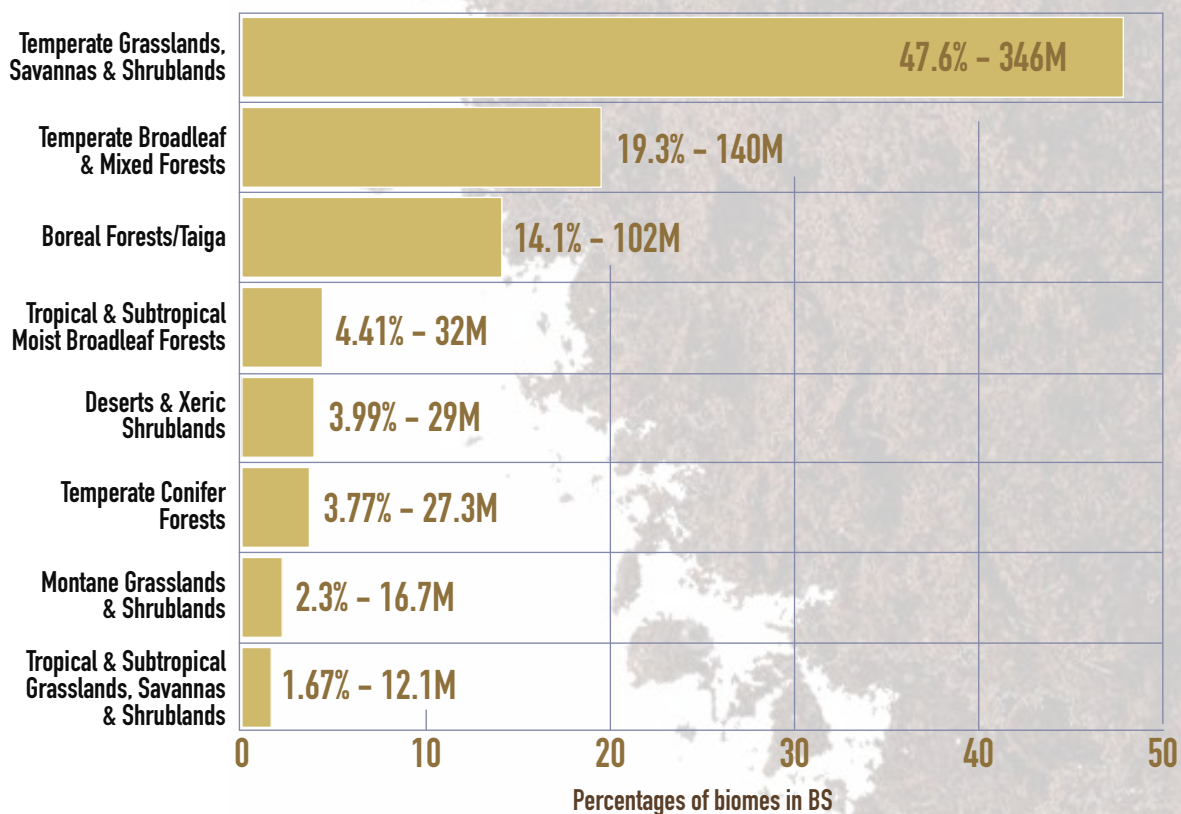
There are an estimated 725 million hectares of black soils worldwide. The Russian Federation has the largest area by far, followed by Kazakhstan and China. Black soil distribution strongly correlates with native prairie ecosystems including, but not limited to, other grassland ecosystems with a continental climate. Black soils are most prevalent in the mid-latitudes of North America, Eurasia, and South America. They are also found to a lesser extent in the tropical regions. At a global level, approximately one-third of black soils are covered with crops and another third by grasslands, with forests accounting for the remaining third. However, this distribution varies within each region.



LAND COVER¹ OF BLACK SOILS BY REGION (AREA IN MILLION HECTARES)



GLOBAL SHARES OF BIOMES UNDER BLACK SOILS, BASED ON THE ECOREGION GLOBAL MAP² (AREA IN MILLION HECTARES)



¹ <https://esa-worldcover.org/en>

² Dinerstein, E., Olson, D., Joshi, A., Vynne, C., Burgess, N.D., Wikramanayake, E., Hahn, N., Palminteri, S., Hedao, P., Noss, R. and Hansen, M., 2017. An ecoregion-based approach to protecting half the terrestrial realm. *BioScience*, 67(6), pp.534-545.

TOP TEN BLACK SOIL COUNTRIES (AREA IN MILLION HECTARES)

Country	BS area	
1 Russian Federation	326.8M	
2 Kazakhstan	107.7M	
3 China	50M	
4 Argentina	39.7M	
5 Mongolia	38.6M	
6 Ukraine	34.2M	
7 United States of America	31.2M	
8 Colombia	24.5M	
9 Canada	13M	
10 Mexico	11.9M	

LEACHED CHERNOZEMS IN CENTRAL CHERNOZEMIC PRESERVE



Fourteen countries have been able to produce their national black soil distribution maps. Based on this information, a global model was developed to fill the gaps left by the remaining INBS members, resulting

in the present version of the GBSmap. Details of the methodology are presented in the Report of the Global Status of Black Soils.

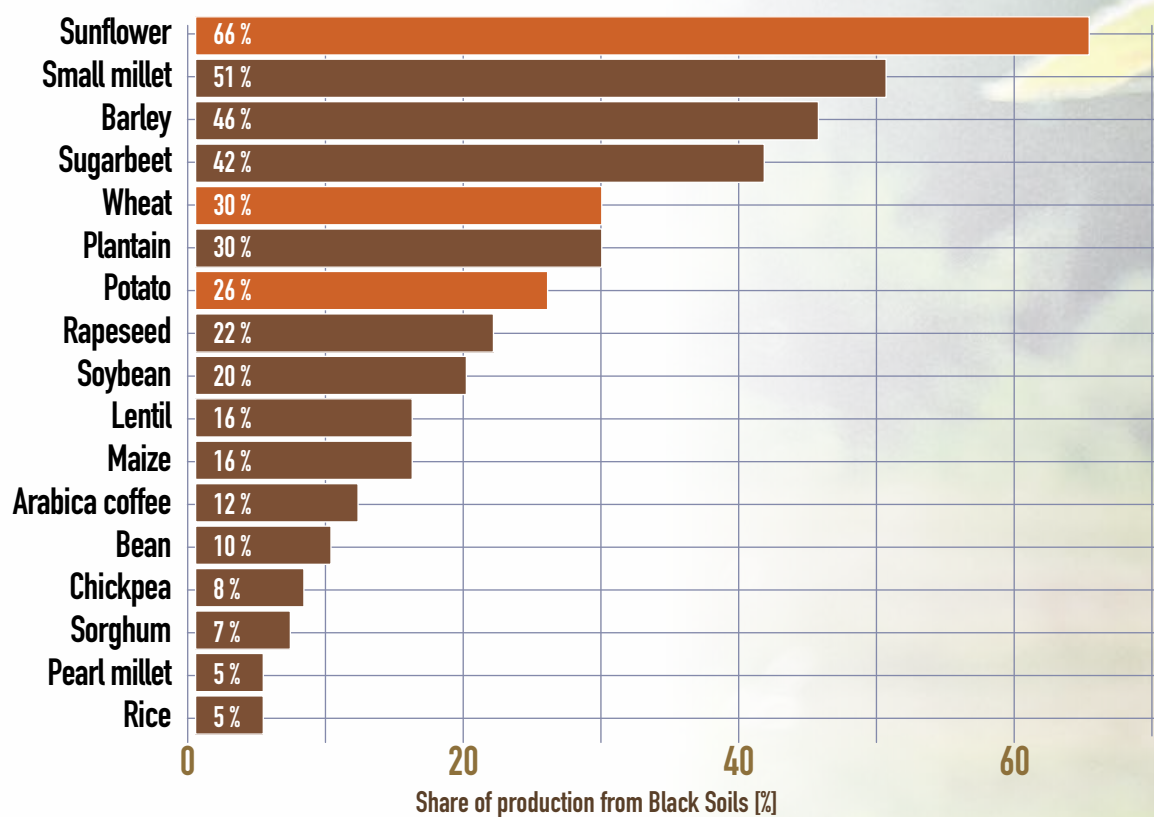
Black soil demography

Approximately 223 million people live on black soils, representing less than 3 percent of the world's population. However, black soils concentrate a substantial portion of the population in various countries. Ninety-three percent of the Moldovan population live in a black soil area. In the Russian Federation, black soils account for 19 percent of the country's land area and yet are home to nearly half of the Russian people. Similarly, black soils cover 14 percent of Argentina's area and yet are home to over half of the country's population. Other countries with a high proportion of their population living on black soils include Ukraine (52 percent), Colombia (49 percent), Uruguay (46 percent), Mongolia (44 percent), and Kazakhstan (42 percent).

Black soils feed the world

Black soils not only sustain the people settled on them, but they also feed the rest of the world through agricultural exports, despite representing a small proportion of the world's soils. A significant percentage of oilseed, cereals, and tuber crops are cultivated in black soils, which are essential to food security and the global economy. In 2010, 66 percent of sunflower seeds, 30 percent of wheat and 26 percent of potatoes were harvested globally from black soils³.

Global share of crop production directly attributable to black soils



The shares were derived by intersecting the GBSmap with data derived from the "Global Spatially-Disaggregated Crop Production Statistics Data for 2010 Version 2.0". (International Food Policy Research Institute, 2019).

The results for crop shares under 5 percent and for aggregated crop types were excluded from the analysis.

³ "Global Spatially-Disaggregated Crop Production Statistics Data for 2010 Version 2.0"



Black soils are under threat

The Status of the World's Soil Resources report⁴ highlighted that black soils remain very sensitive to anthropogenic intervention. They are prone to severe degradation such as erosion, loss of organic matter and of stable aggregates, compaction, salinization and sodification, and can suffer from anthropogenic soil acidification and contamination. As with other soils, the most common indicators of black soil health are organic matter, pH, available phosphorous and water storage. While biological and biochemical indicators are under-represented in regular soil testing and monitoring, they show great potential to better understand the status of black soil.



⁴ <https://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/435200/>

Black soils and climate change

Black soils contain 8.2 percent of the world's soil organic carbon (SOC) stocks and account for 10 percent of the world's SOC sequestration potential. However, this is not evenly distributed across the globe. For example, in the European region, black soils account for almost 50 percent of the potential SOC sequestration, while only reaching 20 percent in South America and the Caribbean.

The degradation processes of black soils lead to the loss of SOC and the emission of large quantities of greenhouse gases. Therefore, adopting sustainable soil management practices (SSM)⁵ for black soils must be a priority to reinforce climate change mitigation efforts.



⁵ Soil management is sustainable if the supporting, provisioning, regulating, and cultural services provided by soil are maintained or enhanced without significantly impairing either the soil functions that enable those services or biodiversity. The balance between the supporting and provisioning services for plant production and the regulating services the soil provides for water quality and availability and for atmospheric greenhouse gas composition is a particular concern.





Sustainable soil management practices to safeguard black soils

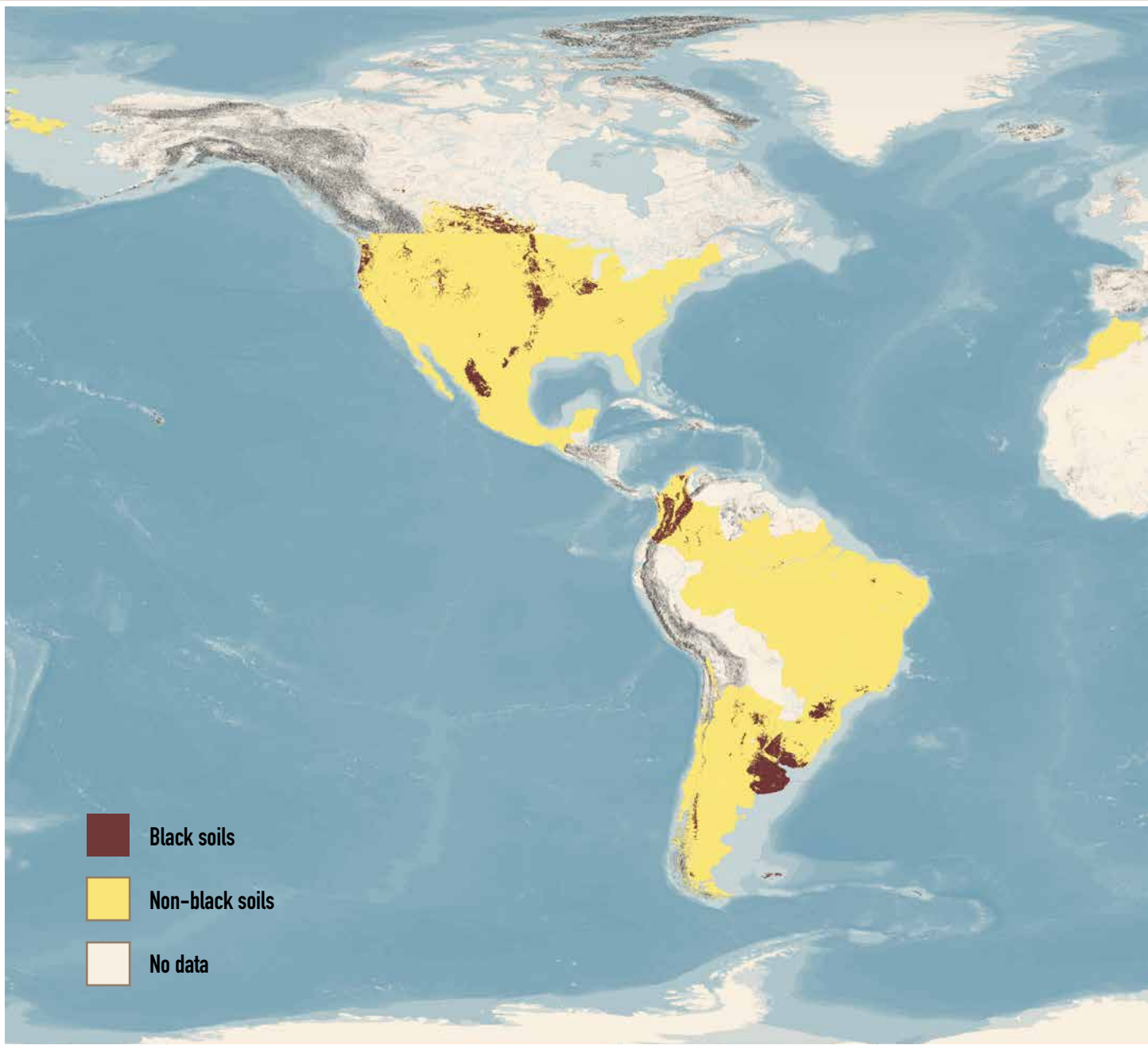
A selection of regionally adapted SSM practices should be implemented to protect and enhance black soils. The best-suited SSM practices will depend on the current cropping system, seeding system, environmental conditions, and resources available to producers to implement change. Considering their relevance for food security and climate change and their increasing vulnerability to soil degradation, it is of the utmost importance to study the properties and status of black soils at the local and global scale. Better monitoring of the dynamics of black soils resulting from management practices would allow for informed decision-making. Building a platform for black soil research, cooperation and education will help strengthen the capacities of research institutions in countries with black soils, bring innovations to black soil management, and leverage potential opportunities, resources, and policies for the protection of black soils.

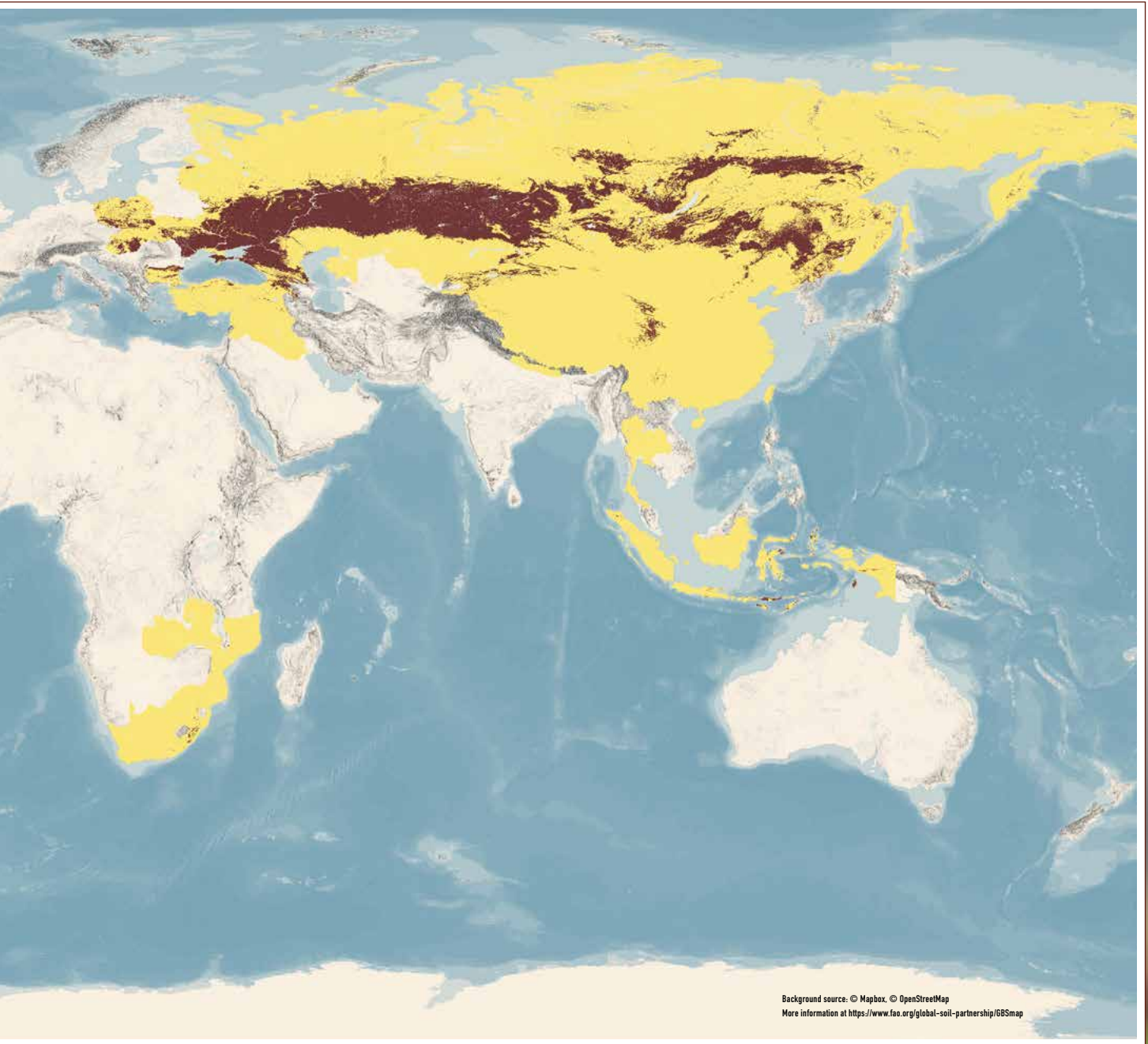
Protect black soils, invest in the future

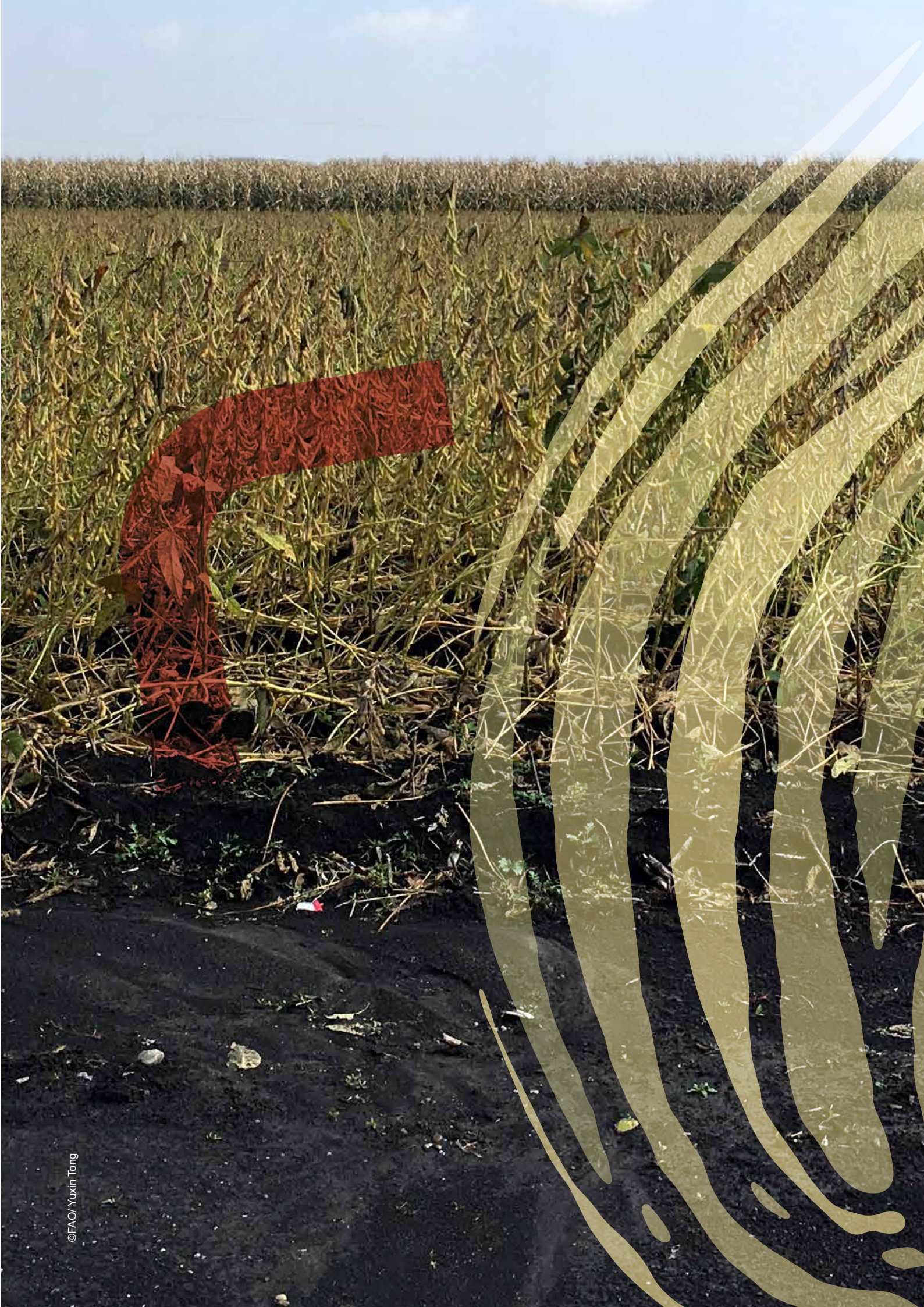
The aim of INBS is to protect and conserve black soils by promoting the best available SSM practices. There are various national soil policies that are relevant to the protection and long-term management of black soils, but none of them are specific for black soils. To accomplish this goal, legal tools at both national and global levels need to be developed, accompanied by a monitoring programme to track the evolution of the state of black soils. Given the importance of black soils for food security and nutrition, climate change mitigation and adaptation, and their value as a scarce and limited resource, agreed commitments towards its conservation should be sought.



Global black soil distribution map (INBS countries, v1.0)











The Global Soil Partnership (GSP) is a globally recognized mechanism established in 2012. Our mission is to position soils in the Global Agenda through collective action. Our key objectives are to promote Sustainable Soil Management (SSM) and improve soil governance to guarantee healthy and productive soils, and support the provision of essential ecosystem services towards food security and improved nutrition, climate change adaptation and mitigation, and sustainable development.

Land and Water Division

GSP-secretariat@fao.org

www.fao.org/global-soil-partnership

Food and Agriculture Organization of the United Nations

Rome, Italy

Thanks to the financial support of



Ministry of Finance of the
Russian Federation

©Juming Zhang



Some rights reserved. This work is available under a CC BY-NC-SA 3.0 IGO licence

© FAO, 2022
CC0238EN/1/05.22