

图书基本信息

书名：<<土地利用变化与施肥管理方式对黑土碳库的影响>>

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前言

Human activity (fossil fuel combustion and land-use change) consumed large amounts of energy resources leading to CO₂ and other greenhouse gases emitted into atmosphere , which escalated and changed natural processes resulting in greenhouse effect and global warming , and it is estimated that atmospheric CO₂ has increased from a pre-industrial concentration of about 280 ppm to about 380 ppm. The global carbon cycle is defined as the processes of carbon flow and exchange through the biosphere , atmosphere , hydrosphere , and geosphere being one of the most complex , interesting and important global element cycles. The cycle is usually thought of as four major pools of carbon interconnected by pathways of exchange. These pools include the atmosphere , the terrestrial biosphere , the oceans and the sediments (including fossil fuels) . Soil carbon pool is the largest carbon reservoir in the terrestrial biosphere , and its carbon storage is twice that of the atmosphere and three times that of the vegetation including forest , grassland and arable land. Soil carbon pool can be either sink or source depending on the carbon input and output through soil-atmosphere interface. Thus , globally , not only scientists and government leaders , but common people are concerned about to what extent global soils can sequester the increasing atmospheric CO₂.

内容概要

On the basis of the long-term position experiments established in the National Field Research Station of Agroecosystem in Hailun, and Key Laboratory of Black Soil Ecology of Chinese Academy of Sciences, this research aims to examine the impact of land-use change and long-term fertilization on soil carbon stocks, the physically protected SOC, and carbon emissions from black soil as well as carbon budget through the ecosystems and soil-plant-atmosphere interface. The stability mechanism of black soil carbon pool was defined, and carbon sequestration capacity of black soil was also evaluated.

书籍目录

Foreword1 Carbon cycling and SOM pool 1.1 Introduction 1.2 Global and terrestrial ecosystem carbon cycling
 1.2.1 Introduction and history 1.2.2 Processes of carbon flow in the terrestrial realm 1.3 The composition of
 soil carbon pool 1.3.1 SOM fractions affected by land use 1.3.2 SOM pool as affected by long-term fertilization
 1.4 Physical protection mechanism of SOM 1.4.1 Density separated fractions 1.4.2 Aggregate stability 1.5
 Isotope technique protocol 1.5.1 SOM turnover 1.5.2 Carbon efflux 1.6 Summary 1.7 References2
 Description of the black soil zone in the northeast China 2.1 Ecological and environmental conditions of the black
 soil zone 2.1.1 Meteorological and hydrologic conditions 2.1.2 Parent material of black soil 2.1.3
 Topography 2.1.4 Vegetation 2.1.5 Evolution and development of Mollisol 2.1.6 Land-use change and
 fertilization in black soil region 2.2 The common characteristics of black soil 2.2.1 The morphological
 characteristics 2.2.2 The physical properties 2.2.3 The seasonal dynamics of soil water 2.2.4 Clay minerals
 and chemical properties 2.3 Experimental sites--introduction to Hailun station 2.4 Experiment setup 2.4.1
 Grass land and bareland 2.4.2 Long-term fertilization 2.4.3 Continuous and rotation cropping system 2.5
 Summary 2.6 References3 Experiment methodology 3.1 Study site description 3.2 SOM stocks estimation
 3.2.1 Soil sampling 3.2.2 Analysis method 3.3 Density fractionation and extraction of humic substance 3.3.1
 Soil sampling 3.3.2 Density fractionation 3.3.3 Chemical extraction of humus 3.3.4 Some soil properties 3.4
 Wet sieving of aggregate 3.4.1 Study site description 3.4.2 Physical fractionation 3.4.3 Organic carbon
 determination of soil samples and isolated fractions 3.5 POM isolation from water-stable aggregate 3.6 SOM and
 aggregate stability of rhizosphere soils differing in continuous cropping patterns and vegetation cover 3.6.1 Soil
 and plant sampling 3.6.2 Aggregate wet-sieving 3.6.3 Organic carbon determination of soil samples and
 aggregate separates 3.7 Determination of C emission 3.7.1 Study site description 3.7.2 Experimental methods
 3.8 Carbon budget 3.8.1 Sampling and determination 3.8.2 Carbon balance estimated through
 soil-crop-atmosphere systems 3.9 Statistical analysis 3.10 Summary 3.11 References4 SOM stocks differing in
 land use and long-term fertilization 4.1 Introduction 4.2 Carbon distribution in soil profile 4.3 N distribution in
 soil profile 4.4 Soil bulk density in profile 4.5 C/N ratio in profile 4.6 SOM stocks 4.6.1 SOC density and
 stocks 4.6.2 Nitrogen stocks 4.7 Conclusions 4.8 Summary 4.9 References5 SOM in density fractions
 differing in land use and fertilization 5.1 Introduction 5.2 Soil properties analysis 5.3 Organic carbon and
 nitrogen contents in bulk soil 5.4 Carbon and nitrogen in density fractions 5.5 C/N ratio 5.6 Organic carbon in
 combined humus 5.7 The elemental composition and spectroscopic properties of humic substances extracted
 from a black soil 5.8 Conclusions 5.9 Summary 5.10 References6 SOM distribution and aggregate stability
 differing in land use and long-term fertilization 6.1 Introduction 6.2 SOC and nitrogen at 0-10 and 10-20 cm
 soil layer 6.3 Distribution of water-stable aggregates 6.4 C storage in water-stable aggregates 6.5 C distributed in
 density separated fractions from aggregates 6.6 Conclusions 6.7 Summary 6.8 References7 SOM distribution
 and aggregate stability of rhizosphere soils differing in continuous cropping patterns and vegetation cover 7.1
 Introduction 7.2 SOM and bulk density 7.3 Root density of crops and grasses 7.4 Mass distribution of
 water-stable aggregates 7.5 SOC in aggregates and correlation analysis 7.6 Conclusions 7.7 Summary 7.8
 References8 Aggregate stability and POM distribution: impacts of land-use change and long-term fertilization 8.1
 Introduction 8.2 SOM in the whole soil and density fractions and related soil properties 8.3 Distribution of
 aggregates and SOM 8.4 POM content within the aggregates and in the whole soil 8.5 MOC content in aggregates
 and whole soil 8.6 C/N ratio of POM and MOC 8.7 Distribution of SOM fractions in the whole soil 8.8
 Conclusions 8.9 Summary 8.10 References9 CO₂ emission characterization and carbon budget estimation
 through different ecosystems differing in land use and long-term fertilization 9.1 Introduction 9.2 Soil properties
 9.3 Soil temperature and precipitation 9.4 Seasonal variations of CO₂ emission 9.5 Related environmental
 factors to CO₂ emission and Q₁₀ estimation 9.6 Rhizosphere and native soil respiration 9.7 Cumulative CO₂
 emission and its relationship with SOC fractions 9.8 Plant biomass under different land use and fertilization 9.9
 Carbon budget through soil-plant-atmosphere system 9.10 Carbon balance of soil ecosystem 9.11 Conclusions

9.12 Summary 9.13 References

章节摘录

Soil carbon flux comprises three biological processes : soil microbial respiration , plant root respiration and soil fauna respiration , and a non-biological process : the oxidation and decomposition of matters containing carbon (Raich and Tufekcioglu , 2000) . In general , soil fauna respiration and CO₂ emission as a result of non-biological process can be negligible due to the very small amount detected . In addition , CO₂ emissions from soil can be divided into plant root respiration , microbial decomposition of plant derived organic carbon , and microbial decomposition of native soil organic matter, microbial autotrophic respiration ; in general , the combination of root respiration and microbial decomposition of plant derived organic matter is defined as rhizosphere respiration (Kuzyakov and Cheng , 2001 ; Cheng and Kuzyakov , 2005 ; Yang and Cai , 2005) . The substrates for rhizosphere respiration come from carbon recently fixed through photosynthesis , whereas SOM decomposition is primarily a function of soil heterotrophic activities using soil carbon . This two processes act simultaneously and are also linked through rhizosphere interactions , which may exert a stimulative (priming effect) or a suppressive influence on SOM decomposition (Cheng , 1999a , 1999b ; Cheng and Kuzyakov, —005) .

Roots of higher plants , as a key functional component of belowground systems and one of the main soil forming agents , interact with virtually all soil components . The processes largely controlled or directly affected by roots and often occurring in the vicinity of the root surface are commonly referred to rhizosphere processes . These processes may include root production through growth and death (root turn over) , rhizodeposition , root respiration and rhizosphere microbial respiration as a result of microbial utilization of rhizodeposits . Rhizosphere processes play a critical role in the global carbon cycle .

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