

东北黑土地退化机理与保护利用关键技术及应用

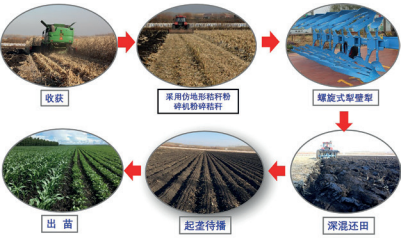
Degradation mechanism of black soil and key technologies and application of conservation and utilization

成果简介:

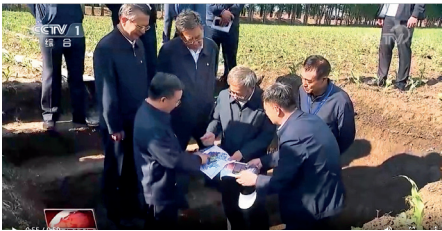
针对东北黑土地由于过度垦殖和用养失调导致的“变瘦”、“变硬”，以及侵蚀导致的“变薄”等突出问题，团队历经35年试验示范，揭示了自然黑土地垦殖后的必然变化和退化机制，明确了黑土层的原位退化和迁移退化过程；研发了厚层黑土秸秆深混扩容增碳、薄层黑土肥沃耕层培育、白浆土梯次改良培肥等关键技术，因地制宜的进行技术叠加，针对中厚黑土层保育、薄层黑土培育、障碍土壤改良、风沙土保护和坡耕地控蚀问题提出了五种解决方案，建立了黑土地保护利用的“龙江模式”，协同实现了黑土地保护、耕地产能提升和农民增收的目标，为中国科学院“黑土粮仓”科技会战的部署和实施提供了重要科技支撑。

Introduction:

Aiming to the problems that intensity utilization of black soil reclamation caused the decrease in soil fertility and the increase of soil penetration resistance, and erosion caused the decrease of black soil layer thickness. The team has revealed the necessary change and degradation mechanism after virgin black soil being reclaimed, proposed the processes of in situ degradation and relocation degradation of black soil layers. It has been developed the key technologies of straw deep mix and soil capacity increase in the soil with black soil layer thickness of 30 cm or more, fertile cultivated layer construction in the soil with black soil layer thickness of less than 30 cm, ladder improvement of soil fertility in Albic soil. Integrating various technologies according to the local conditions, five solutions of black soil conservation and utilization have been proposed, including that conservation measure in the soil with medium-thick black soil layer, fertilization measure in thin black soil, improvement measure of barrier soil, protection measure in wind and sandy soil, controlling erosion in sloping arable land. The longjiang Model of black soil conservation and utilization has been built, which synergistic realized the objectives of black soil conservation, arable land productivity and farmers' rich, and also will provide the important technological support for the “Science and Technology Battle of Black Soil Granary”.



黑土地肥沃耕层构建技术流程
Technical process of fertile cultivated soil layer in black soil



2021年6月4日，国务院副总理胡春华调研黑土地保护利用示范区
On 4th June 2021, Hu Chunhua vice Premier investigated the demonstration area of black soil conservation and utilization



央视报道
CCTV Reports



黑龙江省自然科学一等奖
(2015年)
Heilongjiang Natural Science Award



黑龙江省科技进一等奖 (2017)
Heilongjaing Science and Technology Process Award



吉林省自然科学一等奖 (2017)
Jilin Natural Science Award



神农中华农业科技奖一等奖 (2019)
Shennong Chinese Agricultural Science and Technology Award



黑龙江省科技进步一等奖 (2020)
Heilongjaing Science and Technology Process Award

推荐单位 / Recommended Unit

中国科学院东北地理与农业生态研究所
Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences

完成单位 / Accomplished Unit

中国科学院东北地理与农业生态研究所
Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences

合作单位 / The Main Cooperation Units

农业农村部耕地质量监测保护中心
Center of Cultivated Land Quality Monitoring and Protection, Ministry of Agriculture and Rural Affairs of the People's Republic of China
黑龙江省农业科学院土壤肥料与环境资源研究所
Institute of Soil Fertilizer and Environment Resources, Heilongjiang Academy of Agricultural Sciences
黑龙江省农业环境与耕地保护站
Heilongjiang Agricultural Environment and Cultivated Land Protection Station
辽宁省农业科学院
Liaoning Academy of Agricultural Sciences

社会效益和经济效益:

团队自主研发的相关技术2006年被农业部和财政部组织实施的有机质提升项目采纳、2015年被写入农业部《东北黑土地保护利用试点项目》、2017和2021年被遴选为农业部/农业农村部主推技术；牵头制订了第一个黑土地保护利用的行业标准《东北黑土区旱地肥沃耕层构建技术规程》（2021年1月1日颁布实施）；建立的黑土地保护利用的“龙江模式”被写入《国家黑土地保护工程实施方案（2015-2021年）》。有关技术推广面积累计达9500万亩，作物增产50亿斤，新增效益77.9亿元。东北黑土地保护利用技术效果被央视《焦点访谈》、《新闻直播间》、《晚间新闻》和《振兴路上》，《光明日报》、《中国科学报》、《科技日报》、《农民日报》等各级媒体广泛报道和充分肯定。

Social and Economic Benefits:

Relevant technologies have been adopted by soil organic matter improvement project from Ministry of Agriculture and Ministry of Finance in 2006, recorded in implementation program of Northeast Black Soil Conservation and Utilization Pilot Project in 2015, selected as preferred technologies by Ministry of Agriculture/Ministry of Agriculture and Rural Affairs in 2017 and 2021. The first industry standards of agriculture related to black soil conservation and utilization was released in 2020. Relevant technologies' achievements have been expanded to 95 million mu, with a total increased production of 5 billion jin and 7.79 billion RMB. The technical effect has been broad coverage and full recognition by medias including Focus Report, News Room, Nightly News, Revitalization Road, Guangming Ribao, China Science Daily, Science and Technology Daily, Farmers' Daily, and so on.



2021年7月10日，中国科学院院长、党组书记侯建国调研黑土地保护利用示范区

On 10th July 2021, Hou Jianguo, Present and Party secretary of the Chinese Academy of Sciences, investigated the demonstration area of black soil conservation and utilization



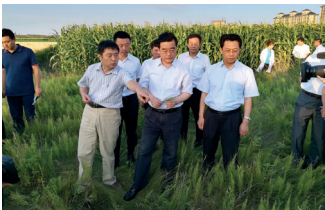
2017年8月11日，时任农业农村部部长韩长赋调研黑土地保护利用示范区

On 11th August 2017, Han Changfu, then Minister of Ministry of Agriculture and Rural Affairs of the People's Republic of China, investigated the demonstration area of black soil conservation and utilization



2021年10月22日，黑龙江省委副书记许勤调研黑土地保护利用示范区

On 22th July 2021, Xu Qin, Secretary of Heilongjiang Provincial Committee, investigated the demonstration area of black soil conservation and utilization



2017年7月22日，时任黑龙江省委副书记张庆伟调研黑土地保护利用示范区

On 22th July 2017, Zhang Qingwei, then Secretary of Heilongjiang Provincial Committee, investigated the demonstration area of black soil conservation and utilization

团队成员 / Team Members:



韩晓增
Han Xiaozeng

中国科学院东北地理与农业生态研究所
主要贡献：团队负责人，研发了关键技术，总体设计，建立了“龙江模式”并推广应用。

Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences
Main contributions: Team leader, developing key technologies, the overall design of the project, building Longjiang Model and promotional application.



邹文秀
Zou Wenxiu

中国科学院东北地理与农业生态研究所
主要贡献：揭示黑土层退化机理、研发了关键技术、提出了黑土地保护方案并推广应用。

Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences
Main contributions: Revealing the degradation mechanisms of black soil layer, development of key technologies, propose and extension of technical proposal for black soil conservation and utilization.



杨帆
Yang Fan

农业农村部耕地质量监测保护中心
主要贡献：建立吉林省和内蒙古自治区黑土地保护利用模式，技术模式在全国推广应用。

Center of Cultivated Land Quality Monitoring and Protection, Ministry of Agriculture and Rural Affairs of the People's Republic of China
Main contributions: Development of black soil conservation and utilization models in Jilin Province and Inner Mongolia, and extension and application of black soil conservation and utilization models in nationwide.



王伟
Wang Wei

黑龙江省农业科学院土壤肥料与环境资源研究所
主要贡献：松嫩平原黑土地保护利用关键技术参数优化与模式集成。

Institute of Soil Fertilizer and Environment Resources, Heilongjiang Academy of Agricultural Sciences
Main contributions: Technical parameter optimization of black soil conservation and utilization in Songneng plain.



周宝库
Zhou Baoku

黑龙江省农业科学院土壤肥料与环境资源研究所
主要贡献：三江平原黑土地保护利用关键技术优化与模式集成。

Institute of Soil Fertilizer and Environment Resources, Heilongjiang Academy of Agricultural Sciences
Main contributions: Technical parameter optimization of black soil conservation and utilization in Sanjiang plain.



马常宝
Ma Changbao

农业农村部耕地质量监测保护中心
主要贡献：东北黑土地质量动态监测、东北黑土地保护利用模式的推广应用。

Center of Cultivated Land Quality Monitoring and Protection, Ministry of Agriculture and Rural Affairs of the People's Republic of China
Main contributions: Monitor of black soil quality, extension and application of black soil conservation and utilization models.



孙文涛
Sun Wentao

辽宁省农业科学院
主要贡献：辽河平原黑土地保护利用关键技术优化与模式集成。

Liaoning Academy of Agricultural Sciences
Main contributions: Technical parameter optimization of black soil conservation and utilization in Liaoh plain.



郭玉华
Guo Yuhua

黑龙江省农业环境与耕地保护站
主要贡献：黑龙江省黑土地保护利用技术模式推广应用。

Heilongjiang Agricultural Environment and Cultivated Land Protection Station
Main contributions: Extension and application of black soil conservation and utilization models in Heilongjiang provincer.



许艳丽
Xu Yanli

中国科学院东北地理与农业生态研究所
主要贡献：玉米-大豆轮作关键技术研发、黑土地保护技术优化与集成。

Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences
Main contributions: Development of key technology in maize -soybean rotation system, optimization and integration of technologies.



于立宏
Yu Lihong

辽宁省农业科学院
主要贡献：辽宁省黑土地保护利用模式推广应用。

Liaoning Academy of Agricultural Sciences
Main contributions: Extension and application of black soil conservation and utilization models in Liaoning province.