

# Research Team on High Efficiency Utilization of Agricultural Soil and Water Resources School of Water Conservancy and Civil Engineering, Northeast Agricultural University



**Prof. Fu Qiang**

The Research Team on High Efficiency Utilization (HEU) of Agricultural Soil and Water Resources (ASWR) in Northeast Agricultural University (NEAU), founded in 2010, has obtained a lot of achievements, based on the key discipline of agricultural water-soil engineering in Heilongjiang Province and Key Laboratory of High Efficiency Utilization of Agricultural Water Resources, Ministry of Agriculture. To meet the regional strategy requirement and demand of food safety, water safety and eco-environmental safety, the research team has been focusing on eco-environmental effects and regulation mechanism for agricultural soil and water resources, the sustainable utilization and management policy of agricultural water resources, as well as the safe operation and management mode innovation of irrigation area project in cold regions.

**Personnel:** There are 36 key members in the research team at present, including 4 professors and 16 associate professors (3 doctoral supervisors and 11 master supervisors). The team is led by Prof. Fu Qiang, who is awarded “Science and Technology Innovation Leader” in the “National Ten Thousand Scientists Plan” and “the New Century Excellent Talent” of the Ministry of Education, and is provided with “the Special Government Allowances of the State Council” and “the Distinguished Young Scientists Fund in Heilongjiang Province”.

**Research projects:** In recent years, the research team has obtained more than 50 research projects at State, Province or Ministry levels, including projects of National Natural Science Foundation of China, National Science and Technology Support Plan, Public Welfare Research Funds of Ministry of Water Resources and Natural Science Foundation of Heilongjiang Province. The total sum of research fund is more than 12,000,000 RMB Yuan.

**Research conditions:** At present, the research team has built a scientific research platform, including the Key Laboratory under Ministry of Agriculture on efficient utilization of agricultural water resources, the team of leading talent echelon of agricultural soil and water engineering in Heilongjiang Province and collaborative innovation center of grain production improvement in Heilongjiang Province. The laboratory has more than 100 advanced apparatuses, including absorption spectrometer, isotope mass spectrometer, liquid chromatograph, gas chromatograph, gas analyzer, high-speed refrigerated centrifuge, unsaturated hydraulic conductivity measurement system, pressure meter and photosynthesis measuring system, etc. The laboratory has a total area of 2000 m<sup>2</sup>, and the total value of these instruments is more than 10,000,000 RMB Yuan.



**Monographs published by the team**



## Domestic and international academic exchanges

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Research achievements: In recent years, more than 150 papers have been published in peer-reviewed journals such as Water Resources Management, Natural Hazards, Irrigation and Drainage, Marine Pollution Bulletin, Environmental Science and Pollution Research, Science of the Total Environment, Environmental Earth Sciences, Transaction of the Chinese Society of Agricultural Engineering and Transaction of the Chinese Society of Agricultural Machinery, among which more than 80 papers have been indexed by SCI/EI. Twelve academic monographs have also been published. More than 20 National Invention Patents have been authorized. Five second-prizes and three third-prizes of science and technology have been awarded by the government of Heilongjiang Province. More than 10 doctoral students and over 80 master students have obtained their academic degrees.

Innovations: (1) Based on the characteristics of cold areas, the research was carried out on water-thermal migration in soil with snow cover, the water-thermal coupling migration patterns and mechanism were discovered during the soil freezing and thawing period; the dynamic mathematical model of water-thermal coupling migration in multi-level soil was built; the intelligent identification method of water-thermal dynamic characteristic parameters and discrete numerical simulation technology were proposed; and the quantification of water-thermal migration in farmland soil under snow cover was solved. (2) In research on new theories and technologies for high efficiency utilization of agricultural soil and water resources, the intelligent discovering technology for a variety of characteristics data group was put forward; the safety threshold of reasonable utilization of regional surface water and ground water and the red line of water resources development ensuring food production were measured; the key problems of high efficiency utilization of soil and water resources in large-scale agricultural production were solved, which provided a science and technology support for implementing the strictest water resources management system and improving food production in Heilongjiang Province. (3) In research on high efficiency utilization and management mode of water and fertilizer during the growing process of rice in cold areas, the water-saving irrigation system for rice with regional characteristics, such as "shallow-wet-dry", "shallow-sunshine-shallow", deficit irrigation and water-fertilizer coupling regulation mode was proposed; and some critical problems were solved, such as high efficiency utilization of coupling water and fertilizer during the growing stages of rice and eco-environmental safety; and a scientific support was provided for improving the utilization efficiency of water and fertilizer in farmland soil and the capacity of water storage and moisture conservation, realizing precise irrigation management, and promoting grain production and income and water saving.



Experimental apparatus and equipment, prizes and patents by the team

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