N°4

GROUNDWATER OVERDRAFT CONTROL AND AQUIFER RECOVERY

Through governance set up and sustainable agricultural practices, water resource was enhanced and groundwater level rose in North East China

WETLAND AND CONTIENTAL WATERS

OVERVIEW

- Organization data :
  - ✓ Name : **Hebei Institute of Water Science**
  - ✓ Organization type : **NGO, research institute**
  - ✓ Year of foundation : **1978**
- Beneficiaries : **Residents in the middle and eastern part of Hebei Province, 115 counties**
- Donors and financing : **The central government and Hebei Provincial government - 3.5 billion USD (3.2 billion Euros)**

- Location : **Hebei province, North China Plain, China; direction at No. 3 Fuqiang Street, Shijiangzhuang, Hebei, P.R. China 050011**
- Beginning date : **2014, August**
- Motivations : **Control the groundwater overexploitation and recover the aquifer**

CONTEXT AND ACTION

Summary | Groundwater overdraft in China has occurred since the 1960s, when the central government encouraged farmers to build tube wells for irrigation. By 2013, 24 provinces of China were touched by groundwater overdraft. To recover depleted aquifers threatened by overexploitation, the Chinese government implemented the Pilot Project of Groundwater Overexploitation Control (PPGOC) in Hebei Province from 2014 to 2016. When the pilot period ended, the groundwater table had been positively altered by integrated measures taken in Hebei. The experience is now popularized to other counties and provinces.

In the pilot project, field measures were solutions relying on the services Nature can give. Agricultural water saving activities were undertaken. One principal measure was plant pattern adjustment. In Hebei, the traditional plant pattern for the farmland is winter wheat and summer maize rotation. Precipitation is very low in dry season when winter wheat grows, thus needing more irrigation. That is why a plant pattern adaptation was set up in Hebei counties. The farmers stopped to plant winter wheat on 130 000 ha, which enable to save the groundwater exploitation for 2700 m^3/ha. Instead, they set single cropping pattern of corn, peanut, sunflower or plant grass for meadows. They also replace the crop with forest and hay, which use far less irrigation than the winter wheat and maize. Between 2014 and 2016, 34 000 ha of farmland were replaced by forest, hay and medicine herbs. Moreover, intensive practices were abandoned, and replaced by cover-cropping and no-till cultivation. Indeed, straw incorporation and no-till practice are very useful for saving water in agriculture. During the pilot period, 83 000 ha of farmland implemented these activities.

Local challenges |

- Groundwater depletion in both confined and unconfined aquifers due to overexploitation in the North China Plain (NCP): irrigated farmland expansion, population growth, economic development and decrease of rainfall with climate change;
- Because of quick water pumping, depression cones appears in drilling wells, and thus groundwater table is disminished at drilling point that can bring seawater in the well;
- Land subsidence;
- Sea water intrusion;
- Groundwater contamination.

Local responses |

- Set up of a governance plan, PPGOC, for a better control and management of water in groundwater depletion areas;
- Plant pattern adjustment set up to a large scale: substitution of winter wheat with grassland, forest and hay;
- Alternative and resilient cultivation: cover-cropping and no-till practices. Soil is protected with straw to decrease evaporation and keeps moisture to the soil, which means less irrigation. No-till solution is also set up to reduce working time.

BENEFITS

Environmental | These different farming approaches led to an annual reduction of groundwater overdraft in the pilot areas that has reached 500 million m^3, and the groundwater levels both in confined and unconfined aquifers has begun to rise in pilot area. Moreover, no-till technique improves soil condition: erosion is strongly reduced, organic matter content is higher, biologic life is preserved, its leads to a better structural stability, and it prevents from water contamination through diminution of phytosanitary products leaching. It also lightly reduces greenhouse gas emission since carbon is stored in organic matter.

Social | Thanks to the rewatering of phreatic table, there are less social tensions. Life condition is also better at farmer's scale since no-till approach lead to a reduction in working time.

Economic | With these new cultural practices, there are reductions in farming fees: less water cost and less energetic costs due to till engines.

SUCCESS FACTORS

- Integrated design and planning of water resource;
- Water right allocation and water price reform;
- Strict water governance by license system;
- Water saving measures.

OBSTACLES

- Policies from different departments sometimes conflict with each other about water use and lead to confusion among farmers;
- Subsidies are necessary at the beginning since farmers don't understand the benefit of saving water for them.

« Policies for improving groundwater recovery should be designed very carefully. »
Zenghui PAN

- Contact :
  - ✓ Name : **Zenghui PAN**
  - ✓ Status : **Scientist in Hebei Institute of Water Science**
  - ✓ E-mail : **panzenghui@126.com**

- Related link(s) :

https://www.iwra.org/member/index.php?page=286&abstract_id=3720

Realized by the International Office of Water (IOWater) as part of International Network of Basin Organizations (INBO)

International Office for Water