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## **ADDRESSING GROUNDWATER MANAGEMENT AND RURAL CLIMATE CHANGE IN SHANXI PROVINCE (PRC)**

Asia Water Week, ADB

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# Shanxi Province

## Groundwater overuse

- 104,000 abstraction points
- 3.5% growth in usage annually
- 6903 km<sup>2</sup> (25%) overused – especially in lowlying areas
- geological disturbance and pollution related to coal mining

## Climate change

- 12% less precipitation in 50 years
- Temperature increase 1.2 degree Celsius, esp in winter





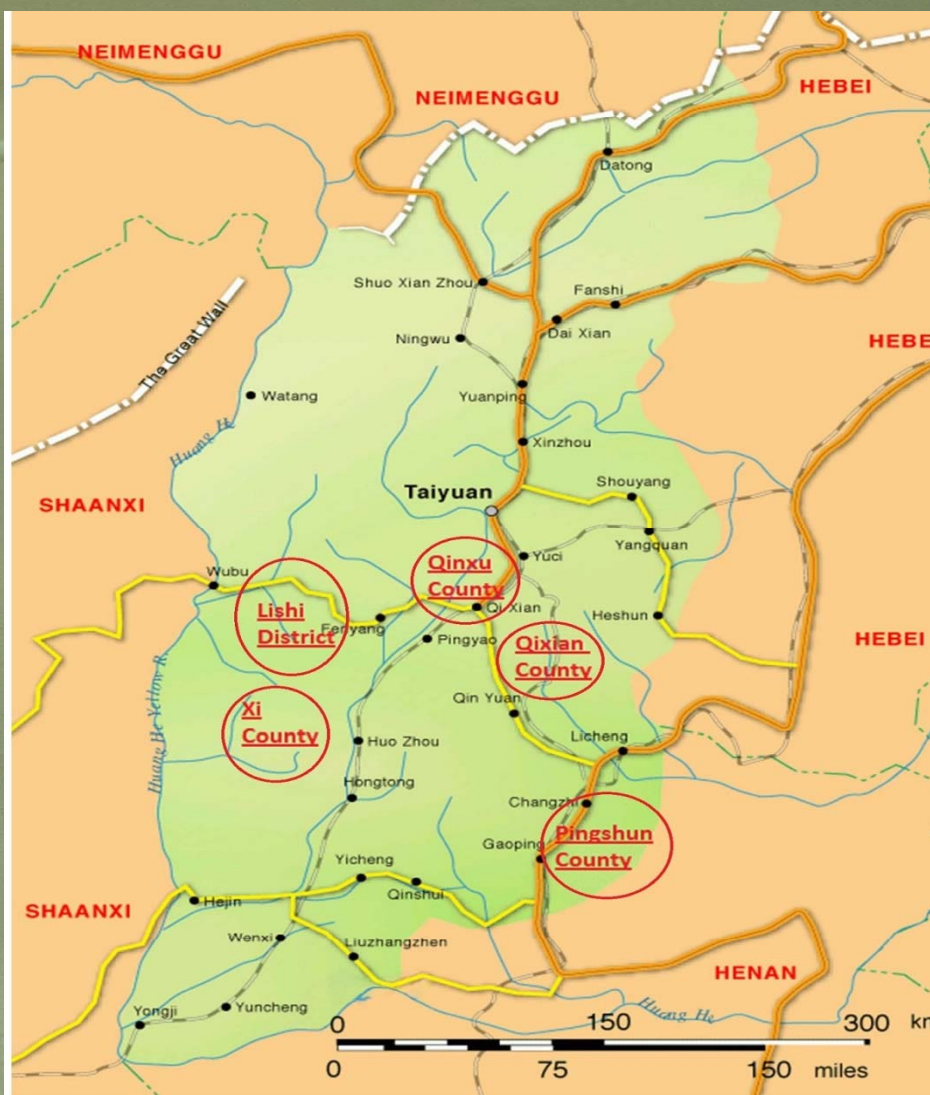


0188 - PRC Grant

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*Climate Change Adaptation through  
Groundwater Management*

Shanxi Provincial Government  
Municipal and County governments  
Asian Development Bank



## Qinxu – regulated groundwater system





# Qinxu – regulated groundwater system

## Overuse

- 11,000 ha under groundwater irrigation
- 2005-2010 decline 1.6 m/y
- 1473 wells

## Impact

- Increased use of levelling and plastic mulch
- Reduced consumption of water is 40%
- Water levels rising since 2010 (>1.6 mtr)

## Integrated system

- All wells equipped with automated system operated by swipe card
- Quota set annually for farmers, industries
- Tiered water price - depending on use of quota
  - RMB 0.41-0.55/unit
- Quotas can be exchanged

## Water levels recorded



## Water use recorded and billed (2 tiers)

			2012-01-25到2012-10-25开停泵记录查询结果		
	用户卡号	开泵时间	开泵剩水量(吨)		
2	MFXIWO15	四方卫井	633	2012-10-20 16:25:53	162
3	MFXIWO15	四方卫井	633	2012-10-19 16:45:44	162
4	MFXIWO15	四方卫井	537	2012-10-13 13:46:10	160
5	MFXIWO15	四方卫井	394	2012-10-12 14:18:29	90
6	MFXIWO15	四方卫井	390	2012-10-10 09:31:14	254
7	MFXIWO15	四方卫井	394	2012-09-25 10:43:01	139
8	MFXIWO15	四方卫井	560	2012-09-24 17:56:34	215
9	MFXIWO15	四方卫井	390	2012-09-24 09:23:58	248
10	MFXIWO15	四方卫井	300	2012-09-23 13:38:29	137
11	MFXIWO15	四方卫井	599	2012-09-23 12:00:11	74
12	MFXIWO15	四方卫井	599	2012-09-23 09:41:22	38
13	MFXIWO15	四方卫井	81	2012-09-18 07:03:49	335
14	MFXIWO15	四方卫井	3940	2012-09-17 16:27:02	57
			4160	2012-09-17 09:51:26	70



## Qixian – controlled drip irrigation in greenhouses



## Qixian

### Water scarce, overuse

- 263m<sup>3</sup>/capita
- Groundwater use 173% of recharge
- Decline 0.76 m/yr
- Upcoming greenhouse agriculture
- Water prices at 0.6RMB/m<sup>3</sup>

### Introducing efficient irrigation

- Filter, frequency converter, dual pipeline, drip system, fertigation units
- Cost (all) RMB 6000/mu
- Additional profit RMB 8000/mu
- Water saving 40-60%
- Fertilizer saving 35-40%
- Yield increase 25-40%
- Water productivity +90%

Plus some crops (zucchini) only grow in controlled environment





Replicated (in loan project and outside) and improved



## Farmers union as driving force



**Other pilots:**  
**Lishi – cold weather irrigation**





## Xi – labour saving spring micro irrigation for 'golden pears'



## Pinghsun – micro-sprinklers in mesh tents for prickly ash shoot



# Pingshun – micro-sprinklers

## Situation

### Situation

- Karst mountain, limited land
- Farm income RMB 2720/yr
- Prickley ash shoots (*zanthoxylum*) and walnuts

### Pilot

- Source development
- Central unit – including filter
- Each field unit owns meter and mixing system for fertilizer/ pesticide
- Suspended micro-sprinklers
- Costs RMB 5000/mu – including source development

## Activities

### Impact

- Washes away aphids: better product
- Water saving approx 40%
- Fertilizer/ pesticide saving approx 40%
- Yield increase approx 20%
- Annual additional income RMB 4000/mu
- Expanded this year to 220 to 1000 mu



## Local enterprise expanding its capacity



## Providing outgrower support







NICHE PRODUCT

山西平顺大红袍开发有限公司

Shanxi pingshun  
dahongpao kaifa youxian gongsi





## Lessons

- Groundwater = managing the water buffer
- Water price is substantial
- Water saving is important but it is not main thing
  - Increased yields and better crops
  - Reduced labour and reduced agrochemicals
  - Opportunities that were not there before
- Quick pay back (after maturity) and expansion
- Getting it technically right is important
- Role of local enterprises and farmers union

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MAIN LESSON

CREATING LOCAL  
ECONOMIES BASED  
ON WATER EFFICIENT  
AGRICULTURE



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# Shanxi Farmers Embrace Modern Irrigation Methods to Adapt to Climate Change

March 2013 | Issue 45

## CHALLENGES

Shanxi Province in the People's Republic of China (PRC) is experiencing reduced water security for the agricultural sector. Changing climate conditions, including reduced rainfall, are increasing reliance on groundwater resources in the province. Unsustainable groundwater use for food production intensifies the impacts of climate change, and cost-effective adaptation responses are needed to better equip vulnerable agricultural regions.<sup>1</sup>

Groundwater is the main source for many local farmers in Shanxi province. Water is often being used with inefficient and outdated irrigation techniques. Most traditional farmers are

## Highlights

- Climate change and declining water resources threaten food production systems worldwide, increasing the need for efficient agricultural processes.
- Four counties in the Shanxi Province of the People's Republic of China were selected as pilot areas where traditional farmers learned modern methods of groundwater use and management.
- As a result, more sustainable use of groundwater was introduced while farm labor was reduced. Crop yields increased and water is used more efficiently.

People's Republic of China | Agriculture/Water



At left, the "spring system" introduced in Xi county. Above, the drip system in Qixian county.  
Photos by Frank van Steenbergen



