

Rural livelihoods and vulnerability to climate hazards in Ningxia

The project, *Impacts of Climate Change on Chinese Agriculture*, is a joint UK/China collaboration which sought to understand how climate change will affect rural China.

Phase I (2001-2004) examined the impact of climate change on crop yields. Phase II (2005-2008) built on this work to investigate the impacts of climate change on national cereal production and the cereal quantities available to each person in China to 2100. This pamphlet summarises the regional component of Phase II - an assessment of how climate change affects the livelihoods of people living in agricultural communities in Ningxia, a province in north west China.



Rural livelihoods and vulnerability to climate hazards in Ningxia

In this part of the project we examined the impacts of climate change on rural livelihoods in Ningxia, one of five autonomous regions in China. Our analysis looked back at recent historical climate change and how people reacted to it. It also sought to highlight how communities might react to future climate change.

Our specific aims were to:

- Gain an insight into the rural livelihoods associated with the different agricultural systems in Ningxia
- Assess the vulnerability of people living in different areas of Ningxia to recent climate events and identify the factors determining vulnerability
- Identify the types of responses made by people and/or organisations to reduce the effects of climate variability on their livelihoods.

Our work formed an important part of the development of a regional adaptation strategy for Ningxia (described in a separate pamphlet).

NINGXIA HUI AUTONOMOUS REGION

Ningxia is located in the northwest of China. Sixty-five percent of its population live in rural areas, with earnings averaging 79% of the national level. Large numbers of people in the region, particularly in southern areas, live under extreme poverty. The climate is dry and highly seasonal, ranging from around 600 mm of rainfall in the mountainous area in the south to 100 mm in the north. Winters are dry and harsh, while summers are hot and the period of most precipitation (Figure 2). The Yellow River is the main regional water source. The amount of water available to each person in Ningxia is only a tenth of the national average. Three very dry years from 2004-2006 have had significant impacts in the region.

The three agricultural areas in Ningxia are:

- Southern area - rainfed (i.e. natural rainfall) cultivation in the more humid parts (though still fairly dry)
- Central area - a mix of irrigation with some rainfed cultivation and extensive grazing in the middle part
- Northern area - primarily irrigation (using water diverted from the Yellow River)

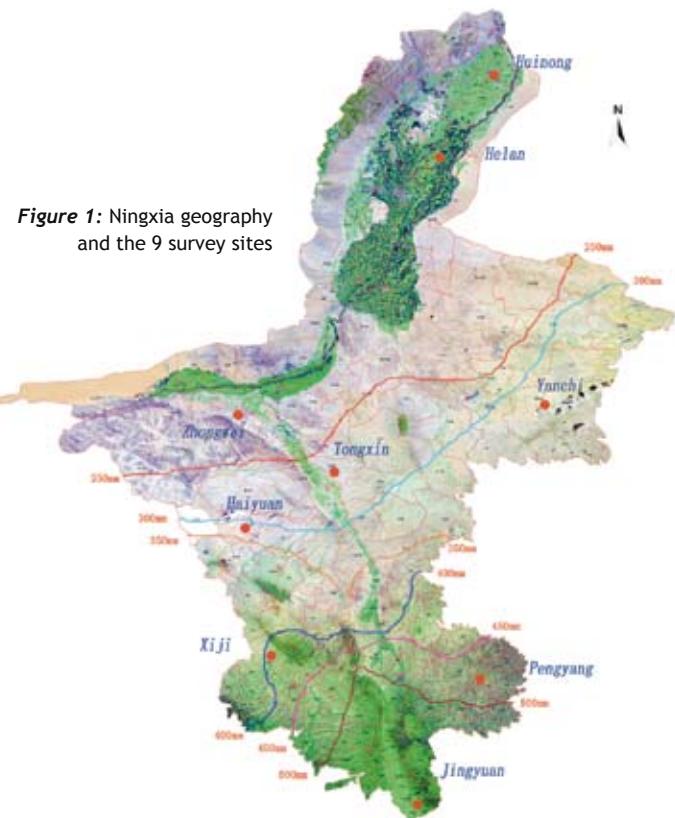


Figure 1: Ningxia geography and the 9 survey sites

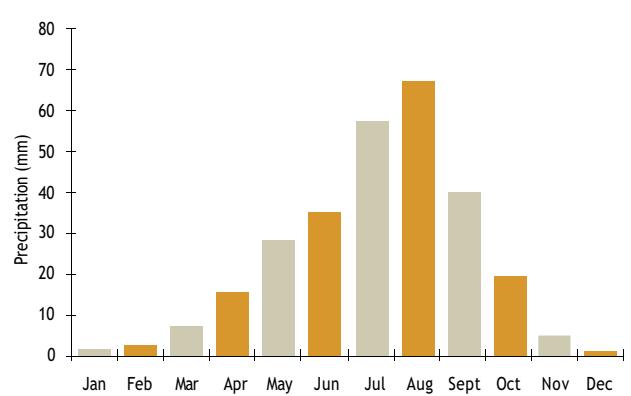


Figure 2. Precipitation in Ningxia

Table 1: Recent climate variability and extremes in Ningxia

Climate factor	Experiences of local impacts
Recent warming: Minimum and maximum temperatures have gone up, particularly since the 1980s.	<ul style="list-style-type: none"> Winter wheat can now be grown in the southern area. The other two areas grow only spring wheat Longer harvest time More frost-free days Fewer cold and frost disasters
Rainfall: Average annual rainfall across Ningxia has fallen slightly since 1990.	<ul style="list-style-type: none"> Lack of rainfall (i.e. drought) is the most recognised meteorological disaster, especially in the central and southern areas where there is greater reliance on rainfed cultivation Local experiences suggest a possible increase in the frequency and intensity of droughts
Major drought 2004-2006: Rainfall reached lowest on record in some areas.	<ul style="list-style-type: none"> Some areas (especially the central area) experienced crop failure Some farmers who depended on rainwater collection cellars had to buy water at great expense The drought caused a direct economic loss of RMB 1.27 billion in Ningxia
Extreme weather hazards such as hail, frost, sandstorm and hot dry winds.	<ul style="list-style-type: none"> Such events result in significant economic losses Community surveys highlight the significant negative effects of these events on livelihoods
Recent decline in Yellow River flows.	<ul style="list-style-type: none"> Annual flow has fallen significantly, thus reducing the amount available for diversion and leading to rationing of supply

VULNERABILITY TO CLIMATE CHANGE VARIES ACROSS NINGXIA

Recent climate variability has touched many aspects of farmers' livelihoods. Farmers in the three agricultural areas have different levels of vulnerability to climate change. For example, susceptibility is higher in the middle arid and southern rainfed mountainous areas because farmers are more exposed to climatic hazards and a greater proportion of income comes from farming activities.

FARMERS' ADAPTATIONS TO CLIMATE AND CLIMATE CHANGE

The farmers in Ningxia use a wide range of measures (e.g. rainwater collection, efficient irrigation, switching crops) to retain soil moisture and maintain agricultural production in the harsh environment. But a range of factors influence their ability to respond to environmental conditions. When asked about the constraints they faced in adapting to the effects of climate change, respondents most often cited lack of money (Figure 3). Available water resources and inadequate infrastructure were given as other important factors.

Respondents also suggested that government could play a greater role. For example, farmers in the northern irrigation area are keen for the government to provide greater financial support for the construction of infrastructure and to help secure more investment for agricultural activities. Adaptation is an ongoing and dynamic process in Ningxia. The adaptation strategies highlighted by the survey are described in the accompanying pamphlet on adaptation.

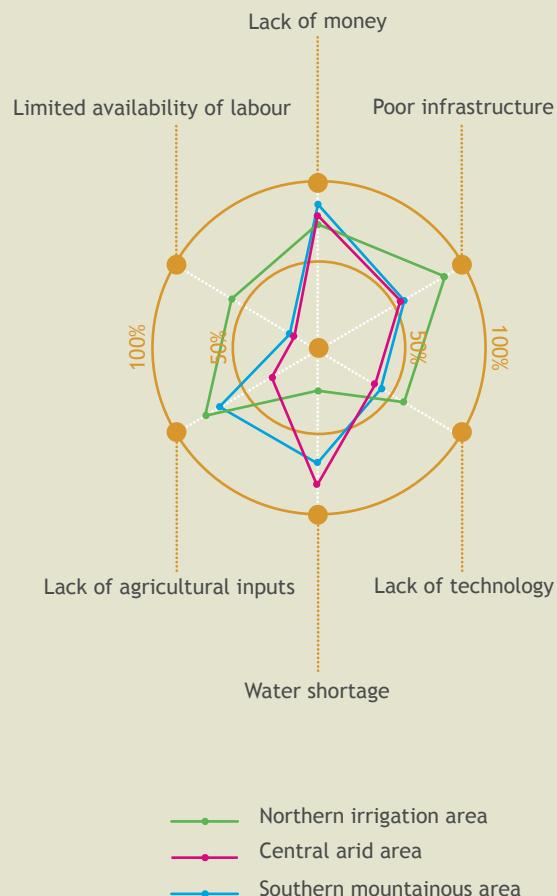


Figure 3. Factors constraining farmers' ability to adapt to climate change (% of respondents)



KEY FINDINGS

- Agriculture in Ningxia is vulnerable to climate variations and extremes
- Farmers in the three agricultural areas show differing levels of vulnerability to the effects of climate change
- Drought is the most serious climate hazard for rural communities in Ningxia
- Farmers and their supporting institutions in Ningxia have adopted a range of adaptation measures, but these may not be sufficient to deal with longer term climate change
- Constraints most often mentioned by farmers in adapting to climate change were lack of money, water shortage and poor infrastructure.

DISENTANGLING THE INFLUENCE OF CLIMATE

Rural livelihoods in Ningxia are complex, being made up of many activities. They are also evolving rapidly as part of China's macro-economic changes.

In this study, 'livelihood' is taken as not just the financial means whereby someone lives; it combines the 'resources' people use and the activities they undertake in order to live. 'Resources' include natural resources (e.g. soil, water, crops, livestock), money,

equipment, tools, knowledge and skills. People's actions respond to many interacting influences of which climate is just one. This can make it difficult to assess the influence of climate on people and communities.

Good understanding of the vulnerability and adaptive capacity of local communities forms a key stage in the development of effective adaptation responses (described in a separate pamphlet).

FURTHER INFORMATION

The full report, *Climate and livelihoods in rural Ningxia*, together with all the other reports and six summary pamphlets from the project, are available from the project website www.china-climate-adapt.org.

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