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Study on Index of Agricultural Drought Disaster Resilience Assessment from Multiple Spatial Scales

A case study of large-scale drought of Northern China in 2009

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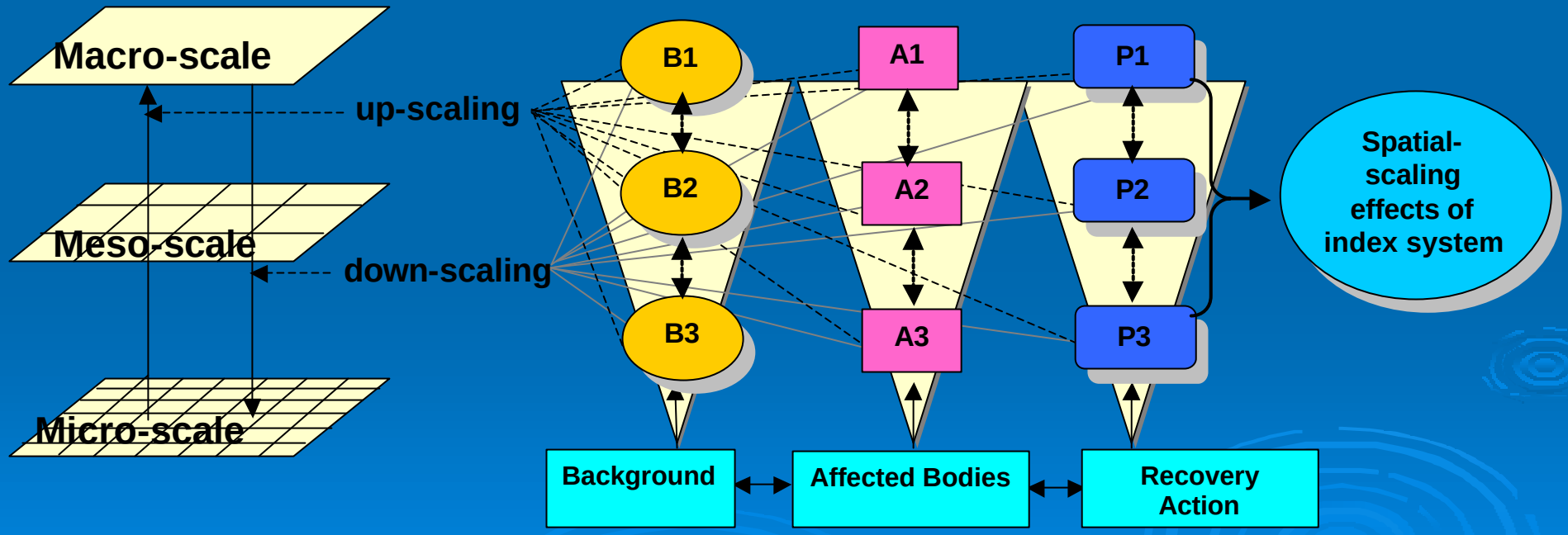
1 Introduction

- In recent years, resilience becomes a hot topic in the disaster field. Researches on agricultural drought resilience are still scarce.
- Some researches focused on the concept and determinants of agricultural drought resilience (Berzborn, 2007; Alwin et al., 2008; Gao et al., 2008; Zhou et al.,2009). Fewer researches analyzed the spatial characteristics of it.
- Based on the case study of large-scale drought of northern China in 2009, we analyzed recovery measures taken in this drought on different spatial scales to explore how to choose indexes to assess agricultural drought resilience based on different spatial scales.

2 Methodology

- 2.1 Model of Resilience Assessment from Spatial Dimension (MRASD)



2 Methodology

2.2 Division of Spatial Scales

- Divide spatial scale mainly according to criteria for the classification of administrative units, considering following three points:
  - ? administrative unit is a political unit.
  - ? Administrative unit is an economic unit.
  - ? Administrative unit is a social unit.
- Considering farmers as one of the main bodies of drought recovery actions, we use state, province, county, town and household as the basis unit of information collection and analysis.

2 Methodology

2.3 Data and Methods

- Collect information about drought-recovery actions carried out on January 20th to February 20th mainly from the reports on the web sites of the water department, and newspapers.

- The process is as follows:
  - ? Divide spatial scales, in part 2.2.
  - ? Classify recovery measures taken to enhance drought resilience into five scales mentioned above, and eleven aspects.
  - ? Analyze spatial characteristics of recovery measures and build the corresponding index systems of resilience of agricultural drought based on the conceptualization of the MRASD.

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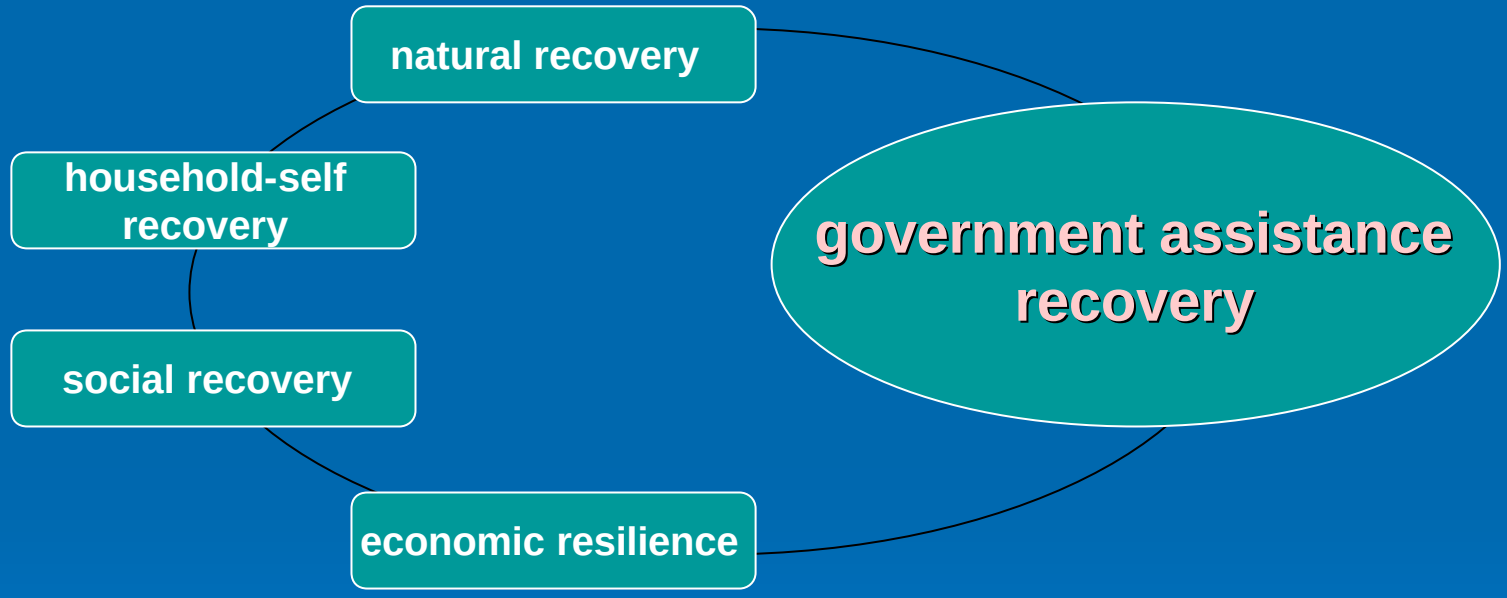
- 3.1 **“Government Assistance” Recovery Mode**



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- 3.2 **Analysis on spatial-scaling characteristic of recovery actions**

- **Eleven types of recovery actions were divided according to the information and data from case study, including policy, management, water source, water conservancy facility, fund, material, energy, technique, technician, information, and mobilization.**

Table Recovery measures at each spatial scale for the large-scale drought in Northern China in 2009 (part)

	State	Province	County	Town	Household
……					
Energy	Organizing provincial electric enterprises to ensure electricity security	Price adjustment of electricity and oil; Issuing electricity quota	Adjustment of operation way of electric network; Examining and repair of rural power lines; Setting up temporary power supply facilities; Sending oil to the field	Setting up temporary power supply facilities	Buying energy
Technique	Publicizing drought cultivating techniques by media	Publicizing drought cultivating techniques by media	Publicizing drought cultivating techniques by media and organizing training	Publicizing drought cultivating techniques by organizing training	Learning and using techniques
……					

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- 3.2 **Analysis on spatial-scaling characteristic of recovery actions**

- There are obvious differences of recovery actions between spatial scales classified according to administrative unit (state, province, county, and town) and household scale.

- Different levels of governments have different focuses in assistance.

- Different levels of governments have different ways of assistance. (take technician and mobilization foe example)

4 Construction of index system of agricultural drought resilience assessment from spatial dimension

- Agricultural drought resilience is a characteristic of human and nature system to reduce drought's impact on agriculture production system.

- The resilience is not only decided by attribute of environment and drought-affected body, but also by recovery actions.

- Taking the spatial-scaling characteristics of recovery action, environment, and affected-body into account, index system of agricultural drought resilience assessment from spatial dimension was constructed in order to provide a reference to the similar researches.

Table Index system of agricultural drought resilience assessment in five spatial scales (part)

	State (S)	Province (P)	County (C)	Town (T)	Household (H)
Recovery measure (C)	…… S_C3 Number of large-sized WCF S_C4 Proportion of drought-relief funds in financial budget S_C5 Proportion of R&D of dry farming technique S_C6 Layout of DRMRB S_C7 Type of repertory materials S_C8 Number of repertory materials ……	…… P_C2 Number of large, mid-sized WCF P_C3 Proportion of drought-relief funds in financial budget P_C4 Proportion of pilot county of dry farming technique P_C5 layout of DRMRB P_C6 Type of repertory materials P_C7 Number of repertory materials ……	…… C_C2 Number of mid, small-sized WCF C_C3 Proportion of pilot areas of dry farming technique C_C4 Number of county drought service system C_C5 Proportion of agricultural technician C_C6 Type of repertory materials ……	…… T_C2 Number of small-sized WCF T_C3 Proportion of pilot areas of dry farming technique T_C4 Number of town drought service system T_C5 Proportion of agricultural technician T_C6 Road accessibility T_C7 Density of electricity network ……	H_C1 Fighting against drought or not H_C2 Implementation of dry farming techniques or not H_C3 Family structure H_C4 Level of income H_C5 Level of education H_C6 Type of equipment H_C7 Number of equipment ……

Note: WCF-Water Conservancy Facilities; DRMRB- Disaster Relief Material Repertory Base.

5 Conclusions and discussion

- Government assistance is the most important driving force in the recovery progress of the large-scale drought of Northern China in 2009.
- Recovery actions have obvious spatial-scaling characteristics. Key points and ways of recovery are different at different spatial scales.
- Resilience has different determinants at different spatial scales, and even the same determinant have different characteristics, so we should select separate indices for each scale.

- This is just a preliminary study on spatial scale issues of agricultural drought resilience assessment. The index system remained to be perfected and Verified.

Thanks for your attention