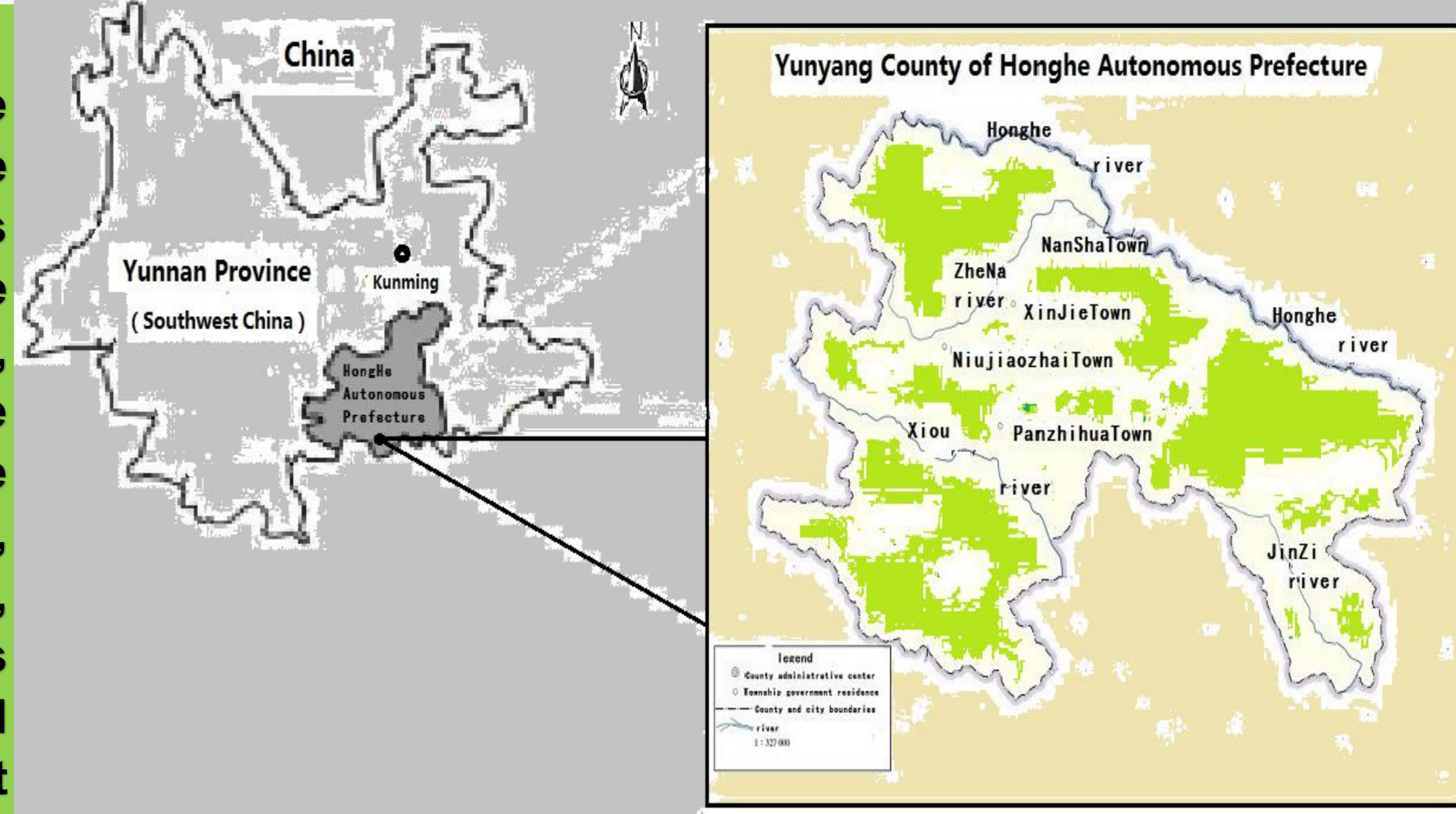




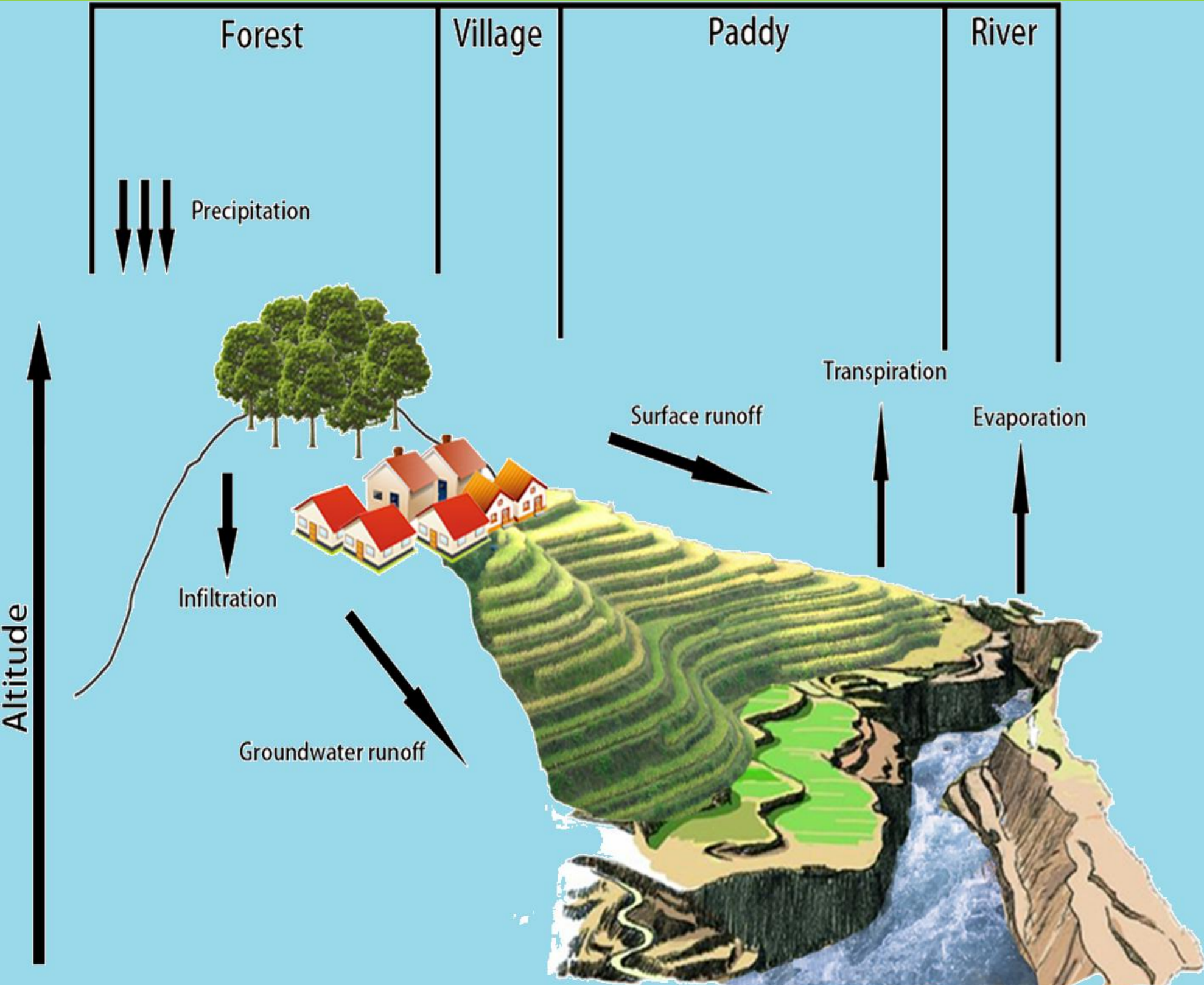
# Integrated cropping patterns and food security in rice:

## insights from Honghe Hani terraces ecosystem in mountainous ethnic region of Southwest China

Currently, the Chinese government and the private sector jointly promote the large-scale "rice-fish-duck" integrated farming model in some terraced rice-farming areas in the mountainous regions of southeast and west China. Even in the remote mountainous areas of southwest China, in the name of intensive and efficient use of land to produce hybrid rice, the "rice-fish-duck" integrated farming model has been declared as a green, high-yielding, and efficient integrated farming model. To a certain extent, the single rice income in traditional agriculture is transformed into the comprehensive income of rice (red rice), fish and loach in terraced fields, duck and duck eggs in terraced fields, realizing "three uses in one water and more income in one field". But at the same time, the changes in the terrace ecosystem and its impact on local rice germplasm resources and regional food security are little known. Therefore, this paper takes the integrated farming model of "rice-fish-duck" as an example to discuss the dynamic impact of joint rice production on local ecology and livelihoods in the ethnic mountainous areas of southwest China. Through the comparison of different "rice-fish-duck" comprehensive business models, the key aspects of the variables that affect the agricultural transformation process are revealed. In the process of agricultural transformation, the "high value" of the added value of community agricultural commercialization is a value mobilization strategy led by "scientific agriculture" from top to bottom. This paper argues that the power relations in the current rural society make it possible to promote "scientific agriculture" and "commercial agriculture", which leads to the success of the commercial value and poverty reduction significance of the integrated farming model reported by the government, but in practice it is contrary to the traditional agricultural knowledge structure in the community on a day-to-day basis. The impact of this project on the centralized, balanced and sustainable mountain agricultural ecosystem is worthy of further observation and discussion.



Research sites: globally important agricultural and cultural heritage—Honghe Hani Terraces



"Four Elements Isomorphism" Natural Ecological Circulating System of Honghe Hani Terraces  
Figure source (Binsheng Luo, Bo Lu, etc., 2019)

### Nature-Humanity Complex Ecosystem

#### 1. Natural ecosystems (UNESCO)

forests - villages - terraces - watersheds - minorities - cultures - religions

#### 2. Integrated symbiotic breeding system (TLEK)

human - rice - fish - microbe - other organisms

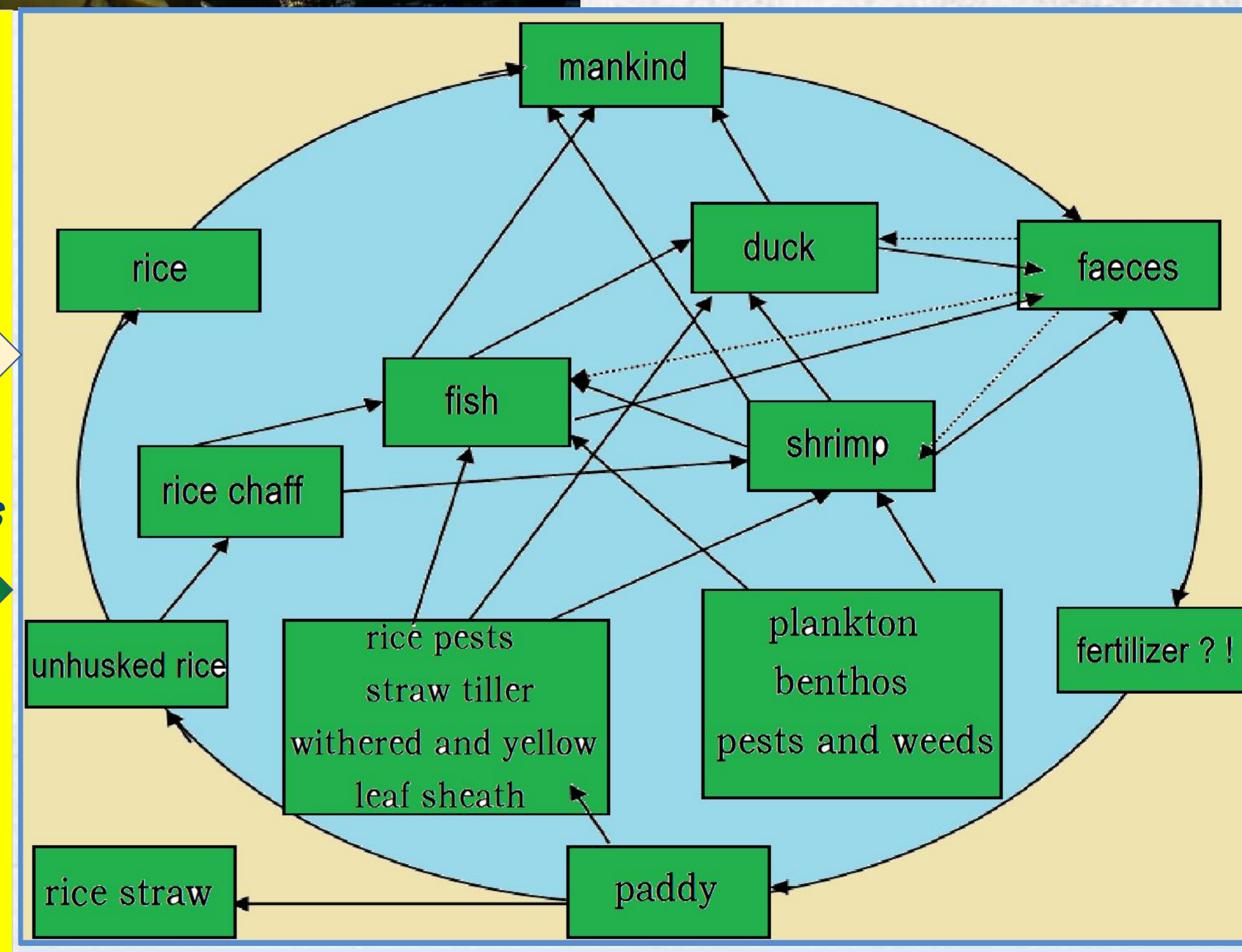
#### 3. Integrated reclamation

system of terraces farming (UNFAO)

rice farming system of terraces farming in mountainous area;

three plough three rake;

irrigation water resources management.



"Rice-fish-duck" symbiotic system

### Mountain ecological security barrier facing Southeast Asia

1. Cross-regional economic and social types of "South Asia - East Asia - Southeast Asia"

2. Wetland ecosystem

River system source water conservation;

Regional climate regulation;

Water conservation at the source of rivers—"Asian Water Tower";  
International Rivers in Southeast Asia;

Regional climate regulation.



Cross-regional economic and social types of "South Asia - East Asia - Southeast Asia"

### Food Security Issues

1. Traditional agricultural knowledge structure in the community on a day-to-day basis.

Three plough three rake;  
Exchange rice seeds.

2. Local rice germplasm resources security.

Age	Region	Rice varieties (total)	Indica rice	Japonica rice	Upland rice
1970s	the core area of Honghe Hani Terraces	200	171	25	47+

3. Commercialization and large-scale planting of single "terraces red rice"

Simplicity of rice varieties;  
Can not resist pests and diseases;  
Altitude stratification is not adaptive.



Planting cycle arrangement of rice in Han terraces