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Telecoupling the check dam construction and grain production: a case of Yulin city in Shaanxi Province, China

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1. Introduction

- As of 2019, there are more than **58776** check dams built across the China, which have strong implications for intercepting soil sediment, **increasing agricultural production and croplands**. The **urbanization** rate increased rapidly from **36% to 61%** during 2000-2020 in China. Urban expansion will encroach on surrounding cropland, which **seriously affects food production**.

Question:

What is the impact of check dam construction on food yield of nearby city?



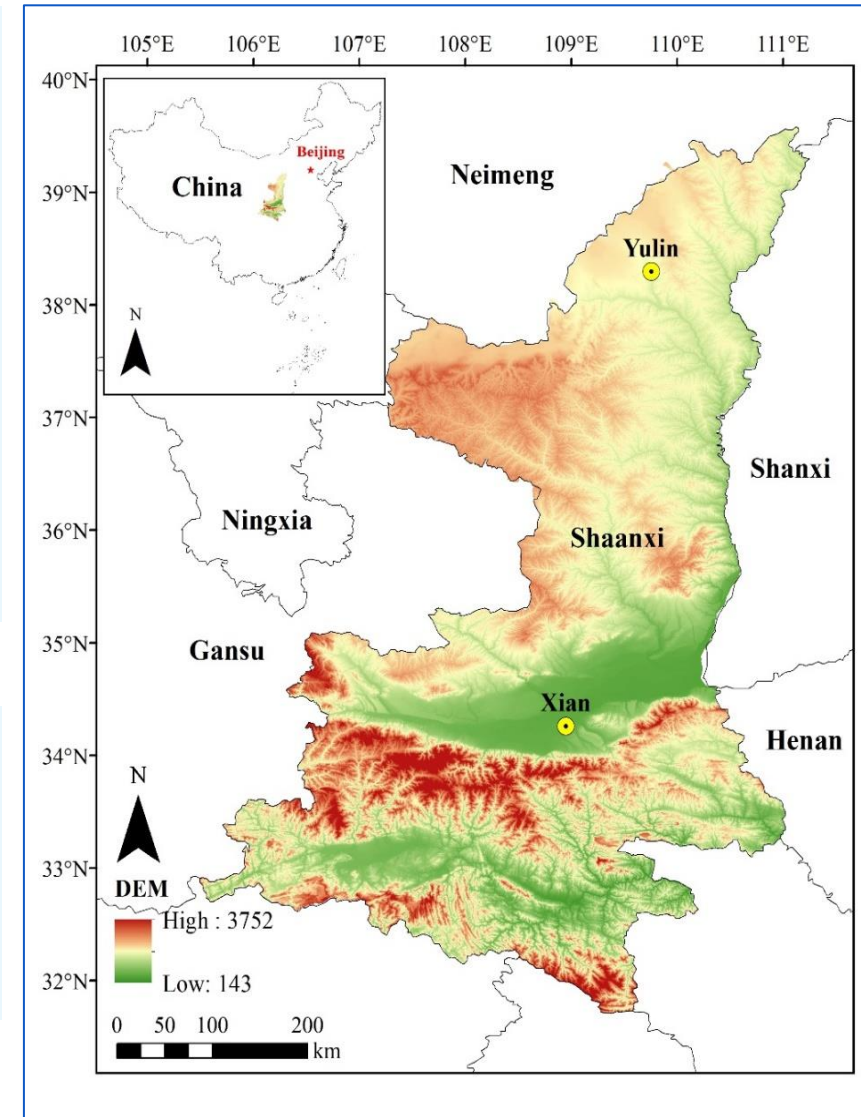
2. Material and method

Study area

- By 2020, the check dams in Shaanxi Province have been built **34,000**, accounting for more than **half** of the check dams have been built in the China, including **22,000 in Yulin**.
- From 2000 to 2020, the proportion of urban population increased from **32% to 63%**

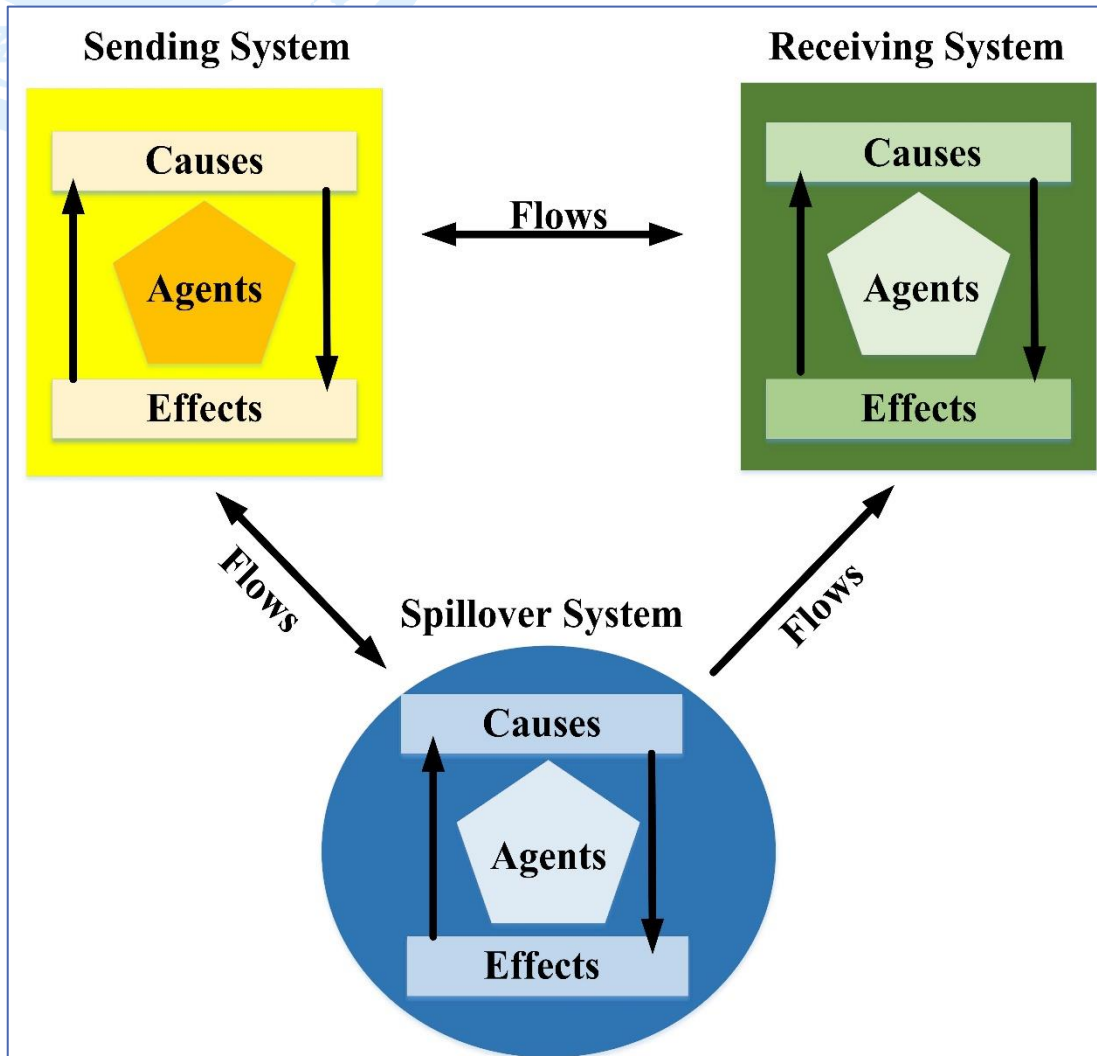
Dataest

- The cropland and grain production data of the Shaanxi province were collected from the **statistical yearbook**.
- The check dams data were obtained from the



2. Material and method

Deconstruction of telecoupling frameworks



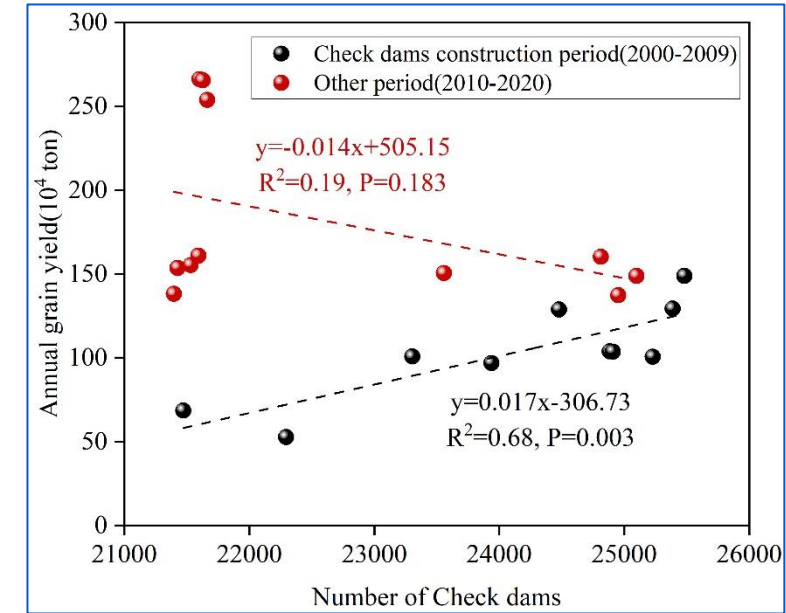
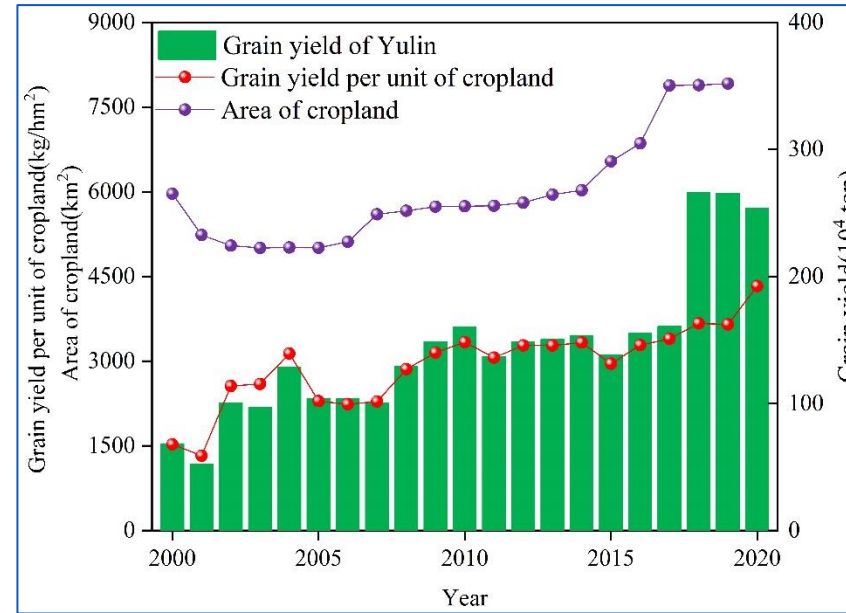
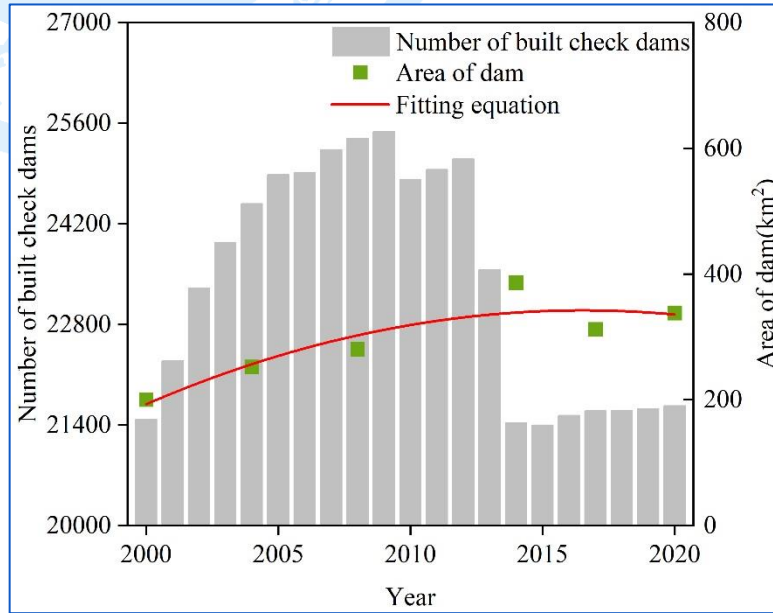
- ✓ **Impact** of sending system on receiving system;
- ✓ **Interaction** between sending system/receiving system and spillover system;
- ✓ **Feedback effect** of the receiving system on the sending system;
- ✓ Analysis of the **causes and effects** of flow exchange between different systems.

For example

- ✓ Impact of check dams construction on local grain yield;
- ✓ Impact of check dams construction on Xian city's grain yield;
- ✓ Feedback effect of the grain yield on the check dams construction;
- ✓ Analysis of the causes for the interaction between check dams construction and local and other regional food yield.

3. Results

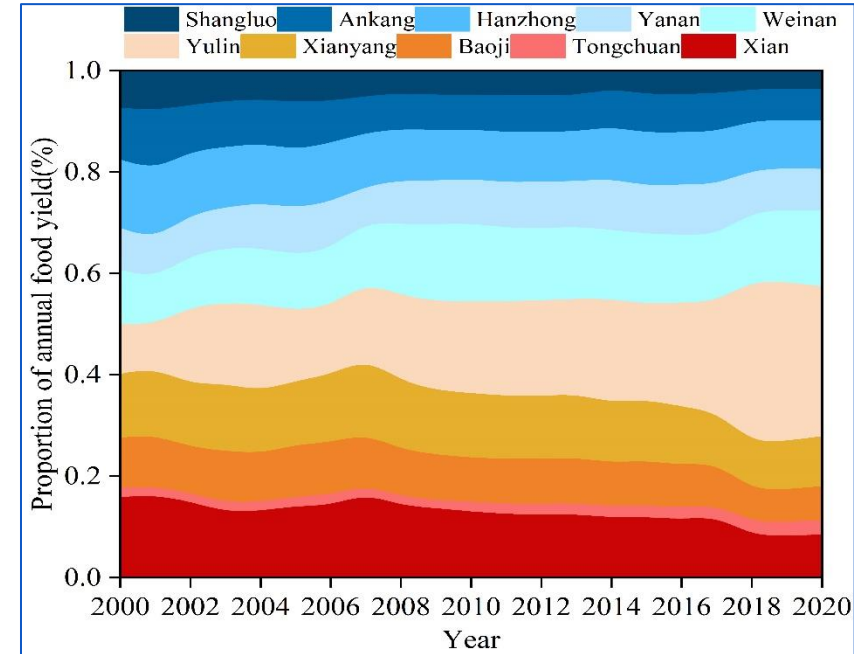
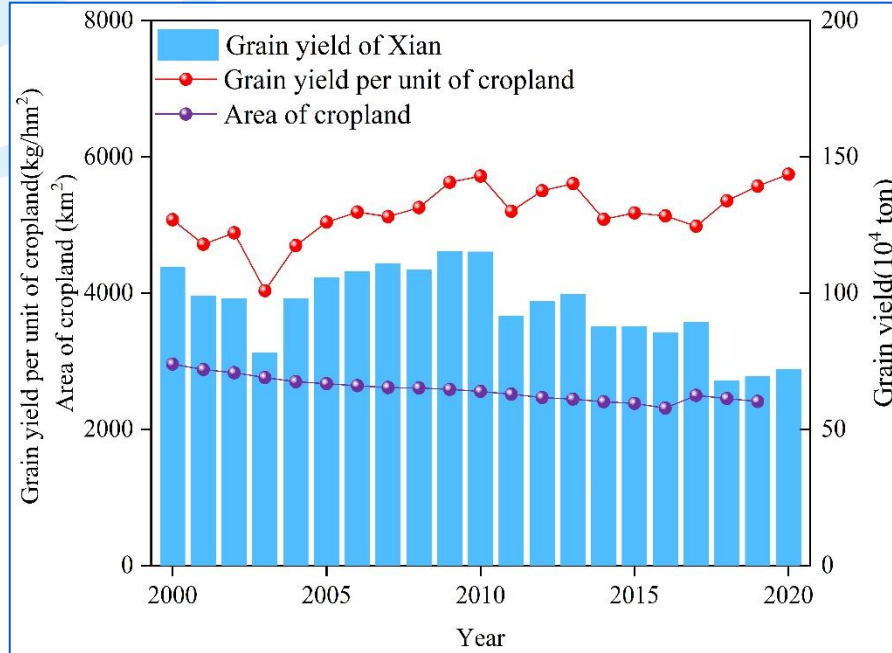
Impact of check dams construction on local grain yield



From 2000 to 2009, the number of check dams in Yulin grew rapidly, from **21474 to 25480**. At the same time, the **annual grain yield** increased from **0.7** million tons to **1.6** million tons. The **correlation analysis** revealed that the rapid construction of check dams **contributed to** the significant increase of grain yield.

3. Results

Impact of check dams construction on Xian city's grain yield

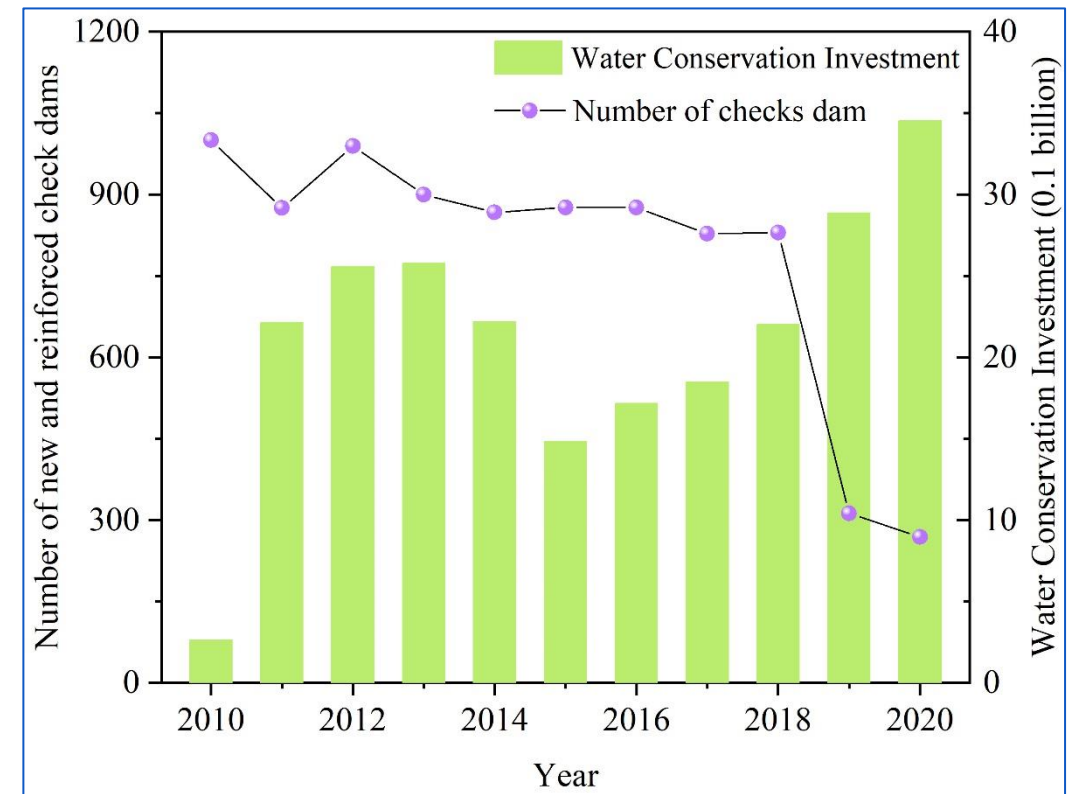


The **annual grain yield** in Xi'an **decreases continuously** with the decrease of **cropland** from 2000 to 2020. The contribution of Yulin to grain yield in Shaanxi Province has been increasing year by year, and Xi'an City has the **most serious loss** of annual grain yield as a percentage. Thus, the result shows that **dam lands** have played a vital role in compensating for Xi'an's food losses.

4. Results

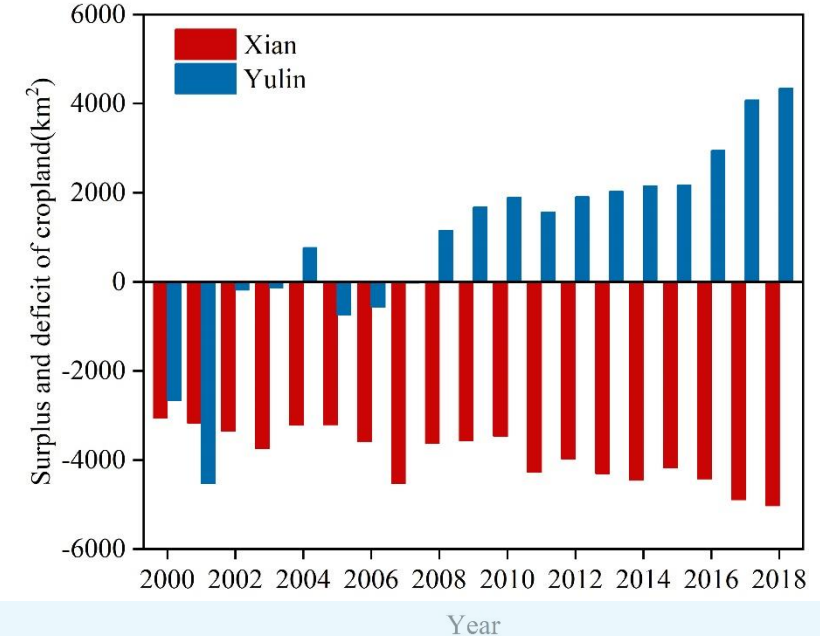
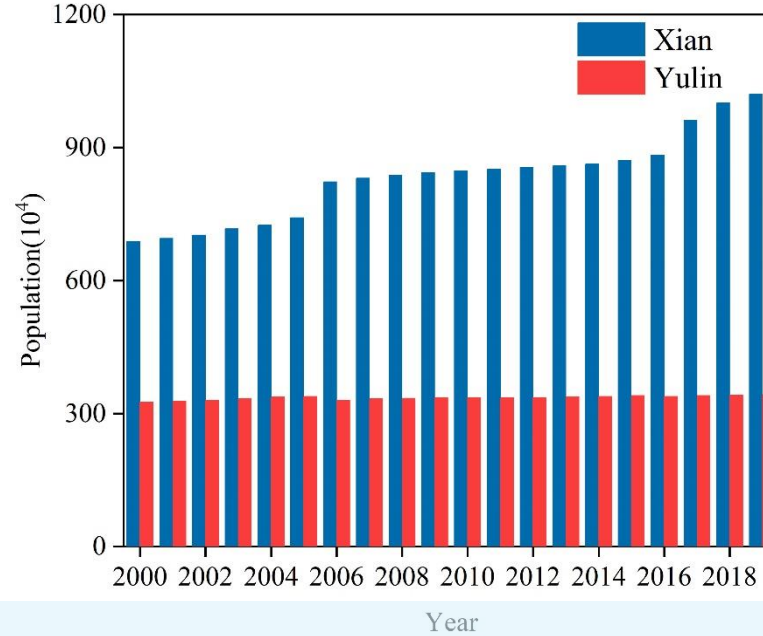
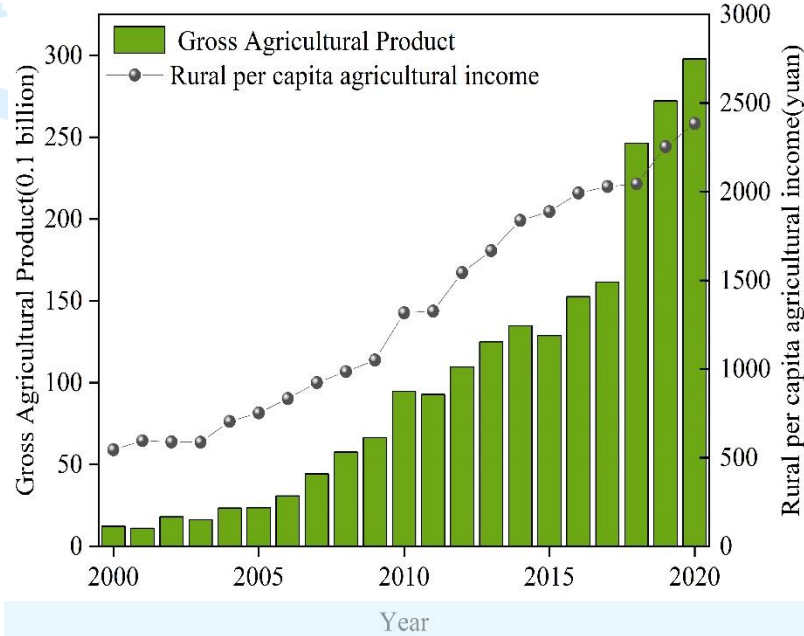
Feedback effect of the grain yield on the check dams construction

The ecological and economic benefits of check dams construction make it an **irreplaceable** and important resource, and both government and national levels have provided more than **adequate funding and related policies** for subsequent construction of check dams. Shaanxi Province has invested an average of **2.1 billion** yuan per year since 2010-2018 for **building new and de-risking of check dams**, and soil erosion control in Yulin City.



4. Results

Analysis of the causes for the interaction between check dams construction and local and other regional food yield



The improvement in **gross agricultural product** and **farmers' income** is the reason for the interaction between the construction of check dams and local food yield in Yulin. In addition, the increase of **dam land** makes the cropland area of Yulin **in surplus**. And the **urbanization** keeps increasing the **deficit of cropland** in Xi'an. **Regional food security** is the reason for the interaction between check dams construction and adjacent regions.

5. Conclusion

- During the period of **rapid construction** of check dams (2000-2009), the annual grain yield in Yulin **increased** by **117%**, and there was a **significant correlation** between check dams growth and grain yield increase.
- From 2000 to 2020, with the construction of check dams and the improvement of cropland quality, the **share of annual grain yield** in Yulin grew from **10% to 30%**, **compensating** for the loss of grain yield in Xi'an due to the **loss of high-quality cropland**.
- **Positive effects of the above** make the country and governments **constantly** increasing their investment in the construction and maintenance of check dams.

Thank you for your attention!

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