Application of spatial analysis techniques for evaluation of farmland transformation pattern: A case study of Tainan County, Taiwan.

Presenter: Chin-Hsien Liao

Department of Urban Planning, National Cheng Kung University, Tainan, Taiwan
krien3082@hotmail.com.
Outline

• INTRODUCTION

• RELATED THEORIES AND RESEARCH METHODOLOGY

• OPERATION AND DISCUSSION

• ANALYSIS AND RESULT

• CONCLUSION
INTRODUCTION

• Taiwan farmland profile

According to the Agriculture Annual Report by the Council of Agriculture, have been **178,956.04 hectares** of farmlands transformed at **1993 to 2009**.

In Taiwan, a **production scale diseconomies** average around **1.25%** of farmland is being converted to other uses **each year**.

- **51% transformed to non-agricultural**
- **22% become obsolete or forestation**
- **7% changed to fishing ground**

• Critical Thinking
• Location characteristic of farmland transformations

1) Farmlands resource transformation:

Many experts have conducted several researches in comparing farmland distributions and location transformations in different time periods.

The conclusions were similar and pointed out those farmlands located at near suburban suffered much lower land use efficiency than at city centre or new developing areas at urban fringe.
RELATED THEORIES AND RESEARCH METHODOLOGY

The sustainable value of farmlands:
• supplying food
• providing living spaces
• open spaces
• moderating weather
• preventing flood
• urban sprawl.

• Functions of Farmland:
  • CO2 to create O2
  • moderating micro-climate
  • protecting soil and water
  • decreasing urban heat island effect.
The spatial distribution of the farmland transformation

In Tainan, Taiwan the farmland had ninety thousand ha. Numerous agriculture county face transformation issues as to they keep balance between three aspects, ecological, environmental and economical, while discussing farmland issues. Especially, the farmland transformation total 3,795 ha at 1995 to 2006.

Figure. The spatial distribution of the farmland transformation
• **Spatial Autocorrelation and cluster analysis**

The measures of farmland transformation used Geographic Information System and Geoda in mapping the rice farmland, wasted farmland and non-irrigated farmland transformation distributions.

Second, we used the spatial autocorrelation analysis will be introduced in analyzing the relation strength between the characteristics of farmland transformation.

![Figure. The spatial autocorrelation of the farmland](image-url)
ANALYSIS AND RESULT

• Moran’s I of farmland

<table>
<thead>
<tr>
<th>Farmland</th>
<th>Moran’s I</th>
<th>Number</th>
<th>Total(ha)</th>
<th>Moran's I</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995 Farmland</td>
<td></td>
<td>46551</td>
<td>9288.26</td>
<td>0.86</td>
</tr>
<tr>
<td>2006 Farmland</td>
<td></td>
<td>61252</td>
<td>5493.00</td>
<td>0.13</td>
</tr>
</tbody>
</table>

• Descriptive statistical characteristics of farmland type

<table>
<thead>
<tr>
<th>Farmland type</th>
<th>Number</th>
<th>Total(ha)</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995 rice farmland</td>
<td>18457</td>
<td>2555.99</td>
<td>0.26</td>
</tr>
<tr>
<td>1995 non-irrigated farmland</td>
<td>26146</td>
<td>6642.00</td>
<td>1.31</td>
</tr>
<tr>
<td>1995 wasted farmland</td>
<td>1948</td>
<td>90.26</td>
<td>0.12</td>
</tr>
<tr>
<td>2006 rice farmland</td>
<td>14775</td>
<td>1591.30</td>
<td>0.17</td>
</tr>
<tr>
<td>2006 non-irrigated farmland</td>
<td>41048</td>
<td>3659.45</td>
<td>0.30</td>
</tr>
<tr>
<td>2006 wasted farmland</td>
<td>5429</td>
<td>242.25</td>
<td>0.14</td>
</tr>
</tbody>
</table>
ANALYSIS AND RESULT

The LISA analysis of the rice farmland

The LISA analysis of the non-irrigated farmland

The LISAC analysis of the wasted farmland
• Ecological footprint analysis

According to Wackernagel and Rees (1996) to measure human beings occupancy to eco-resources view, which is the Biological Productivity Area, in order to evaluate the impact of human beings’ activities on the ecology.

The Ecological Footprint measures the amount of biologically productive land and water area an individual, a city, a country, a region, or all of humanity uses to produce the resources it consumes and to absorb the waste it generates under current technology and resource management practices.
ANALYSIS AND RESULT

The ecological footprint in Taiwan.

The ecological footprint in the world.
CONCLUSION

• First, farmland transformation might have different spatial distribution. How to declare and categorize a factor based on its identity and effectiveness is a quite important and skillful work.

• Second, this paper use ecological footprint analysis provide snapshots of past farmland resource demand and availability.

• Finally, it is important to involve the public sector and planning mechanism to make the best use of farmland in order to balance the economic, ecological, and environmental functions of farmlands.
REFERENCES

The End~
Thanks You

Liao Chin-Hsien
Department of Urban Planning,
National Cheng Kung University, Tainan, Taiwan
krien3082@hotmail.com.