47. An Economic Study of Land Use in Taichung Area, Taiwan

臺灣縣市土地利用之經濟研究

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Purpose of Study:

This is a report of an economic study of agricultural land use in Taichung Hsien and City, central Taiwan, China. The purposes of this study were:
1. To make a map of agricultural regions for the study area.
2. To make an economic land class may within each agricultural region of the study area.
3. To conduct a farm management survey within Taichung Hsien and City so that (a) Differences among regions and economic land classes can be described and analyzed. (b) Differences among farms in the same agricultural region and economic land class can be studied.
4. To give graduate students of the Research Institute in Agricultural Economics, College of Agriculture, Taichung, Taiwan an opportunity to participate in an economic land classification study.
**Methods and procedures used in this study:**

This study is divided into three parts. They are:

1. Studying factors related to differences in agricultural regions, placing these data on maps, interpreting them and preparing an agricultural region map.

2. Studying factors related to differences in intensity of land use and income within regions, placing these data on maps, interpreting them and preparing an economic land class map.

3. Making a farm management survey stratified by agricultural regions and economic land classes.

An important technique in the preparation of land classification maps is to place available data and information on maps and then superimpose the various maps, actually or figuratively, over each other to study interrelationships. A basemap must be selected on which data can be recorded for study, and the final map prepared. In an economic classification of land it is usually best to move from results, such as income or population density, to land use, and then to the physical land characteristics which act as causes.

In this study two base maps were used. A map prepared by the Survey Department CCSF at scales of 1:25,000 and 1:50,000 was obtained through the U.S. military advisory group. The scale of 1:25,000 was used where available. It showed land use information, topography at contour intervals of 10 meters, roads, railroads location of farmsteads, and urban areas. The other base map was prepared from information obtained from township offices. It showed hsien, township and village boundaries. The latter map was used to record data obtained from the township offices.

The steps in the procedure were approximately as follows:

1. Preparation of agricultural region map by:
   (1) Selection and preparation of base maps.
   (2) Calculation of area per farm household by villages and placement of these data on base map showing villages.
   (3) Inspection of maps showing land use.
(4) Study of inter-relationship of land use and farm population density with land features, especially topographic and climatic features.

(5) Drawing of preliminary agricultural region map based on natural features.

(6) Checking agricultural region map with aerial photos.

(7) Reviewing questionable areas in the field and drawing final agricultural region map.

(8) Classifying villages according to dominant agricultural region and adjusting boundaries to the nearest village boundary based upon this classification.

Steps (7) and (8) indicate that two agricultural region maps were prepared, one with boundaries based upon natural land differences such as elevation and presence or lack of irrigation; the other with these “natural” boundaries adjusted to the nearest village boundary.

2. Preparation of economic land class map by:

(1) Using the same base maps as those used in preparing agricultural regions.

(2) Calculating various measures of intensity of use within regions by villages.

Maps prepared for Taichung Hsien and City were:

(a) Multiple cropping index.
(b) Yields of important crops.
(c) Percentage of cultivated area in intensive, medium intensive and extensive crops.

(3) Classifying individual farms and villages as to size and condition of visible capital. These ratings were recorded on the base map prepared by the Survey Department CCSF.

(4) Interviewing many farmers on an informal basis while doing step (3). The purpose was to get local opinion of crop yields, land values, changes in productivity of land and land grade.

(5) Drawing of preliminary economic land class lines based upon natural land features using village data, farm classification map and field notes.
(6) Reviewing preliminary map by comparing it with aerial photos and with "land use capability map". The "land use capability map" referred to here is a map showing present land use and "hazards or other limiting factors" to land use. It has been prepared by aerial photo interpretation for Taiwan and is similar to the land use capability maps prepared by the Soil Conservation Service of the United States Department of Agriculture. It was sponsored by JCRR and made by the Taiwan Research Institute with the cooperation of the Survey Bureau of the Combined Service Force, Taiwan Fertilizer Company and Taiwan Forestry Research Institute.

(7) Checking doubtful areas against their land grade rating and with local farm leaders.

(8) Preparation of final map. In the Rice Region the economic land class boundaries were adjusted to nearest village boundary but this was impractical in the Upland Regions where land class areas were small and boundaries irregular. In the Rice Region, therefore, two economic land class maps were prepared for Taichung Hsien and City, one using natural boundaries, the other adjusted to village boundaries.

3. Farm management survey was made by:

(1) Determining the objectives of the survey with the help of Professors of Farm Management and Graduate Students of the Taiwan Provincial College of Agriculture. (Re-organized as Chung Hsing University in 1961)

(2) Preparing a survey schedule.

Hsu Yu-chu took leadership in this phase. Previous farm management surveys had been made by staff members of the Colleges of Agriculture at Taichung and Taipei. Time was limited so it was decided to have them revise the previous survey schedule rather than build a new one. Questions were raised about the practicability of getting detailed data by enterprises because the questionnaire was longer than those ordinarily used in the United States. The number of enterprises for which
detailed data were taken on any one farm was limited to three.

(3) Drawing a random sample by villages for two regions and by land classes in the Rice Region (See sampling procedure).

(4) Testing questionnaire in the Field.

It took about 2½ hours on the average when used by interviewers for the first time. Later the interviews averaged about 2 hours.

(5) Training enumerators.

Professors of Farm Management, Taiwan Provincial College of Agriculture, were in charge. (Re-organized as Chung Hsing University in 1961)

(6) Interviewing selected farm families.

Graduate students and selected senior students of Taiwanese extraction were the interviewers.

(7) Preparing an office record card.

It was used to record original and calculated data. The card made of heavy paper, was 11” x 16” in size.

(8) Calculating measures of size, income, expenses, crop yields, labor efficiency and intensity of use.

(9) Sorting the 11” x 16” cards in various ways to study relationships. Cross tabulations were made and summarized.

(10) Making statistical tests of significance and analyzing correlation coefficients of selected items.

(11) Preparing reports.

Results and Conclusions:

1. Differences in the physical characteristics of land in T'ai-chung Hsien and City determine the intensity of use to which it is adapted. These differences are reflected also in the present use of land by farmers.

2. Some differences in land use can be mapped as agricultural regions. These regions differ in the type of farming usually practised and in the density of population which can be supported, based upon the standard of living of the country.
In Taichung Hsien and City, four regions were identified and mapped.

3. The differences in agricultural regions in Taichung Hsien and City were caused mostly by climatic differences, including irrigation. Elevation and topography were also important causal factors, associated with climate.

4. Agricultural regions do not necessarily differ in the income produced per family or per person but do vary in how many persons are supported per unit of area. The Rice Region is the most densely populated and intensively used region in Taichung Hsien and City, followed by the Upland Field Crops, Upland Tree Crops and Forest Region, in that order.

5. Land also differs in the intensity of use to which it is adapted, and in the intensity with which it is used, within each agricultural region. These differences in the capacity of land within regions to repay expenditures per unit of area are reflected in both the income per chia and the income per person. These differences, called economic land classes in this study, were mapped within three agricultural regions; namely, Rice, Upland Field Crops and Upland Tree Crops. Three or four economic land classes were mapped in each region. Only the three land classes in the Rice Region however, were studied sufficiently to give a basis for drawing general conclusions. Differences in the intensity of use per chia and income per family vary significantly among economic land classes, being highest in Land Class 1 and lowest in Land Class 3.

6. Within each economic land class, a further difference in income is related to size of farm business. Size of farm appears to be even more important than economic land class. It probably is independent from economic land class as a farm characteristic when measured as land area per farm. If size of business is measured as volume of sales or days of work, it is inter-related with economic land class.

7. The highest income is earned, on the average, by families who operate large farms on the best land. If a farm family
operates less than about 0.5 hectare of land the management and labor return is very low, even on better-than-average land.

8. Labor efficiency pays, based on data in this study. This farm management factor is partially inter-related with size of farm.

9. Crop production per chia is related to family farm income and other measures of income. This factor is inter-related with economic land class but independent of size of farm.

10. Data in this study support the idea that factors of production share in proportion to the volume of production, and not on a basis that some factors of production have prior claims, and others residual claims. Contributors of fertilizer, insecticides, hired labor, repairs and the like received about 40 per cent of the gross earnings on each of the land classes in the Rice Region. In other words, cash expenses were proportionate to gross earnings. Both gross income and cash expense tended to be proportionate to total farm capital.

Likewise, labor and capital shared proportionately in the income, as the productivity of the land per chia, reflected by farmers’ estimate of market value, increased.

11. Variations of total capital investment in land, buildings, machinery and livestock were most closely related to labor and capital earnings per man, a non-residual measure of income on a “per man” basis. Other non-residual income measures usually were related to total capital, also.