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## THE GIS APPROACH METHOD FOR SUMMARIZING VIETNAM AGRICULTURAL COOPERATIVES MODELS SINCE TRANSFORMATION ACCORDING TO THE VIETNAM COOPERATIVE LAW 2012

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**Keywords:** GIS, transformed agricultural cooperative, Vietnam Cooperative Law 2012

### Abstract

This paper presents the GIS approach application methodology for analyzing the transformation of Agricultural Cooperatives under the Vietnam Cooperative Law 2012. Through the survey data at 90 cooperatives at 9 provinces in 7 economic regions of Vietnam, which can assess the level of the transformed successful group, transformed not successful group and do not transform of the agricultural cooperatives.

GIS analytical tools allowed for spatial analysis using field survey data. From that, the managers can determine the level and quality transforming of the Agricultural cooperatives under the Vietnam Cooperative Law 2012 according to the four selected criteria.

## ZASTOSOWANIE GIS DO PODSUMOWANIA MODELI WSPÓŁPRACY ROLNEJ WIETNAMU OD CZASU TRANSFORMACJI ZGODNIE Z PRAWEM SPÓŁDZIELCZYM WIETNAMU Z 2012 ROKU

**Słowa kluczowe:** GIS, transformowane spółdzielnie rolnicze, Ustawa o Spółdzielczości Wietnamu 2012

### Abstrakt

W niniejszym artykule przedstawiono metodologię stosowania podejścia GIS do analizy transformacji spółdzielni rolniczych w ramach wietnamskiej ustawy spółdzielczej z 2012 roku. Dzięki ankietom przeprowadzonym w 90 spółdzielniach, w 9 prowincjach oraz w 7 regionach gospodarczych Wietnamu dokonano oceny poziomu przekształconej z sukcesem grupy, przekształconej nieudanie grupy i nieprzekształconej grupy spółdzielni rolniczych.

Dzięki narzędziom analitycznym GIS przeprowadzono analizę przestrzenną, wykorzystując dane z badań terenowych. Na tej podstawie menedżerowie mogą określić poziom i jakość przekształcania spółdzielni rolniczych w ramach Wietnamskiej Ustawy Spółdzielczej 2012 zgodnie z czterema wybranymi kryteriami.

### 1. INTRODUCTION

Already during the early 1990s, Vietnam can be seen as an example of a successful agricultural transition in

criteria of poverty reduction, economic growth and political stability are to be used (Fforde 2002: 204). In 1996, Vietnam had a Cooperative Law at the first time, the agricultural cooperative of Vietnam was changed in

terms of organization form and mode of operation in accordance with the law.

Up to now, the agricultural cooperative in Vietnam had adjusted twice in organization form and mode of operation under the Cooperative Laws 2003 and the Cooperative Laws 2012. The Vietnam Cooperative Law 2012 defines “Cooperative is a collective economic organization, co-ownership with legal entity, and is established voluntarily by at least 7 members and mutually cooperate and assist in the production, sales and job creation to meet the general needs of all members, on the basis of self-control, self-responsibility, equality and democracy in management of cooperative.” (The National Assembly, 2012).

In Vietnam, the process of developing and converting agricultural cooperatives following 1996, 2003 and 2012 cooperative law have not been successful yet (MOLISA, 2015; 2016). It does not satisfy the expectations of cooperative’s members and the requirements of Vietnam’s socio-economic development. Specifically, the agricultural cooperative movement has been implemented in Vietnam for a long time. However, the effect of the agricultural cooperative has not achieved as expectation, the old cooperative model does not conform to the requirements of agricultural developing in the new change situation; and it has not created the new big agricultural cooperatives which are organizing, operating lawfully the cooperatives law.

Up to now, the cooperative’s conversion period ended on July 31st, 2016, but few of cooperatives has converted successfully and/or formal only. Most of the new cooperatives have done the legal formalities for conversion and re-registration at the end of 2015, but they were not operating under the legal regulation of the Cooperative Law 2012 (MOLISA, 2015; 2016). The capacity and organization effectiveness of agricultural cooperatives have limited. The majority of agricultural cooperatives are confused in business activities, and there is no working closely between cooperative and its members, so the positive effect is limited. Cooperatives have re-registered, which are unable to expand the operation of business activities, so resulting in a low turnover, ineffective business; especially for cooperatives with few members, the development of cooperatives has been many difficulties. Pre-fact above, it is necessary to apply scientific and new technologies in managing and evaluating the conversion quality of cooperatives under the Cooperatives Law 2012.

In recent years, information technology is the trend age, and Geographical Information System (GIS) has been widely applied in many fields of Vietnam and other countries. With the advantages of the ability to analyze, display, share information, updates, etc. GIS has actually become an effective tool to support the state management and economic development (Mekong river delta, 2002; Nguyen Ngoc Thach, 2007; Kang-Tsung Chang, 2008; McCall M. K., 2003), as well as in assessing the conversion of agricultural cooperatives in the present and in the future. GIS has quickly become a tool to make decision support from planning to management, all of the natural resources such as the environment, land use, minerals, technical infrastructure; and human society. In agriculture, GIS technology has proven effective in managing agricultural production and land use planning, environmental management, agricultural production orientation. It is increasingly effective, becoming a tool of decision support for planning and managers agriculture (Nguyen Van Bo, 2013; Christopher Edmonds, 2002; Ghana Agriculture online GIS Platform).

In Vietnam, base on the survey data of 90 agricultural cooperatives located in 7 economic regions of Vietnam, which was supported by National Project “Research and propose solutions to promote conversion of organization form and operation mode of Vietnam cooperative, for the effective implementation of the Cooperatives Law 2012”, the GIS database of Vietnam cooperative has been established in order to evaluate the current status of organization form and operation mode of Vietnam cooperative under the Cooperatives Law 2012.

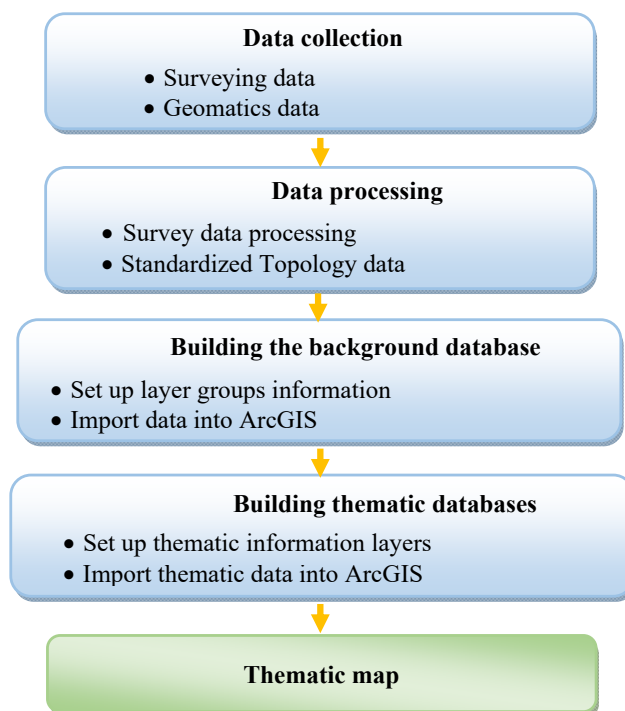
## 2. THE PROCESS OF GIS DATABASE

The GIS database serves to summarize successfully transformed agricultural cooperatives model under the Cooperatives Law 2012, which is established according to the process (Fig 1).

### 2.1. Data collection

Collect relevant materials from central government and localities to analyze and evaluate materials, thence bring out process planning and the way using each type of material:

- Map data:
  - Administration maps of 9 provinces established in 2013.



**Fig. 1.** The process of GIS database serves to summarize successfully transformed agricultural cooperative models under the Cooperatives Law 2012

**Rys. 1.** Proces bazy danych GIS służący do podsumowania pomyslnie przekształconych modeli spółdzielni rolniczych zgodnie z ustawą o spółdzielniach z 2012 r.

- topographic map scale 1: 100,000 of 9 provinces was revised in 2008.
- The administration maps perform Directive No 364/CT.
- administration maps set up by the Viet Nam publishing house of natural resources, environment, and cartography in 2013.
- Survey data: including all survey data of cooperatives in the national project area.

## 2.2. Processing and modifying data

- Mapping data: Geodatabase and thematic maps are unified in the VN2000; UTM projection grid, zone 60; prime meridian 105o; Ellipsoid WGS84).
- Survey data: The survey data includes all information, questionnaires on cooperatives in the surveying field trip. The survey data on the cooperatives is a significant information source for assessing the transformation of cooperatives under the Cooperatives Law 2012.

## 2.3. Building the background database

The establishment of GIS database based on administration maps of each province which is consisted of two main components: spatial data and attribute data. These two elements must be linked together through the feature code, which has only one object code.

The GIS database is stored on 6 object class packets with content requirements and spatial relationships between objects as follows:

- Feature Dataset class: The basic class describes the general characteristics of objects including: space limits (internal frames), national coordinate points, map names, scale, etc. It is set into three feature class: FrameByDo, DiemGocQuocGia, GhiChuCoSo.
- Administrative boundaries class: The administrative boundaries are including three feature classes: DuongBienGioi, DuongDiaGioi, DiaPhan.
- Topography class: Topography class describes the land, soil, road and elevation, including 5 feature classes: DuongBinhDo, DiemDoCao, DiaHinhDacBiet, DiaDanhSonVan, GhiChuDiaHinh.

- Population and infrastructure class: The population and infrastructure class comprise layers of information describing the population and economic, cultural and social objects. It is divided into 5 Feature class: DiemDanCu, TramQuanTrac, KhuChucNang, DiaDanhHanhChinh, GhiChuDanCu.
- Traffic class: Traffic class consists of information layers that describe traffic factors and their dependencies, divided into 8 feature classes: DoanTimDuongBo, NutMangDuongBo, DoanDuongSat, NutMangDuongSat, BenBai, CauGiaoThong, HamGiaoThong, Deo, GhiChuGiaoThong.
- Hydrologic classes: hydrodynamic layers describing hydrology and relative objects, including 15 feature class: Bien, BaiBoi, Dao, DuongBoNuoc, DuongMepNuoc, RanhGioiNuocMatQuyUoc, SongSuoi, KenhMuong, MatNuocTinh, CongThuyLoi, Dap, De, TramBom, NhaMayThuyDien, GhiChuThuyHe.

## 2.4. Building thematic databases

The database of thematic information was established base on cooperatives survey data. The research data on agricultural cooperatives in 9 provinces (including Thai Nguyen, Hanoi, Thanh Hoa, Binh Dinh, Lam Dong, Ho Chi Minh City, and An Giang) where are representing for 7 eco-economic zones as approved by the Government. The thematic database is the information on 90 selected cooperatives of the National Project. The model structure, content of the thematic database are modeled as point information, along with a detailed attribute table.

Thus, each point represents the spatial information (location) and attribute (characteristics, criteria of evaluation) of a cooperative being studied. Thematic data is the same as the feature class of GIS, which is assigned a geographic code to link spatial information and attribute information of the research object.

The basic steps to be taken in setting up this information include:

- Step 1: Design the database structure of the ArcGIS software to ensure the requirements of the national standard (ISO-TC 211 and standard of Ministry of Natural Resources and Environment). Just show the contents of the description following the survey.
- Step 2: Import data into ArcGIS software.

This is an especially important step to bring all attribute information of the cooperative collected into the database. The spatial and attribute information that has been updated into the database, which is supported the fast query of the cooperatives that have transformed according to the Vietnam Cooperative Law 2012.

Thematic databases for each province are stored on an object class package with the feature class: DiemHTX.

### 2.4.1. Thematic content

The thematic content is shown on the map in the spatial location descriptor form of the selected agricultural cooperatives and classified into 3 separate groups by color.

- Red color indicates the cooperatives have successfully transformed according to the Vietnam Cooperative Law 2012.
- Blue color indicates the information of cooperatives have been transformed according to the Vietnam Cooperative Law 2012, but have not been successful.
- Yellow color indicates the cooperatives that have not done the transformation.

### 2.4.2. Glossary

Commentary: fully explain the content elements on the map such as traffic, administrative boundaries, population, socio-economic factors.

## 3. BUILDING GIS DATABASE FOR SUMMARIZING VIETNAM AGRICULTURAL COOPERATIVES MODELS TRANSFORMED SUCCESSFULLY ACCORDING TO THE VIETNAM COOPERATIVE LAW 2012

Basing on the survey of 90 agricultural cooperatives located at 9 provinces in 7 economic regions of the country (Fig. 2), the GIS database has been developed with the aims to serve summarizing Vietnam agricultural cooperatives models transformed successfully according to the Vietnam Cooperative Law 2012.

- The locations and attributes of cooperatives in the database were developed:

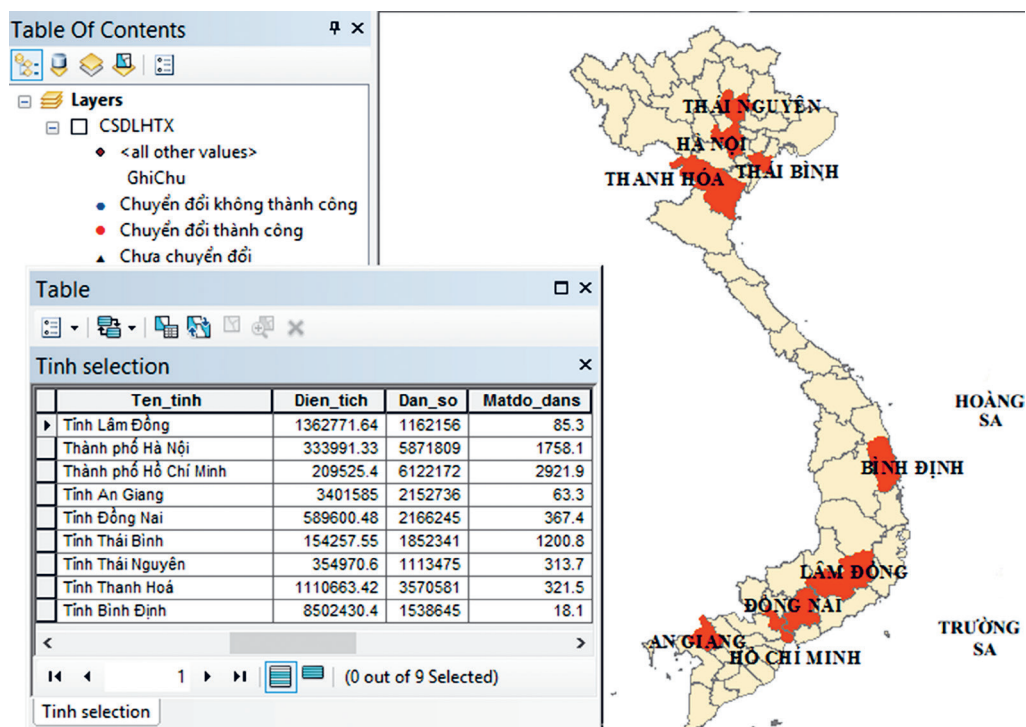


Fig 2. Location of 9 provinces surveying

Rys. 2. Lokalizacja 9 analizowanych prowincji

### 3.1. Grouping of cooperatives

There are three cooperatives groups: Transformed successful group; Transformed not successful group; Do not transform according to the Vietnam Cooperative Law 2012, which divided by 4 criteria.

Criterion 1: Cooperatives have carried out procedures for transforming according to the Vietnam Cooperative Law 2012, the cooperatives have been certificated the business licenses at the survey time (2016). It's determined the cooperatives transformed and do not transform.

Criterion 2: The criterion of pre-tax profit in 2016 compared to previous years must be increased. That mean, the result of comparing the pre-tax profit between 2016 and 2013 must be more than 0. Based on this criterion, two groups of cooperatives can be identified: the transformed successfully group have results of the pre-tax profit in 2016 higher than the previous year (2013); Transformed not successful group have to result of the profit in 2016 less than the previous year. Thus, only criterion 1 and criterion 2, it can group the cooperative into 3 different groups (Figs 3, 4).

Criterion 3: The percentage of services provided to cooperative's members for the main activities, which includes irrigation, electricity, credit, marketing, preservation, processing, seed supply and seed production, soil preparation, veterinary, fertilizer materials, encourage agriculture, plant protection, Kober services, clean water, environmental sanitation, transportation, etc, are better than before transforming.

Criteria 4: This criterion based on the comparison and assessment of the cooperative management system level, the number of the degree of bachelor (or degree of associate) of staffs must be more than the pre-transformed.

The structure of cooperative post-transformed includes: management board, the head council of cooperative, cooperative control board, accountant, treasurer, and technical staffs.

Comparative results of criteria 3 and 4 are summarized in Table 1 and 2. Based on the results, 27 cooperatives were successfully transformed in 9 provinces: An Giang province (3 cooperatives), Binh Dinh province (4 cooperatives), Dong Nai province (3 cooperatives), Hanoi (3 cooperatives), Lam Dong (3 cooperatives), Thai Binh province (3 cooperatives), Thai Nguyen



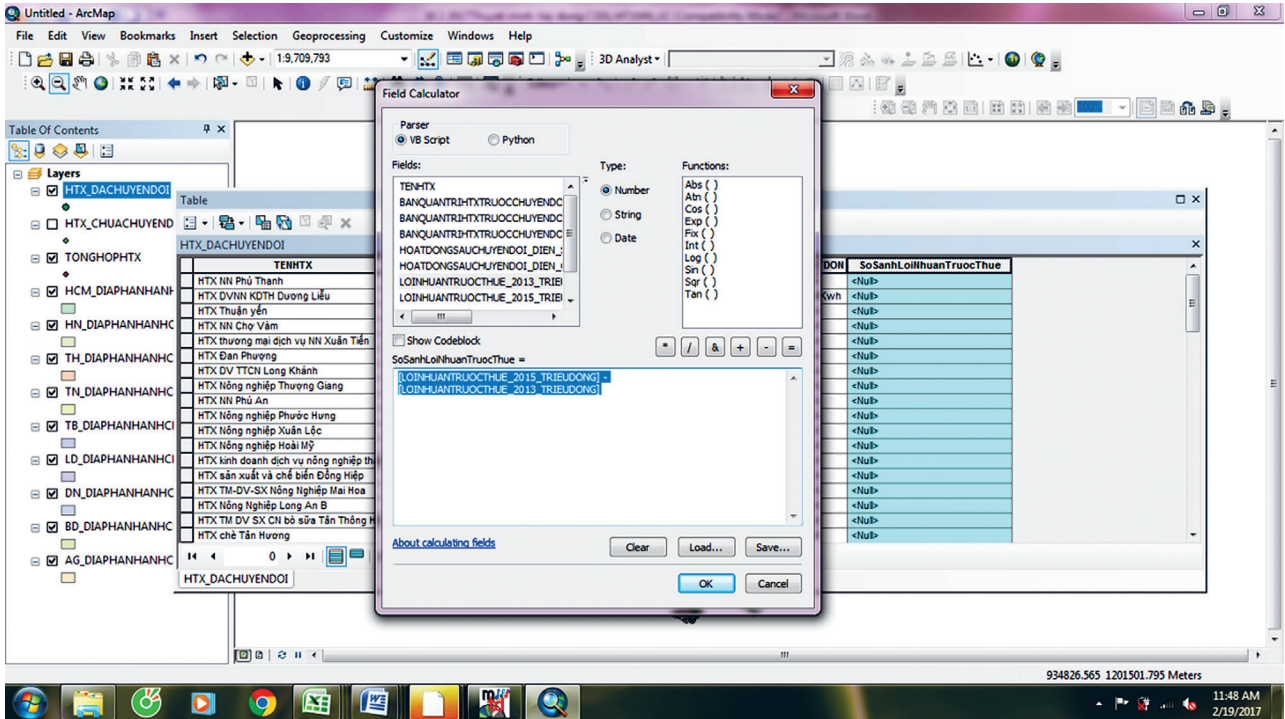


Fig. 3. Comparison of pre-tax profit between 2016 and 2013 on ArcGIS

Rys. 3. Porównanie zysku przed opodatkowaniem w latach 2016 i 2013 w ArcGIS

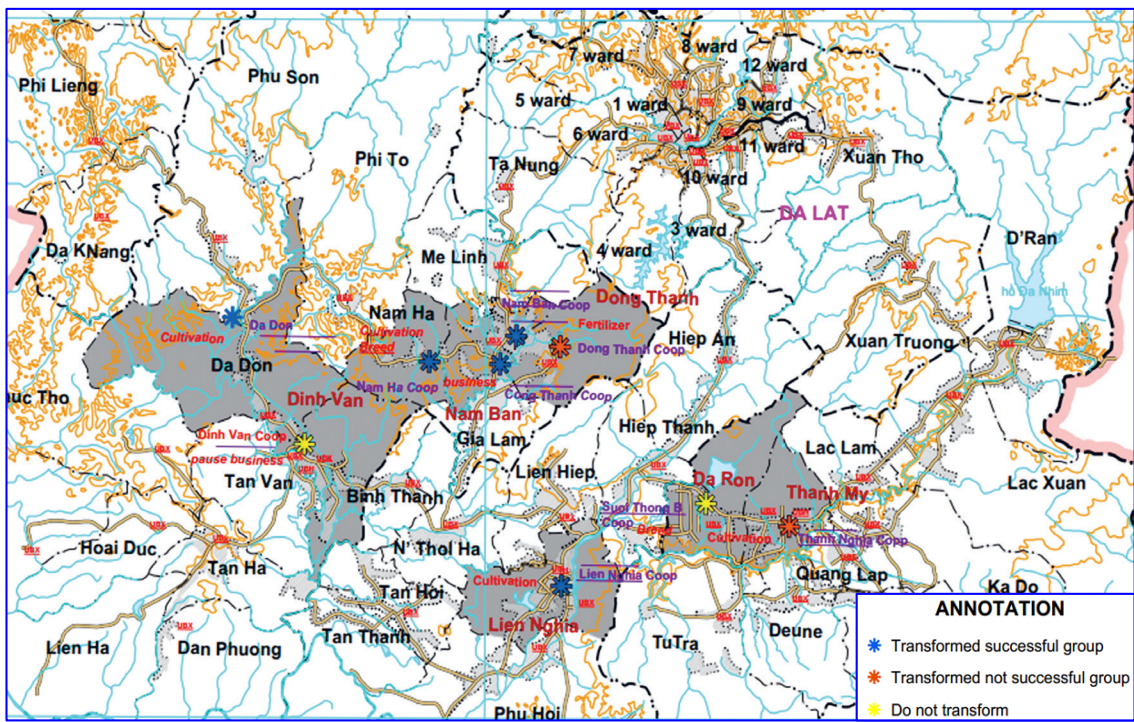


Fig. 4. Distribute 3 group of cooperatives on the map at Lam Dong area

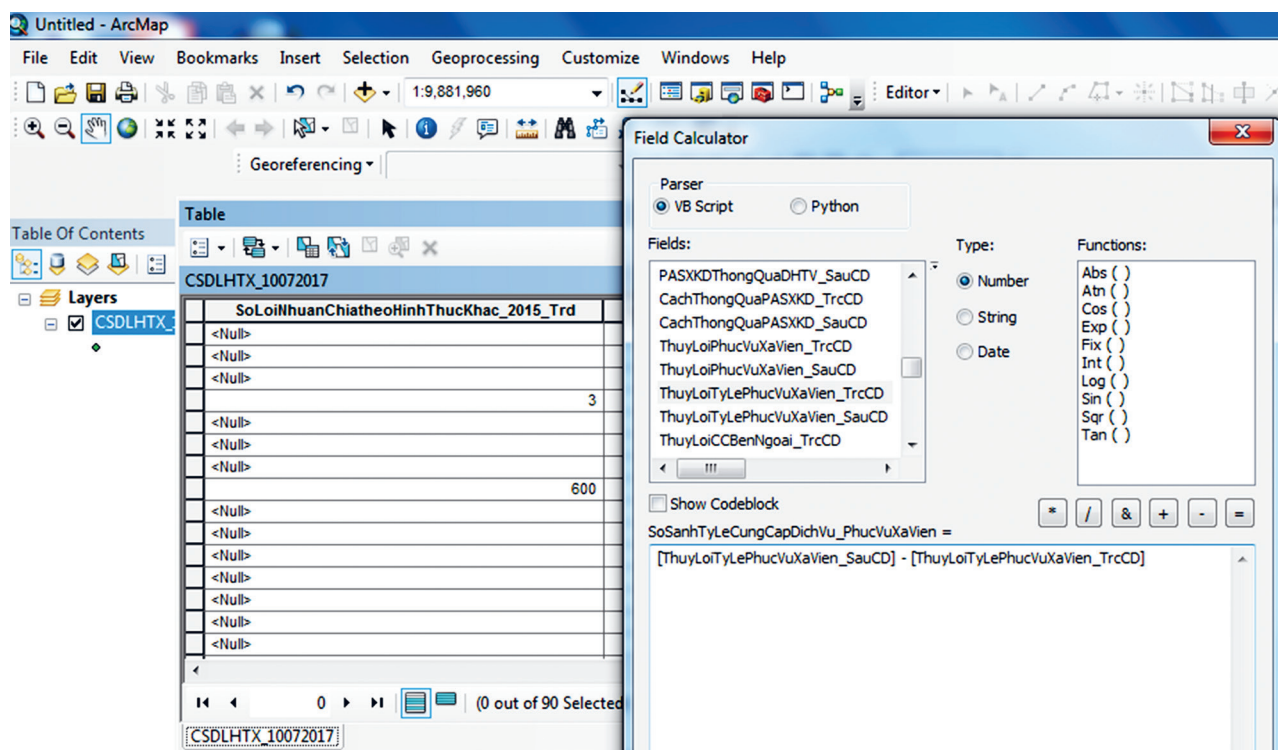
Rys. 4. Rozkład 3 grup spółdzielni na mapie w obszarze Lam Dong

**Table 1:** Comparison of the results by criteria 2, 3 and 4 of the cooperative group transformed successfully and do not successfully.

**Tabela 1:** Porównanie wyników według kryteriów 2, 3 i 4 grupy spółdzielczej przekształconej pomyślnie i niepomyślnie.

Average value	SF	NSF	Comparison
Comparison of pre-tax profit (million VN dong)	110.8	-46.4	157.2
Comparison of service activities rate to cooperative's members (%)	7.4	6.0	1.4
Comparison of management board standard	0.4	0.3	0.1

where SF: The transformed successfully cooperative group; NSF: The transformed not successfully cooperative group.



**Fig. 5.** Comparison of irrigation rates served to cooperative's members after transformation (ArcGIS analysis)

**Rys. 5.** Porównanie wskaźników nawadniania dla poszczególnych członków spółdzielni po przekształceniu (analiza w ArcGIS)

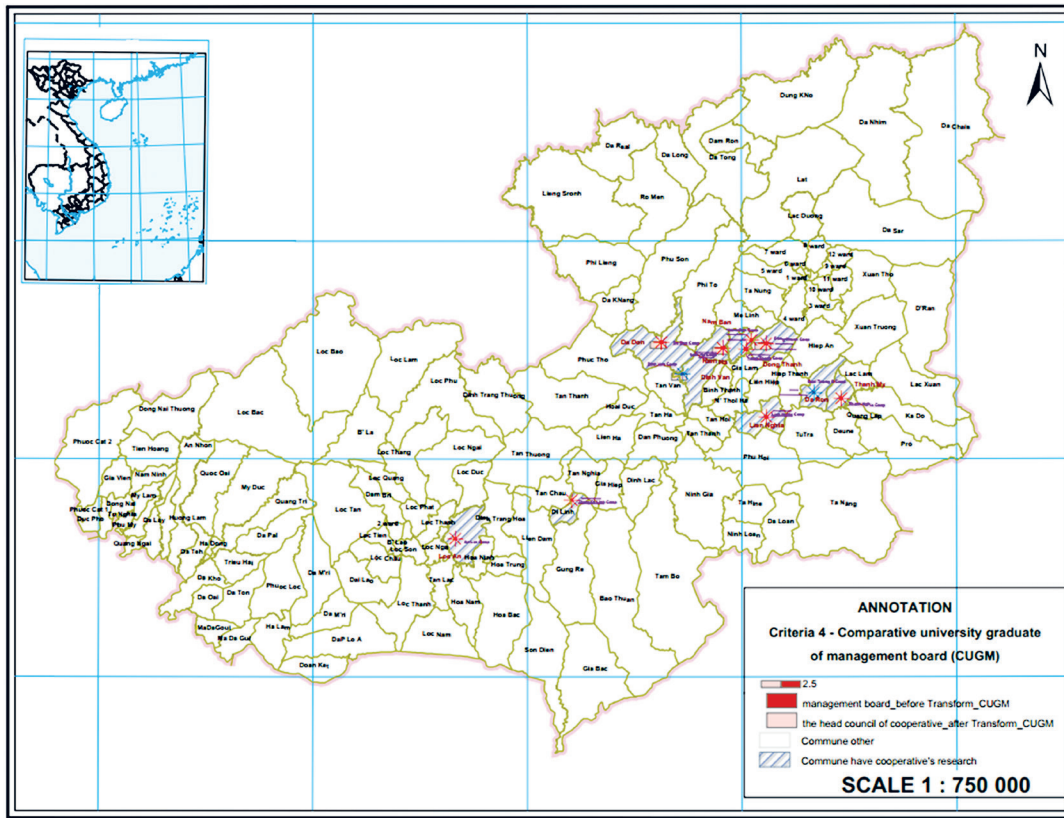
province (2 cooperatives), Thanh Hoa province (3 cooperatives), Ho Chi Minh city (3 cooperatives). Table 1 is shown the average value of the transformed successfully cooperative group and do not successfully cooperative group by criteria 2, 3 and 4.

#### 4. RESULT

With the results of the study, it has provided the quality of materials for managers to find out the limitations of cooperatives and management systems during

the transformation according to the Vietnam Cooperative Law 2012.

GIS technology has shown its superiority, playing an important role in the management, storage, processing, spatial analysis and distribution of geoinformation on agriculture and rural areas, specifically on cooperatives which is transforming period and in summarize Vietnam agricultural cooperatives models transformed according to the Vietnam Cooperative Law 2012. The GIS become the visual materials to display the results of the National Project "Research and propose solutions to



**Fig. 6.** Map of cooperative grouping under criterion 3 and 4  
**Rys. 6.** Mapa grupowania spółdzielni według kryterium 3 i 4

promote conversion of organization form and operation mode of Vietnam cooperative, for the efficient implementation of the Cooperatives Law 2012”.

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