Research Paper

IDENTIFICATION THE TREND OF AGRICULTURAL LAND TRANSFORMATION USING PRA TOOLS: A CASE STUDY OF RAJSHAHI

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Abstract

Predominantly, the economy of Bangladesh depends on agriculture. But, nowadays agriculture land is converting into other uses of land. The main reasons behind it are population growth, high production cost, benefit is low, farmers are not getting fair price etc. The study focuses on to find out the trend of agricultural land transformation in Harian union, Paba, Rajshahi. Agricultural land transformation now becomes severe in Harian Union.The trend of this transformation can be shown using secondary data and GIS software. But, this study based on primary data and trend analysis is shown using PRA tools such as social map, resource map, trend analysis etc. Data are collected through focus group discussion with the people of the study area. It provides more accurate information. Villagers are asked to compare present uses to the previous uses, and finally trend analysis diagram is prepared. For better realization, the map and diagram are digitized using software such as GIS, Illustrator and Publisher etc. This study shows that the agricultural land is transformed into pond and brick kilns. Benefit is lower in Agricultural activity than fisheries and construction of brick kilns. As a result, the owner of land is supposed to excavate pond for fisheries. Moreover, the brick kilns are built in agricultural land because of getting raw materials from the excavation. It also affects the environment and livelihood of marginal farmers. This study will help to take steps or regulation on land-uses and may provide a base for further study.

Keywords

Focus group discussion, Trend analysis, Pond excavation, Construction of brick kilns

1. Introduction

Agricultural land transformation becomesa common issue in Bangladesh.Bangladesh has always been an agrarian country where over 50% of the population is still dependent on crop agriculture (BBS, 2008). Rajshahi is one the largest populated districts in Bangladesh. To meet the requirement of increased peoples, infrastructures are developed in rapid way. Fast growing rate of infrastructures causes losses of agricultural land. Rajshahi is losing 0.47%

arable land due to population growth and infrastructure development in every year (Islam, 2013).The district is facing the several problems of agricultural land transformation such as reduction of productivity, environmental degradation, increasing risk of life of marginal farmers (Halim, Rahman and Hassan, 2013). This study is conducted for showing the trend of agricultural land formation.

In previous researches, the transformation of land is shown in maps by using GIS software. It is rarely done with the help of PRA tools. If PRA tools is used, it will provide not only good understanding but also the real situation will come out (Chandra, 2010). Engagement of local people ensures raising awareness about agricultural land transformation. The purpose of the study is to find out the existing land-use of the study area and to analyse the trend of agricultural land transformation in the study area by using PRA tools. This study will identify local people's perception towards the agricultural land transformation and the pattern of agricultural land transformation within the study area.

The rationale of agricultural land transformation is clearly based on the fact that the amount of agricultural land is decreasing day by day. It can be hazardous to human being and the environment if not appropriately considered. Consequently, everyone has to be concerned about the changes. This study will help to take proper steps for reducing this transformation and provide background information for further research.

2. Study Area Profile

The study area is located at Harian union in Paba upazila, Rajshahi. For the study purposes, four villages are considered and they are Nolkhola, Kukhandi, Mallikpurand Ranhat. It is located at Southside of Paba upazilla. It is mainly rural area where maximum people depend on agriculture. The income of peoples is also low.

Figure 1: Location of the Study Area

Source: LGED, 2018

According to Bangladesh Bureau of Statistics (BBS) 2011, the total household of the area is 1822 and total population is 7103. Maximum structures of houses are semi-pucca and katcha. The main drinking water source is tube-well. The average literacy rate is below 50%

and the electricity connection is moderate. Following table shows the summary of the study area-

Table 1: Overview of the study area

Village	Household	Population	Literacy rate (%)	Electricity connection (%)
Kukhandi	540	2272	41.6	73.5
Mallikpur	418	1608	47.3	85.9
Nolkhola	363	1378	60.8	69.4
Ranhat	501	1845	42.5	83.8
Average			48.05	78.15
Total	1822	7103		

Source: Bangladesh Bureau of Statistics (BBS), 2011

3. Literature Review

Literature review chapter includes the review of related researches and related PRA tools. Related researches help to understand the significance and how to conduct the studies. And knowledge about PRA tools helps to prepare the diagrams and maps. The book named "Methods for Community Participation" is reviewed for grabbing knowledge about different PRA tools and how does it work (Kumar, 2002). To know the condition of agricultural land, root causes of decreasing agricultural land and impacts of this transformation, a number of papers are reviewed. These are described briefly in bellow-

A study is conducted by Rahman (2010) about agricultural land use change in Bangladesh over a 59-year period (1948–2006). This study examines how these have impacted crop diversity, productivity, food availability and the environment. The study reveals that land use intensity has increased significantly over this period and crop diversity has increased too. The production environment has suffered with widespread soil nutrient depletion experienced in many agro ecological regions. He mentioned crop diversification as a desired strategy for agricultural growth to improve resource economy, productivity and efficiency in farming in Bangladesh.

Another study by Rai et al. (2017) shows a systematic review of the changing status, patterns, and compositions of Land Use and Land Cover (LULC) in Bangladesh on national, regional and local scales over the past 85 years. The primary LULC classes in Bangladesh are agricultural land, urban and built-up area, forest and vegetation, water bodies, and wetlands. It is shown that high population growth, rapid urbanization, and infrastructure development have been directly associated with changing patterns of land use across the country. In recent decades, urban areas and water bodies have been increasing, to the detriment of both forests and agricultural land.

A study is conducted by Hossain and Noman in 2017 about agricultural transformation due to climate change in Northern Bangladesh. This study examines theimpact of climatic factor in agricultural transformation and food security intwo upazilas of Rajsahahi district such as

Godagari and Puthia. It reveals that rice cultivation land istransformed into guava and mango orchard. As a result, rice cultivation isreduced that will reduce food production. This study concludes that the rate oftransformation of guava is higher in Godagari than Puthia and rate oftransformation of mango is higher in puthia than in Godagari and they claimed that transformation is going to affect the food security situationsboth positively and negatively. From the literature review it is proved that agricultural land is converting other land-uses and it will affects the overall economy of Bangladesh.

4. Methodology

The major problems and issues were identified by reviewing existing policies, plan, programs, reports etc. which helped to materialize researcher's concept about the study and formulate goals and objectives of the study. Literatures are reviewed in two times for this study such as for project identification and for objectives fixation. After finalizing goals and objectives a comprehensive literature review was conducted to understand the condition of the land transformation by reviewing relevant reports, journals, and international cases which helped to develop conceptual frame work of the study.Then the best possible study area have been selected in the Rajshahi for the study purpose. For the study the whole statistical analysis has been basically based on primary data. The whole study was conducted using various tools of Participatory rural Appraisal (PRA) method by involving the local residents, which helped obtaining information about that locality. The relevant secondary data for the study was collected from union parishan of Harian.

Aftabun Nahar, Md. Habibur Rahman & Imzamam Ul Khan Shuvo were the facilitators and 12 peoples were participated in focus group discussion. To get an overview of physical and social characteristics of the area, many PRA tools are used such as social map, resource map, etc. Community people mapped their community including information on boundary, road, housing status, health complex, primary school, high school, college, mosque, rural market, important landmarks, ponds, light industry, brick factory, poultry farm, garden and cultivated land etc. To cross check the information recorded on the social and resource map transect walk was used. Moreover, trend analysis is also used to show the actual condition. Trend analysis is based on the idea that what has happened in the past gives the researcher an idea of what will happen in the future.The collected data is processed with the author's choice and interpreted the inner meaning of the data. After that, the findings are written. The result will reflect the study to the readers.

5. Existing Land-uses of the Study Area

5.1. Existing condition

To find out the existing condition of the study area, social map is prepared (shown in figure 2). It is used to show the relative location of households and the distribution of different types of people together with the social structure and institutions of the area.The villager's occupation can be categorized in four major activity and they are farmer, marginal farmer, day labour, watchman (Pond and Poultry farm). Some other work activity also found and they are rickshaw puller, small businessman, service holder etc. Most of the peoples in these area are related to diversify working activity.

The community consists of four village named Mallikpur, Kukhandi, Ranhat and Nolkhola. The map nearly depicts highway road (Khorkhori Bypass), village road, school, college, house, poultry farm, brick kiln, community clinic, mosque, temple, union parishad etc. of the villages. In addition, using different symbols gives clear sign of social condition of the villages. In study area, there are three types of house. These are pucca, semi pucca, and katcha. Though maximum people in this area are farmers but their housing condition is better because they have opportunities to take loan from different NGOs. Eight active NGOs are found there. Maximum houses are semi pucca. Pucca house is less than semi pucca and katcha houses. Maximum pucca houses are situated near the road side and katcha houses are situated in the back side.

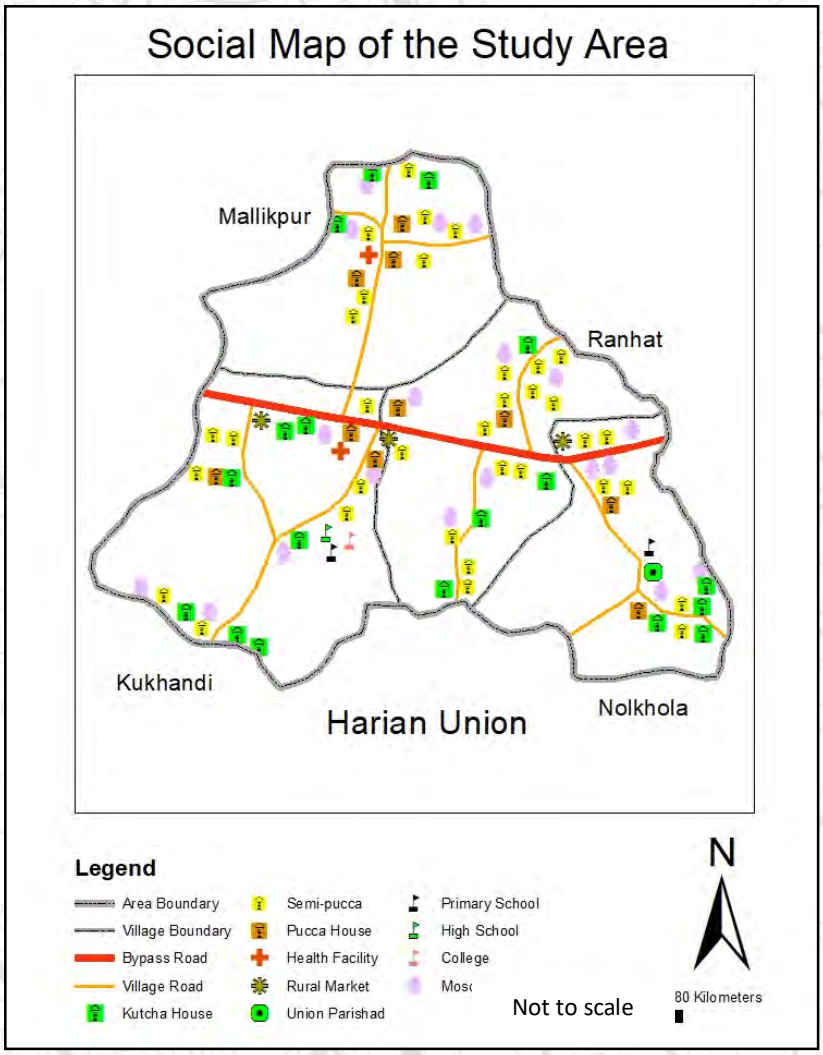

Figure 2: Social Map of the Study Area

Source: FGD, 2018

Facilitators: Aftabun Nahar, Habibur Rahman, Imzama Ul Khan; Participants: Billal Hossain, Fokrul Ahmed, Samsu Sarkar, Rahmotara.

Four educational institutions are present in this area. One primary school, one secondary school and one college are located in Kukhandi and another primary school located in

Nolkhola. There are two health care centres in Mallikpur and in Kukhandi. The union Parishad is located in Nolkhola. Rural markets are also found in the study area. All the rural market located near the bypass road. Many mosques are found in study area and these are located in different location.

5.2. Existing resources

To find out existing resources of the study area, a resource map has been produced with the help of local people through focus group discussion (shown in figure 3). According to the participant of the focus group, there are many resources in this area. Specific resources which related to the study topic are selected for mapping. The map is not to scale and symbols are placed approximately according to the frequency of the resources in the villages. The map shows that the number of pond is more in Mallikpur and Nolkhola rather than in Kukhandi and Ranhat; brick factory is present in Kukhandi and Mallikpur; poultry farms are more in Kukhandi and Ranhat than other two villages.

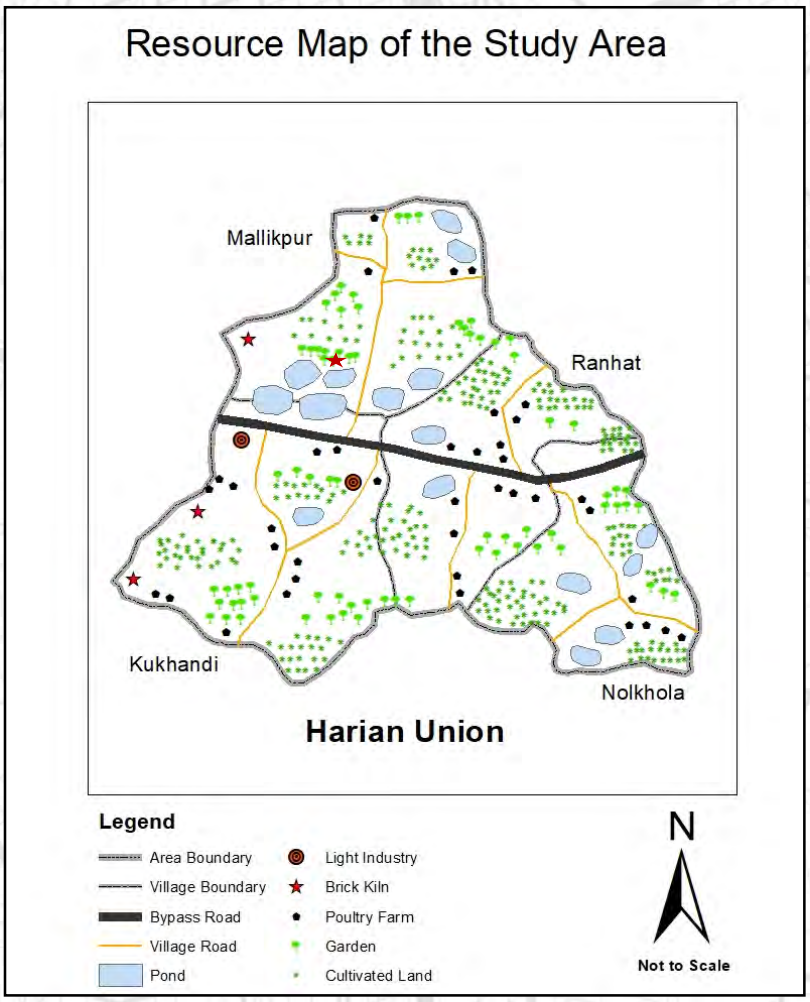

Figure 3: Resource Map of the study area

Source: Focus Group Discussion, 2018

Facilitators: Aftabun Nahar, Habibur Rahman, Imzama Ul Khan, Participants: Billal Hossain, Fokrul Ahmed, Tamjid Ali, Bablu Mia.

The existing resources of the study area are cultivated land, garden (fruit), pond, poultry farm, brick factory, light industry, main road etc. In the study area, about 70% areas are cultivable. Different types of crops are produced such as paddy, mustard, wheat, lentils, onion, pumpkin, cucumber, calabash, sugarcane, lady's finger, etc. Fruit production is another resource. Different types of fruits are produced in the study area. The main fruits are mango, guava, banana and papaya. Moreover, some big farmers are interested to produce unique and good priced fruits such as strawberry, dragon, orange (malta) etc.

The ponds are definitely important resources. It helps to keep ecological cycle active. About 15% of the study area is pond. Maximum ponds are excavated for fisheries that effect agricultural production and also the life of marginal farmers. The main fishes are rui, katla, telapia, pangas, boyal, mrigel, silver etc. The another resource of this area is poultry farm. The peoples of the area are moving to poultry farm business due to high profit. Mainly, the farms are built in the middle space of two or three houses.

Brick factory is the other source of income. But it has also negative impact on environment and fruit production. Mainly, the ponds are being excavated and the soil is the raw materials of the brick. As a result, the number of brick factory is increasing. Moreover, there are two light industry in the study area such as metal and chemical fertilizer industry. Both are located in Kukhandi.

6. The Trend of Agricultural Land Transformation

According to the community peoples, the cultivated land is transformed to other uses in the study area. The existing condition also shows the evidence. Mainly, the agricultural land is converted into Homestead, Brick kiln, Garden (fruit), Pond, Poultry, farm and other infrastructure such as school, road, shops etc.

Collected data from union parishad also indicates that the agricultural land is converted to other land-uses. The following table 2 describes it clearly.

Table 2: Changes in Land Uses of the Study Area

Land use	2010		2017	
Cultivable land	558 ha	83%	496 ha	73%
Pond	54 ha	8%	84 ha	12.5%
Physical infrastructure	50 ha	7.5%	72 ha	11%
Garden (fruit)	10 ha	1.5%	20 ha	3.5%
Total	672 ha		672 ha	

Source: Union Parishad, 2018

There are huge changes in agricultural land transformation. Agricultural land is converted into ponds and brick kiln greatly. Brick kiln holds the maximum percentages in change in physical infrastructure. Among these changes, the number of Brick kiln and the number of pond is increasing at alarming rate. Data from union parishad shows that the number of brick kiln is increased from 4 to 8 in four year's difference (table 3).

Table 3: Increase in number of brick kiln

Village	Brick kiln (2013)	Brick kiln(2017)
Mallikpur	1	3
Kukhandi	3	5
Ranhat	0	0
Nolkhola	0	0
Total	4	8

Source: Union parishad, Harian (2018)

In fisheries, the income is better than production of crops. The owners of land are thinking about the benefit and excavating the pond in agricultural land. As a result the number of pond is increasing day by day.

Trend analysis tool is used to find out the actual trend of agricultural land transformation.Trend analysis is a commonly used and popular PRA method which is used to capture changes and trends related to certain variables over different spans of time (Abedo, 2000). Hence, this also provides an idea on historical perspective. Trend analysis mainly helps to understand increase and decrease in the variables under study over a period of time.Figure 4 illustrates the land transformation trend analysis done by a group of men and women from four villages. As the study is conducted to show the changes in land uses, so seven most important land uses are discussed. These are Agricultural land, Garden (fruit), Pond, Brick factory, Farm, Household and Road. The landmark years were 2008s, when land use changes begun to start; 2013s, when changes begun to severe and at the present time (2018s).

In 2008, there were huge amount of agricultural land in the study area. But with the passes of time agricultural land has reduced in significant amount. In 2013, the land owner started to transform their agricultural land to other land use for increasing their income as a result agricultural land reduced to 5%. Now in 2018, theagricultural land reduced 10% from 2008. In 2008, mango garden was lower in amount. But 2013, mango garden covered a significant amount of land. According to villagers from 2008 to 2013, mango garden was increased. But, from 2013 to 2018, mango garden was reduced due to the effects of brick kilns. The smoke created from brick kilns affects the flavor and taste of mangoes. Same changes are happened from 2008 to 2018 for banana. Guava gardens are increased with the passes of time. Before 10 years, the amount of guava garden was low. But in recent years, the production of guava becomes high.

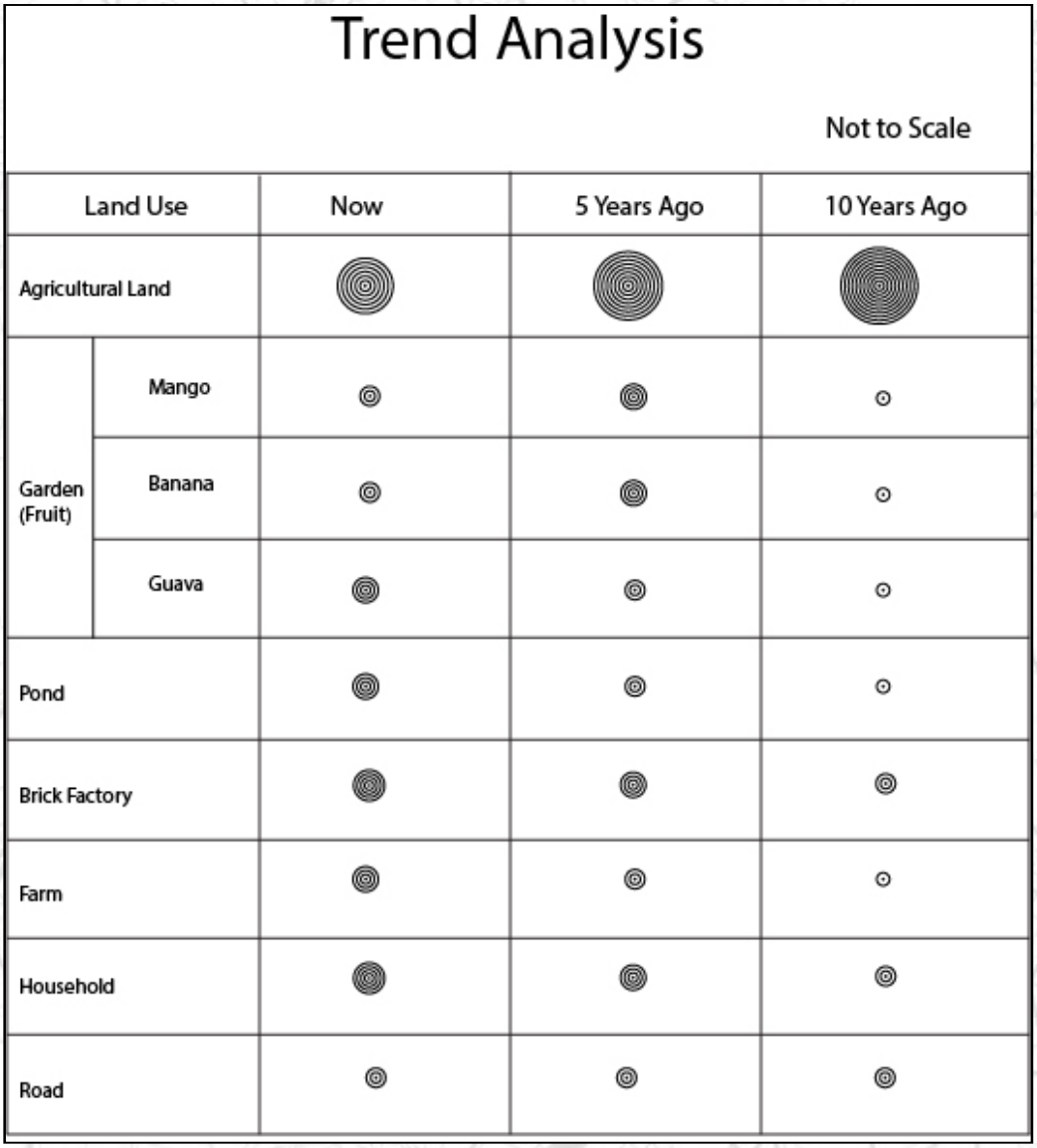

Figure 4: Trend Analysis

Source: Focus Group Discussion, 2018

Facilitators: Aftabun Nahar, Habibur Rahman, Imzama Ul Khan, Participants: Haldar, Monsur Ali, Josna Begum, Emdadul Hoq.

During the study period, it was found that pond has increased in significant amount. In 2008, the number of pond was less. From 2008 to 2013, pond started to increase. At present, agricultural land converted into pond. Brick factory is also increasing in the study area with the passes of time. In 2008, number of brick factory was less and it covered very less amount of land. But from 2013 to 2018 the number of brick factory is increased due to easy availability of soil. Figure 4 shows that a significant expansion of household has occurred during the study period. The household is increased double in number. It indicates that the transformation of agricultural land is increasing with the increasing amount population. Farms are also increasing rapidly with the passes of time. In 2008, there was no farm in the

study area. But in 2018, farms cover a huge amount of land. But, in the study period, no significant changeis found in land covered road construction.

7. Conclusion

The study reveals that the landuse changes from agriculture to other use and significant change of agricultural land has occurred in last few year in this area. According to participant of villages most of the agricultural land converted to pond, fruit garden, brick factory and farm during the study period. That has a resulting effect on the change of livelihood pattern of the small farmer in this area. At the same time, some households have no parcel of agricultural land due to land use change, then they start to find income generating activities all over the year. Agricultural land transformation also leads the environmental degradation. Since the study is based on a particular small community within Harian union, spatial variation may occur within the different community based perceptions. But, the study reflects the overall condition of agricultural land transformation of Harian union. Moreover, the study suggests to implement regulation and policies for stopping conversion of agricultural land.

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