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## The Impacts of Irrigation System on Agriculture: A Study Based on Porativupattu ds Division

**S. Mathanraj**

Department of Geography, Eastern University, Vantharumoolai, Chenkalady, Sri Lanka

E-mail address: [smathan02@gmail.com](mailto:smathan02@gmail.com)

### ABSTRACT

Irrigation is the artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and re-vegetation of disturbed soils in dry areas and during periods of inadequate rainfall. Paddy production is the main agriculture of this area, has good climate, well irrigation and soil structure for paddy production. Both temperature and rainfall are the main climatic factors that affected the paddy cultivation. The main objective of the study is to find out the agricultural activities especially paddy cultivation. The sampling method has been used to collect the primary data through the questionnaire survey from 100 households and secondary data has been gathered form District Secretariat, Irrigation Report, and published research reports. MS Excel was utilized for the study to examine the changes of paddy production and other agriculture due to the irrigation water. As the result, paddy production was very high in the Maha season but it was low in Yala season because of the less rainfall and irrigation process. In addition, the highland crops were cultivated around 396 hectare in this area. Whatever, when compere with vegetable production, this was very low and the vegetable production was very high. Thus, these area people cultivate different kind of crops for their economy but have the less production. Therefore, the improvement of irrigation and other water body help to make much production can be produced more in highland crops cultivation. Proper management and better agricultural practices cause to the high production in future.

**Keywords:** Irrigation, Agriculture, Paddy production, Rainfall, Vegetables

## **1. INTRODUCTION**

Irrigation is the artificial application of water to the land or soil. There are many irrigation systems in Sri Lanka. Of these, two major irrigation networks have found in the study area, Navagiri and Thumpenkerny. Besides, 10 small tanks and more than 100 small pools are found here. Even though it is unavoidable, there is dearth of drinking water in more than 15 G.N Divisions during the drought period and condition sour and saline. Moreover, this area has a large extant of land Resources hut people are unfortunate to do even the home gardening (Divisional Secretariat, 2014).

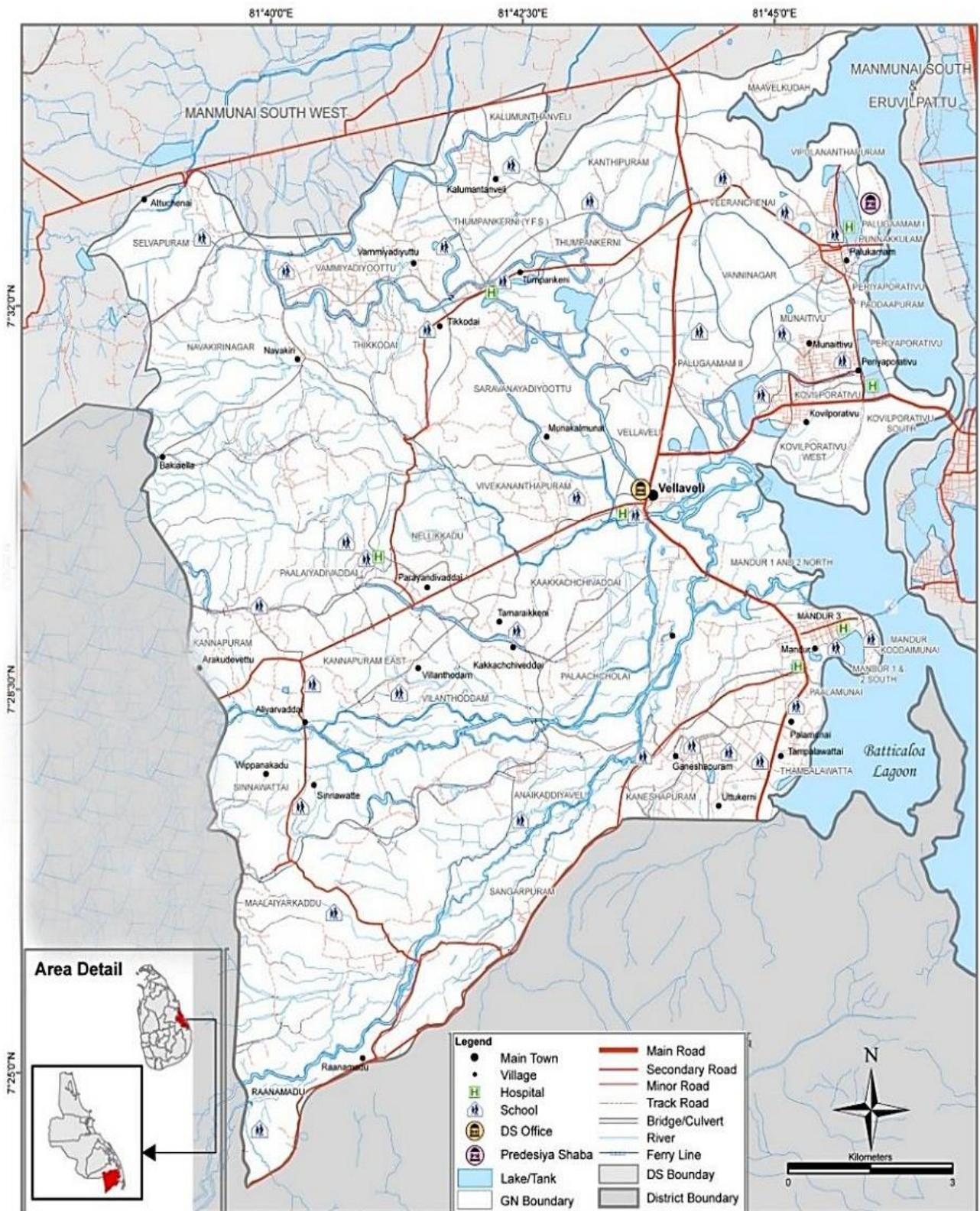
The beginning of Paddy Cultivation in Sri Lanka, traces its root back to the proud history between 161 B.C. and 1017 A.D. Our ideal climatic conditions yielded a flourishing crop, which encouraged many Sri Lankans to make Paddy Cultivation their way of life. Thus, it became a focal point of Sri Lankan lives, knitting a beautiful pattern including the society, culture and religious beliefs in the country.

Paddy is planted in Sri Lanka as one of the main agriculture. Contributing the Maha season provides about 70 percentage of the country's annual rice production. These areas involves in Anuradhapura, Batticaloa, Hambantota, Polannaruwa, Vauniya, Ampara, Jaffna, Kurunegala, Galle, Kalutara, Gampaha and Colombo zone in Sri Lanka, which have been reserved and designated purposely for wetland paddy cultivation by the government in the National Agricultural Policy. Most of the government support programs and interventions on paddy cultivation sector are concentrated in these areas, which also makes it an important area for research and development activities.

The study area has many agriculture activities such as Paddy cultivation, sugarcane, Vegetables, chilies and other crops. Paddy cultivation is the major plantation for farmers of the study area. Their basic economy and food is mainly depending on rice production. The study area has good climate, well irrigation and soil structure for paddy production. Both temperature and rainfall are the main climatic factors that affected the paddy cultivation. The study area's paddy cultivation is also affected by the rainfall fluctuation and the other hand without enough irrigation water. Due to this, they leave the paddy cultivation in the middle of this period. There was lots of researches and publishing done about this issue. These problems lead to number of problems in paddy production and human life. It is a major problem in primary economic activities [1-26].

## **2. STUDY AREA**

The District of Batticaloa itself consists of several administrative divisions, of these; Porativupattu Divisional Secretariat division has been located in Southwest part of Batticaloa district. It has an extent of 180 sq. m. It consists of 43 Grama Niladhari divisions and 136 villages. Its population is 47,180 and consists of 12,883 families. 22,902 males and 24,278 female live it (Divisional Secretariat Porativupattu, 2014).



(Source: Retrieved on GIS, 2015)

### **3. OBJECTIVES**

1. To find out the production of Agriculture in Porativupattu
2. To examine the relationship between irrigation and paddy production in Porativupattu
3. To suggest the solution for the sustainable development of this area

### **4. METHODS AND MATERIALS**

#### **Primary Data**

The sampling has been gathered through questionnaire survey from 100 households. These 100 samples were distributed to different stakeholders as follows; Development Officer 20, Irrigation officers 15, Farmers 50, other people 15. Further, Monthly and annual rainfall changes and the trends of vapour and vaporization were calculated on the research that depending on rainfall.

#### **Secondary Data**

The secondary data has been collected from Census reports of Sri Lanka, Rainfall and temperature data from Meteorological Department, Paddy production of Porativupattu area from District Secretariat, Irrigation Report, Annual performance report & accounts of Batticaloa, images, and published research reports.

#### **Data Analysis**

To examine the changes of paddy production and other agriculture due to the irrigation water, irrigation data of 2014 was obtained from Irrigation Department and 10 years paddy cultivation data from Department of Agriculture and 10 years rainfall data from Department of Meteorology have been utilized to analyze the result. MS Excel and GIS software were used for the study.

### **5. RESULT AND RECOMMENDATIONS**

Today, Irrigation and Water Resources Management functions are major factors contributing to the economic growth, national food security and providing employment and livelihood in the rural sector. The subject of water resources development has been incorporated as a Ministry function to ensure integrated management of water resources in a holistic manner and in order to meet the water demands of all sectors and user groups, with good governance. Conservation, development, management and protection of these resources are the key expectations in the adopted policies and principles.

#### **Irrigation System in Study Area**

Different types of irrigation techniques vary in how the water obtained from the source is distributed within the field. Generally, the aim is to supply the entire field uniformly with water, so that each plant has the amount of water it needs, neither too much nor too little.

### **Basin irrigation**

Water is allowed to flow freely from the furrows to the basin. This method is not suitable for undulating lands. Even though, it is suitable for the study area. The water requirement for this method is high as considerable amount of water is lost due to soil absorption, leaching, and evaporation. This method is particularly not suitable for sandy soils due to heavy losses of water by percolation.

### **Hose irrigation**

An underground PVC pipes network to supply water to outlets is more suitable for agriculture. One-inch diameter and 100 ft. long rubber hoses are used to irrigate the agriculture lands. In addition, it facilitates to irrigate intercrops and maintenance is very easy and profitable. The pipe system consist main line sub main line and risers.

### **Drip irrigation**

Drip irrigation system is practicable for agriculture lands. It involves the wetting of a smaller soil volume in the root zone to provide the water requirement of plant. The high capital investment and maintenance problems are the disadvantages of this system. The study area farmers are using this methods for some plantations like chilies.

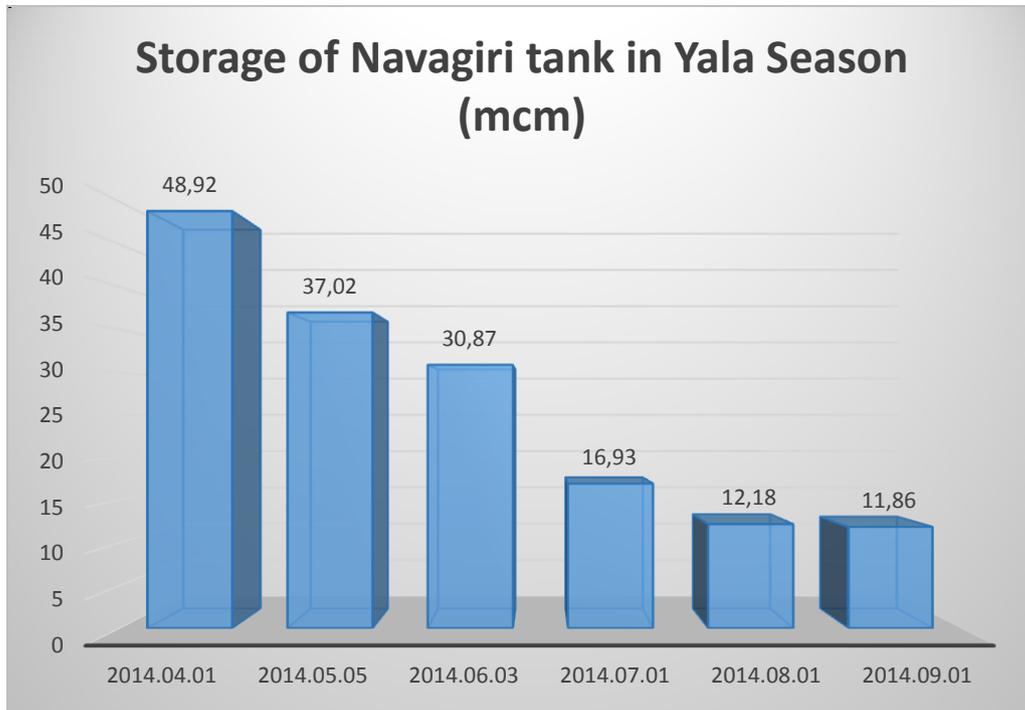
The irrigation tanks of Navagiri and Thumpakeny are taking a huge participation of providing the water for irrigation. These are of the major irrigation systems in Sri Lanka. The main problem of these tanks contain that has not enough the capacity to store much water into them. According to the irrigation officials of Navagiri Division, much water went runoff without store or any uses. Because, this has very less capacity in it and if they reconstruct the dam height, this will help to store much water into them.

According to the irrigation engineer of the Navagiri Division, if they plan to up the height of the dam, this may cause to the disaster and this is not 100 percent suitable in this area for instance, suppose the dam will be broken by the development, many areas are going to destroy by the heavy flooding. This will affect the people who live around the tank as well as the agriculture activities especially, paddy cultivation.

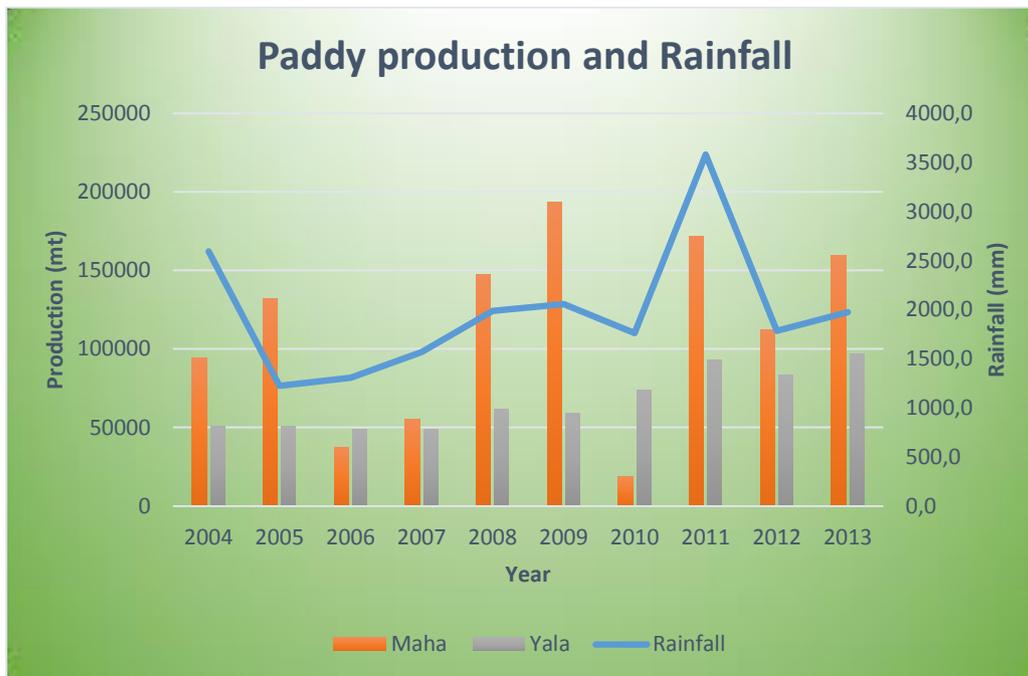
In addition, there are few proper channels to be with them. They could not make more channel to provide the water. The reason for this is the landscape not favorable to make more. Nevertheless, the Porativupattu Divisional Secretariat area is getting the advantage by the landscape to bring the water. They provide the water for the agriculture around 4 -5 ft. per day to the Porativupattu Divisional Secretariat. This is differed in every season. Although, this is not enough for the cultivation and so the people reduce the agriculture activities during the dry season.

### **Agriculture**

Agriculture is by far the largest water use at global level. Irrigation of agricultural lands accounted for 70% of the water used worldwide. In several developing countries, irrigation represents up to 95% of all water uses, and plays a major role in food production and food security.



**Figure 1.** Storage of Navagiri tank in Yala season 2014  
(Source: Irrigation Department Kalwanchikudy, 2016)



**Figure 2.** Paddy production and rainfall in Porativupattu 2004 – 2013  
(Source: District Secretariat, Batticaloa, 2016)

Future agricultural development strategies of most of the people depend on the possibility to maintain, improve and expand irrigated agriculture. On the other hand, the increasing pressure on water resources by agriculture faces competition from other water use sectors and represents a threat to the environment.

Among the agriculture, paddy production is essential for Sri Lankan people. Rice is their main food as well as their livelihood. Approximately 9,085 acre paddy produced in Porativupattu area.

According to the figure 2, the paddy production was very high in Maha season when compare with Yala season. The yield was very high above 90,000mt in 2004, 2005, 2008, 2009, 2011, 2012, and 2013. During the period of 2006, 2007 and 2010 were very less yield produced in Maha season. The main reason for this, it got very less rainfall in 2006 and 2007 and even the post-civil war is another reason for the less production in 2010. Whatever the rainfall is high in this area, 2005, 2008, 2009 and 2013 were got high production.

In the Yala season, less amount of production had produced by the farmers because, they could not get the sufficient water for the cultivation. The major reason for this, the less rainfall was registered during this period. The highest production is 96,780mt in 2013 and others are less than 2013. There is not enough water for the production because in these area needs around 4 - 5ft water per day for cultivation. However, they got average yield from paddy by the irrigation water in Yala season. Otherwise, they could not do the paddy cultivation during this season because of water shortages and Navagiri tank has the less amount of water in this period.

**Table 1.** Paddy production in Porativupattu

<b>Paddy Cultivation in 2014</b>					
	<b>Yala (in Acre)</b>		<b>Maha (in Acre)</b>		
	Major	Minor	Major	Minor	Rain fed
<b>Asweddumized</b>	No	No	15,067	1259.5	7,289
<b>Swon</b>	16,282.24	1,190.54	17,616	158.1	5,789.7
<b>Harvested</b>	16,193.32	1,170.78	17,586.4	106.2	4,409

(Source: District Secretariat, Batticaloa, 2016)

The Table 1 illustrates that they had harvested much production of 16,193.32 acre cultivation in Yala season and 17586.4 acre cultivation in Maha season. The minor production was 1170.78 acre in Yala season and 106.2 acre in Maha season. In addition, the rain fed has also done in Maha season around 4409 acre.

**Table 2.** Highland Crop production in Porativupattu

<b>Highland Crops in 2014</b>		
<b>Crop</b>	<b>Area (in Hactare)</b>	<b>Production (in Kg)</b>
<b>Kurakkan</b>	4	2,400
<b>Maize</b>	242	605,000
<b>Ground nuts</b>	88	105,600
<b>Green gram</b>	27	21,600
<b>Cowpea</b>	8	38,000
<b>Black gram</b>	27	21,600
<b>Total</b>	<b>396</b>	<b>794,200</b>

(Source: District Secretariat, Batticaloa, 2016)

The Table 2 shows the different kinds of crop cultivation in the study area. They are Kurakkan, Maize, Groundnuts, Green gram, Cowpea and Black gram. The highland crops were cultivated around 396 ha and the production is 794,200kg in 2014. When compare with the paddy cultivation, it cultivates very less amount of acre in this area.

**Table 3.** Vegetable production in Porativupattu

<b>Vegetable 2014</b>		
<b>Crops</b>	<b>Extent (Ha)</b>	<b>Production (Kg)</b>
<b>Chilies</b>	25	170,500
<b>Sweet potatoes</b>	9	63,000
<b>Brinjal</b>	33	396,000
<b>Tomatoes</b>	11	77,000
<b>Cucumber</b>	5	36,000
<b>Ladis finger</b>	27	243,000

<b>Long bean</b>	16	128,000
<b>Total</b>	<b>126</b>	<b>1,113,500</b>

(Source: District Secretariat, Batticaloa, 2016)

According to the Table 3, many vegetable are cultivation by these people, through this they have earned much money and develop their economy. They were cultivated around 126 acres and the production is 1,113,500kg in 2014. When compare with the highland crop cultivation, its production was very high amount in this area. However, the cultivation is not done only the rainy season but it is also depending on irrigation water.

In order to solve the problems, the following recommendations are suggested from the study. Through this, we can minimize the water shortage and irrigation problems. The ways are; reconstructing the damaged tanks and ponds, educating to change consumption and lifestyles, recycling waste irrigation water, developing efficient desalination vegetation, controlling the over chemical usages, developing the traditional agricultural practices, making the proper irrigation system, improving mangrove replantation and conservation, suggesting the proper management of irrigation, legislations and awareness programs.

## **6. CONCLUSIONS**

Irrigation is used to assist in the growing of agricultural crops, maintenance of landscapes, and re-vegetation of disturbed soils in dry areas and during periods of inadequate rainfall. Additionally, irrigation also has a few other uses in crop production, which include protecting plants against frost, suppressing weed growth in grain fields and preventing soil consolidation.

The study area contains three irrigation types namely basin, hose and drip irrigation. These area people are using these methods for agriculture production. They are growing different vegetation and highland crops as home gardening. Vegetable production is very high in this area because the soil and topography for water irrigation are more suitable to make much production.

Paddy production was very high in the Maha season but it was low in Yala season because of the less water irrigation. The yield was very high in Maha season above 90,000mt in 2004, 2005, 2008, 2009, 2011, 2012, and 2013 but this is in the Yala season above 90,000mt 2011 and 2013. The production was not high profitable in past 10 years.

In addition, the highland crops were cultivated in a size of 396 hectare in this area. Whatever, when compare with vegetable production, this was very low because it is cultivated more than triple times of land of vegetable but the vegetable production was very high.

Thus, these area people cultivate different kind of crops for their economy. By this, they have supported to the high economic growth in the district. The improvement of irrigation and other water body help to make much production can be produced more in highland crops cultivation and proper management and better agricultural practices cause to the high production in future.

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