

Impact of Crop Intensification Program on Sustainable Maize Production in Rwanda

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Abstract: *This paper focused on crops production under Crop Intensification Program (CIP) with an overall objective of generating knowledge about the impact of CIP on crops production in Rwanda. The purpose of this study was to assess whether the Crop Intensification Program is effective in boosting Maize Production yields among the maize growers in the sector. Specifically, the researcher analyzed Maize production before and after the program. According to Paraid t test, there is difference between Maize before and after CIP because t stat (= 2.69) is greater than t critical value (= 2.13) and P value (= 0.03) which is less than 0.05 and this means that there is significance between Maize crop production before and after CIP. The result showed that, CIP increased Maize production in Rwanda due to improved seed and fertilizers use. However, even if the CIP has a positive impact on Maize production, there is a long way to go if VISION 2020 and MDG1 are to be achieved and three major constraints were mentioned that hamper Maize production and these were the low commercialization of Maize output, climate related shocks and harvest and post-harvest handling constraints. To overcome these constraints the government of Rwanda and MINAGRI in particular should create market opportunities to Maize growers in order to help them to generate income which through it, they will improve their living conditions and purchase seeds, fertilizers and others related inputs for the next agricultural season. This study concludes that the CIP has a positive impact on Maize crop production due to the increase of productive inputs (fertilizers use), of improved seeds, Improvement of irrigation, district and sector agronomists.*

Keywords: Crop Production, Maize Production, Crop intensification program, Sustainable Maize Production.

Introduction

The Crop Intensification Program (CIP) is flagship program implemented by The Ministry of Agriculture and Animal Resources to attain the goal of increasing agricultural productivity under PSTA-II. The aim of agriculture is to contribute sustainably to the national economy increasing productivity for self-feeding and for the market. Increasing agricultural productivity and food security in Rwanda therefore requires replication of such adoption of modern inputs by the smaller holder farmers. Setting this as the goal, the Ministry of Agriculture and Animal resources developed the crop intensification program in 2007. The CIP Started in September 2007; it focuses on six priority crops namely maize, wheat, rice, Irish potato, beans and cassava. Under this program, the farmers synchronize the cultivation of crops in lands that are consolidated and

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rearranged to form larger and more rational holdings. According to MINAGRI (2010), Maize is currently ranked fourth after Bananas, Sweet Potatoes, and White potatoes.

Farm inputs such as improved seeds and fertilizers were imported and distributed to farmers through public-private partnerships, and extension services on the use of inputs and improved cultivation practices are rendered to farmers. As a result, the crop productivity has increased. And the Author examines the production of Maize crop before and after the implementation of CIP. Maize was identified as a priority crop by the government of Rwanda within the context of the national crop intensification program as it plays an important role in food security and income generation for the majority of Rwandese. Maize is currently cultivated in the whole country, contributes to poverty reduction in rural Areas and is essentially intercropped with beans. This paper is a timely contribution as it cuts across the fertilizer sector; the Author focuses on the evaluation of agricultural production before and within the CIP progress in order to assess its impact on agricultural productivity in Rwanda. The author also addresses the gaps associated with the Maize growers in Rwanda.

Research Problem

The low productivity is mainly attributed to the low use of inputs. In vicious cycle, the low productivity continues to prevent farmers from using the inputs, as many farmers barely produce sufficient food to feed their family with no surplus and therefore have no income with which to purchase yield enhancing inputs. Thus the solution lies in breaking this vicious cycle through appropriate government intervention. Green revolution in Asia and elsewhere was immediated by the facilitation of modern inputs such as improved seeds, fertilizers and pesticides to farmers. In this context, the government of has lunched the Crop Intensification Programme (CIP) in order to increase the living conditions of farmers in particular and increase agricultural productivity and food security in general through modern inputs such as improved seeds, fertilizers and pesticides to farmers, consolidation of land use, provision of extension services, improvement of post harvest handling and storage mechanisms. Thus, this paper assesses the impact of the program on maize crop production in Rwanda.

Methodology

Source and data collection procedure

Since the source of the data collected was secondary, the procedure for the data collection was relatively simple. More specifically, data were collected from available records, publications and bulleting of the Ministry of Agriculture and Animal Resources (MINAGRI) and the National Institutes of Statistics of Rwanda (NISR). The data collected with regard to Maize crop production for the season A, before the CIP data from 2002-2006 were taken and after the CIP data from 2007-2011 were taken.

Method of Data Analysis

All information (data) collected from the secondary source were sorted out, edited and collated with the aid of simple tables to enable the overall perspective of the data to be determined quickly and easily as well as enabling interpretations and meaningful conclusions to be drawn. Furthermore, in order to substantiate the effectiveness of the information presented in the tables, lines graphs have been used to display the data.

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Statistical test like paired t test has been used to test the hypothesis and Statistical computer software programme was used to analyze the data. Specifically the Microsoft Excel has been used to analyze such data.

Theoretical Background

Crop Intensification refers to a process whereby inputs of capital or labor are increased to raise the productivity or yield (output) of that crop to a fixed land area. The challenge of meeting future global food demand as well as framing policies for more sustainable crop production and land use systems, means that agriculture intensification is likely to remain an important concept during 21st (Barney Warf, 2013). Over the past decade, Rwanda has experienced substantial economic growth and poverty reduction, driven by ambitious government program on productive agriculture. The government of Rwanda (GoR) has launched a Crop Intensification Program (CIP) to increase national agricultural productivity and improve food security. Therefore the government of Rwanda (GoR) considers agriculture a major catalyst for growth and poverty reduction (NISR, 2011). To that end, the government of Rwanda has adopted a two-pronged approach to agricultural development, targeting substantial public sector investment along selected agricultural value chains and boosting productivity among smallholder farmers through the Crop Intensification Program. The Crop Intensification Program (CIP) was launched in September-2007, as a pilot program with the main goal of increasing agricultural productivity in high-potential food crops and ensuring food security and self-sufficiency. Under this program, the farmers synchronize the cultivation of crops in lands that are consolidated and rearranged to form larger and more rational holdings.

Objectives of the study

The basic objectives of this study are:

- 1) To Assess the impact of Crop Intensification Program (CIP) on Maize agricultural production;
- 2) To evaluate the gaps associated with Maize growers in Rwanda.

Strategies for Sustainable Maize production

Maize was identified as a priority crop by the Government of Rwanda within the context of the National Crop Intensification Program as it plays an important role in food security and income generation for the majority of Rwandese. Maize contributes to poverty reduction and has thus been particularly targeted by CIP. The demand for food will increase due to population growth; security food supply involves strategies in meeting demand for increasing population. Sustainable intensification of crops production is a strategic objective of the Government of Rwanda (GoR) to achieve this strategic objective of the government of Rwanda through Crop Intensification Program provides farmers with improved Maize seed, fertilizers, technologies, knowledge, capacity building, etc so they can increase their crops productivity and profitability throughout time.

It will be necessary to raise Maize production per unit of land not only under optimum growing conditions, but even more under conditions constrained by climate, water availability and soil quality.

Assessment of Crop intensification program

Crop Intensification Program (CIP) was implemented by the government of Rwanda (GoR) with the objective of increasing the agricultural productivity in high potential food crops security and self sufficiency crops. In this context, it is better to assess the agriculture production before and after the CIP and evaluate the progress of CIP.

Food crops production before CIP

In this section, the Author demonstrates the crops production (Maize, Wheat, rice, Irish potatoes, Soya, Cassava and beans) in Rwanda before the implementation of the CIP and the period 2002-2006 was taken.

Below gives Maize crop production (before CIP) for the season A from 2002-2006 and after CIP for the season A from 2007-20011

Table 1: Yields trends (Kg/ha)

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Maize	927	804	895	929	900	721	1311	2115	2585	2270

Source: MINAGRI (2011)

Comparison between crops production before and after the CIP

The objective of this paper is to assess the agricultural production before the implementation of CIP and after its implementation, remember that, the main objective of CIP is to increase the agricultural productivity in high food crops and ensuring food security and self sufficiency.

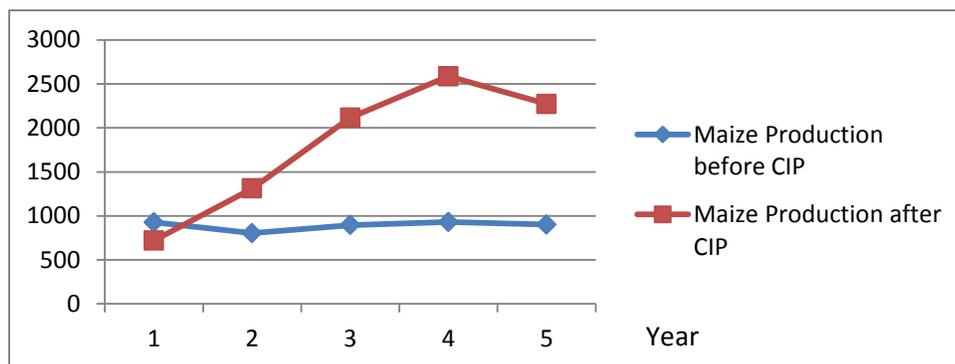
The CIP focuses on the production of Maize, Wheat, Rice, Irish Potatoes, Soya, Cassava, Beans. And the Author examines the production of these crops before and after the implementation of CIP. But the Author examined the production of Maize before and after the CIP.

Two approaches are used to assess whether the CIP has increased the agricultural production or not. Firstly is the observatory approach and secondly is by using the statistical Paired t-test.

Observatory Approach

Here the author observes the secondary data obtained from The Ministry of Agricultural and Animal Resources (MINAGRI) and see the evolution of Maize production before and after the program and then traces the trends.

Figure1. Comparison of Maize production before and after the CIP



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The figure No.1 shows that the program has played an important role in increasing maize crop production, during 2007-2011 in the season A which means that CIP contributed positively to increase Maize production in Rwanda as it is shown on the above figure.

Paired- t- Test

Paired sample t-test is used in before and after studies or when the samples are the matched pairs. Also, the paired samples t-test compares the means of two samples. It computes the difference between the two variables for each case and test to see if the average difference is significantly different from zero.

Paired sample are 2 samples for which each observation in one sample is paired in a meaningful way with a particular observation in a second sample, here 2 observations are connected in a meaningful way. Pre and post, before and after situations are studied by using Paired t test.

Hypotheses to be tested

$H_0: \mu_d=0$: There is no difference between Maize production before and after the CIP.

$\mu_d=0 \rightarrow \mu_1 - \mu_2=0$

$H_1: \mu_d>0$: There is difference between Maize production before and after the CIP.

$\mu_d>0 \rightarrow \mu_1 > \mu_2$

Results

t-Test: Paired Two Sample

	<i>Maize After CIP</i>	<i>Maize Before CIP</i>
Mean	1800.4	891
Variance	584927.8	2601.5
Observations	5	5
Pearson Correlation	0.250065107	
Hypothesized Mean Difference	0	
df	4	
t Stat	2.698101074	
P(T<=t) one-tail	0.027100427	
t Critical one-tail	2.131846782	
P(T<=t) two-tail	0.054200854	
t Critical two-tail	2.776445105	

Mean difference	909.4
Stand.Dev of difference	753.6708831
Standard Error of difference	337.0518654
T alpha half 95% CI	2.13
Lower confidence level	191.4795266
Upper confidence level	1627.320473

Table No.2 shows the results after using Paired t-test, the result for the Maize (before and after) is shown above and gives the sample means, the mean difference, the standard deviation

and the standard error. A two tailed P-value of 0.5 would mean that there is 0.5 (or 50% chance) that the two sets came from the same group. So if there is less than a 5% then it is considered a significant difference between the two sets. Here P- value is equal to 0.03 which is less than 0.05 and this means that H_0 is rejected.

A t-test computes a t- statistic value. The t- statistic value (2.69) is greater than the critical t- value (2.13) therefore; the difference between the two sets is significant.

Major Findings and suggestions

According to the results found:

First, t- stat=2.69 which is greater than t- critical= 2.13, this means that H_0 is rejected in favor of H_1 which states that, there is significance between Maize production before and after the crop intensification program (CIP) in another way it means that, the Crop intensification program has a positive impact on Maize production.

Second, P –value is equal to 0.03 which is less than 0.05 and this means that H_0 is rejected and in this case there is difference between Maize production before and after the CIP.

Even if the existing policies and strategies have improved agricultural productivity in Rwanda in general and CIP in particular and there is considerable progress in Rwandan agricultural sector but there is a long way to go, there are still gaps to be addressed if VISION 2020 and MDG1 are to be achieved. The Author points out a number of gaps linked to increasing agricultural productivity for self-feeding and for the markets. The CIP should work on and filled the following gaps in order to achieve the sustainable agriculture in Rwanda and achieving MDG1.

Conclusion

This paper attempts to assess the effect of policy interventions in increasing crop yield in Rwanda with reference to CIP, in this way the agricultural productivity was been assessed in both before and after the program in order to give a clear understanding about the impact of CIP on agricultural production and the crops under CIP were taken into consideration for the assessment under Maize crop production. The author has used the secondary data obtained from the Ministry of Agricultural and Animal Resources (MINAGRI).

The results found show that, the Crop Intensification Program (CIP) has increased the Maize production in Rwanda due to the increase of productive inputs (fertilizers use), of improved seeds, Improvement of irrigation, district and sector agronomists have also played an important role in increasing Maize productivity and the statistical tool helps to find if there is any difference between Maize production before and after the CIP. By using Paired t test, the H_0 (There is no difference between Maize production before and after the CIP) was rejected.

1. There should be an increased use of inputs for Maize cultivation , investment in Maize irrigation farm in order to increase Maize production;
2. Maize production needs to be commercialized for the markets, in this case the government of Rwanda (GoR) and MINAGRI need to support, motivate and encourage Maize producers so that the farmers become more market-oriented.

Authors' Note

This manuscript is the authors' original work, has not been published and is not under consideration for publication elsewhere.

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