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The Impact of Input Subsidies Program on Agricultural Productivity InNyamagabe District 2008-2020, Case of Maize Crop

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ABSTRACT:
The general objective of this research was to assess the impact of inputs subsidies to agriculture productivity in Nyamagabe District from 2008 to 2020. The study was guided by objectives and set research to determine the types of input subsidized in Nyamagabe District, to evaluate the effect of agriculture inputs subsidized on maize yield, to check whether the subsidized inputs impacted agriculture productivity in Nyamagabe District and the research questions were the impact of inputs subsidy on the agricultural productivity of farmers of Nyamagabe District, What are the types of input subsidized in Nyamagabe District, What are the effect of agriculture inputs subsidized on maize yield and How subsidized inputs impacted agriculture productivity in Nyamagabe District. These two types of yields produced by the people in the Nyamagabe district before and after the agriculture subsidies provision had to be compared in order to see if there was a significant difference between them which indicates the improvement of yield thanks to those subsidies. And at this juncture, the paired t-test (similarity test) analysis was carried out in this research. The results show that 31.9% were using fertilizers as the subsidies with 24.2% produced above 1700kg/Ha, the assessment of the effect on the yield, it was evident that the yield was related to the subsidies received and it was statistically significant as Pearson Chi-square (χ^2) = 5.336 and p-value = 0.048 < 0.05, most agriculture input subsidies increased the yield and the production, except the travertine which shows the contrary whereas about 40(44%) don't see its impact on the yield. From the Pearson's correlation matrix, it is noted that input subsidies had a positive relationship with maize productivity (r =.997, p< 0.047) at a significance level of 0.05 with the highest positive coefficient of (r=.997). There is a similarity test between the yield produced before and after the agriculture subsidies provided to the respondents. With a 95% confidence interval of the difference, the mean difference is $-7.531*10^3$, this is because the yield obtained after the agriculture subsidies is very greater than that obtained before applying the subsidies and the probability of this test p-value =.000 < 0.05 which means that there is a similarity between these two yields and also we assume that the relationship between them can be pointed out by chance. According to the respondents, the Inputs subsidies have a positive contribution to the socio-economic development of farmers' in the Nyamagabe District
The Government should also advocate for the agricultural sector to the financial institutions to provide credit according to the agricultural season.

KEYWORDS:agriculture input subsidies, productivity, Nyamagabe District, Maize crop

I. INTRODUCTION

Agriculture is fundamental to the economic growth of states globally. In Africa, statistics indicate that approximately one-fifth of the continent's Gross Domestic Product (GDP) is constituted by Agriculture. Agriculture also constitutes almost half of the exports from the continent as two-thirds of the population resides in rural areas and a significant percentage of these inhabitants take agriculture as their main livelihood (World Bank Development Indicators, 2014). The move by most governments to turn into subsidies is aimed at securing food and income-generating activities arising from agriculture (Sibanda, 2016). The three affirmative effects translate into an accumulation of income from the sale of crops and savings from not participating in the market to buy

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extra food crops. It is this income that has the potential of being invested in both agricultural and non-agricultural enterprises (Chirwa&Dorward, 2013).

In Africa, Malawi introduced subsidies in fertilizer in the mid-1970s but suspended these initiatives in the 1990s owing to IMF's structural modification adventures that looked forth at reducing price variations and promoting the diversification of the country's rural economy (Dorward, et.al, 2008; Buffi &Atolia, 2009). Despite IMF's intervention, historical 4 information reveals that the Malawian government introduced numerous alternatives of agricultural in out subsidies after the IMF and World Bank structural modification due to the relapse of drought that led the country to a food crisis and the resumption of the importation of maize (Buffi &Atolia, 2009).

In Rwanda, the national agricultural policy recognizes agriculture as a shared opportunity and responsibility, which requires the concerted action of a variety of state and non-state actors. As part of this policy, the time and the true model, the family-oriented farms, to encourage the expansion of the farmer's co-operatives and the development of the agri-food economy led by the private sector (MINAGRI, 2017). In July 2007, the Government of Rwanda decided to move from subsistence agriculture to intensified agriculture through the Crop Intensification Program (CIP) under MINAGRI, and implemented by RAB. The program is implemented in the 30 Districts. MINAGRI was responsible for the importation and distribution of agricultural inputs (seeds and fertilizers). Fertilizers and Seeds distribution is a component of Crop Intensification Program (CIP) for ensuring food security and self-sufficiency of Rwanda (MINAGRI, 2017).

The lack of agricultural subsidies is a serious problem for farmers during the planting season (they need them, as well as other agricultural resources, as well as off-farm income, as the previous season's food comes to an end), and a limited ability to borrow at a very high cost. To address these challenges, the Government of Rwanda has adopted the agricultural subsidies policy known as Nkunganire which facilitates farmers' accessibility to acquired fertilizers, improved seeds and other agricultural inputs. Later, for better management, Smart Nkunganire (SNS), which is a supply chain management system to digitalize the end-to-end d value chain of the Agro-Input Subsidy program to enhance access to agriculture inputs, has been put in place. From this new system, built by Rwanda Agriculture Board (RAB) in collaboration with Bank of Kigali TecHouse, the farmers receive advisory messages from experts on best practices as warnings or general notification from different stakeholders. (MINAGRI, 2018).

In Rwanda, Fertilizer and seed subsidies have been introduced since 2007 to accelerate agriculture productivity. The introduction and adoption of improved inputs enhanced food production levels by several folds. An increase in yields brought in food security which in turn transformed the economy socially and economically. But still, studies or information on the impact of agriculture inputs subsidies on the socio-economic development of farmers are very limited. The scarcity of information on the effect of agricultural subsidies the agriculture productivity in Rwanda presents a research opportunity to bridge the knowledge gap.

The Objectives of the study are the following:

The main objective of this research is to assess the impact of inputs subsidies on agriculture productivity in the Nyamagabe District from 2008 to 2020.

The specific are

(i) To determine the types of input subsidies provided in the Nyamagabe District

(ii) To check whether the subsidized inputs impacted maize productivity in Nyamagabe District

(iii) To assess the socio-economic of inputs subsidies in the Nyamagabe District

Research Hypothesis

H01: Inputs subsidies do not have effect on maize yield users in Nyamagabe District

H02: Inputs subsidies do not have an impact in Nyamagabe District

H03: Inputs subsidies contribute to the socio-economic development of farmers' in the Nyamagabe DistrictMaterials and Methods

II. MATERIALS AND METHODS

2.1 Description of the study area

This research was conducted in Nyamagabe District, in 5 cooperatives. The District of Nyamagabe is one of eight Districts comprising the Southern Province. It is surrounded by the District of Karongi and Ruhango in the North, Nyanza and Huye in the East, Nyaruguru in the South, Rusizi and Nyamasheke on the West. Nyamagabe District has 1090 km2 subdivided into 17 Sectors, 92 Cells and 536 Villages (Imidugudu), (Nyamagabe DDP (2013-2018).

This study concerned the members of five agricultural cooperatives operating in rural areas of Nyamagabe district, especially 623 members of COOPIMU, 90 members of KOIKWI, 83 members

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of URUMURI MUSHISHITO, 67 members of JYIMBERE MUHINZI, and 108 members of INGENZI KAMEGERI. The total number of members is 971, five cooperative presidents and secretaries, two staff in charge of agriculture at sectors and two staff in charge of agriculture at District level of study area were consulted.

The sample was calculated as the following:

SN	Cooperatives	Total members	Sample size
1	COOPIMU	623	57
2	KOIKWI	90	8
3	URUMURI MUSHISHITO	83	8
4	JYIMBERE MUHINZI	67	6
5	INGENZI KAMEGERI	108	10
TOTAL		**971**	**91**

Among 971 populations, the sample size was determined by using Yamane‟ formula (1967):

$$n = \frac{N}{1 + N(e)^2}$$

n= required sample size
N=Population Size
e=is the level of precision 90% and then standard error is (10%=0.1)

$$n = \frac{971}{1 + 971(0.1)^2} = \frac{971}{1 + 971(0.01)} = \frac{971}{1 + 9.71}$$
$$= \frac{971}{10.71} = 90.66 \approx 91$$

n=91 households

The distribution of sample size according to the 5 cooperatives was done proportionately as calculated below

1. COOPIMU: $\frac{623}{971} \times 89 = 57.1 \approx 57$
2. KOIKWI : $\frac{90}{971} \times 89 = 8.2 \approx 8$
3. URUMURI MUSHISHITO : $\frac{83}{971} \times 89 = 7.6 \approx 8$
4. JYIMBERE MUHINZI : $\frac{67}{971} \times 89 = 6.1 \approx 6$
5. INGENZI KAMEGERI: $\frac{108}{971} \times 89 = 9.8 \approx 10$

2.2 Data collection and analysis

Data collection is the procedure of collecting, measuring and analyzing accurate insights for research using standard validated techniques. A researcher can evaluate their hypothesis on the basis of collected data. In this regard, for data collection, the researcher deliberated the data collection techniques for primary and secondary data where questionnaires and documentation have been used.

The descriptive analysis method is the starting point to any analytic process, and it aims to answer the question of what happened? It does this by ordering, manipulating, and interpreting raw data from various sources to turn it into valuable insights to your business. In this study, with the mixed methods, the researcher analyzed the collected data by using Social Package of Social Sciences (SPSS v.16.00) which has been utilized to calculate frequencies and percentage. The researcher also used the content analysis, for qualitative data, which used to determine the presence of certain words, themes, or concepts within some given qualitative data (i.e. text). Using content analysis, researchers can quantify and analyze the presence, meanings and relationships of such certain words, themes, or concepts.

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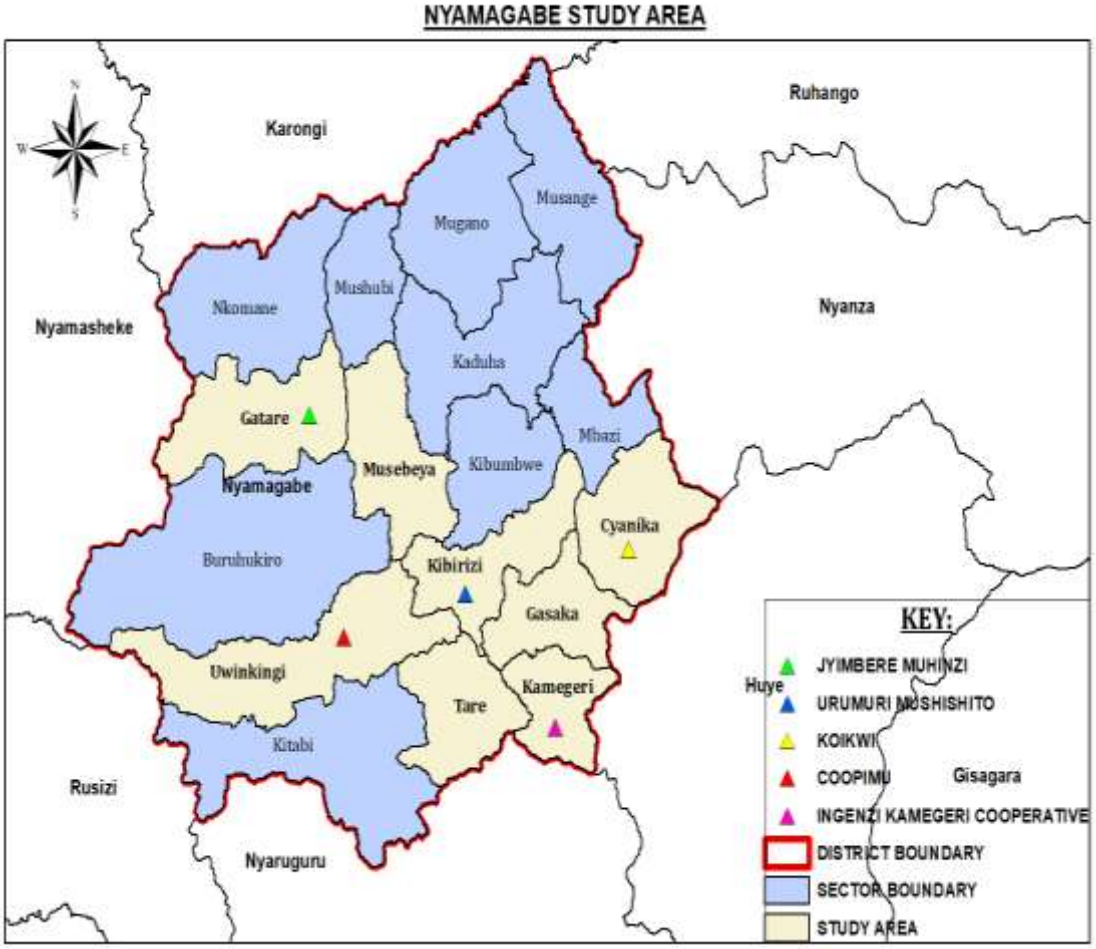

Figure 1: Map Localize Study Area

III. RESULTS

Different tables below show how the people in the Nyamagabe district feel about the different programs and strategies concerning the provision and use of agriculture subsidies.

Objective 1: To determine the types of input subsidies provided in the Nyamagabe District

In this research, the respondents were asked about the type of subsidies received and it was found that they received fertilizers, improved seeds, a combination of two, and lime as it has been shown in table 2 that most received fertilizers with 31.9% were using fertilizers as the subsidies with 24.2% produced above 1700kg/Ha. And the assessment of the effect on the yield, it was evident that the yield was related to the subsidies received and it was statistically significant as Pearson Chi-square (χ^2) = 5.336 and p-value = 0.048 < 0.05.

Table 1: Relationship between received subsidies and yield production after using agriculture subsidies.

			Production yield range after using subsidies		
			Under 1700kg/Ha	Above 1700kg/Ha	Total
Which kind of subsidy	Fertilizer	Count Which kind of subsidy have been given?	7	22	29

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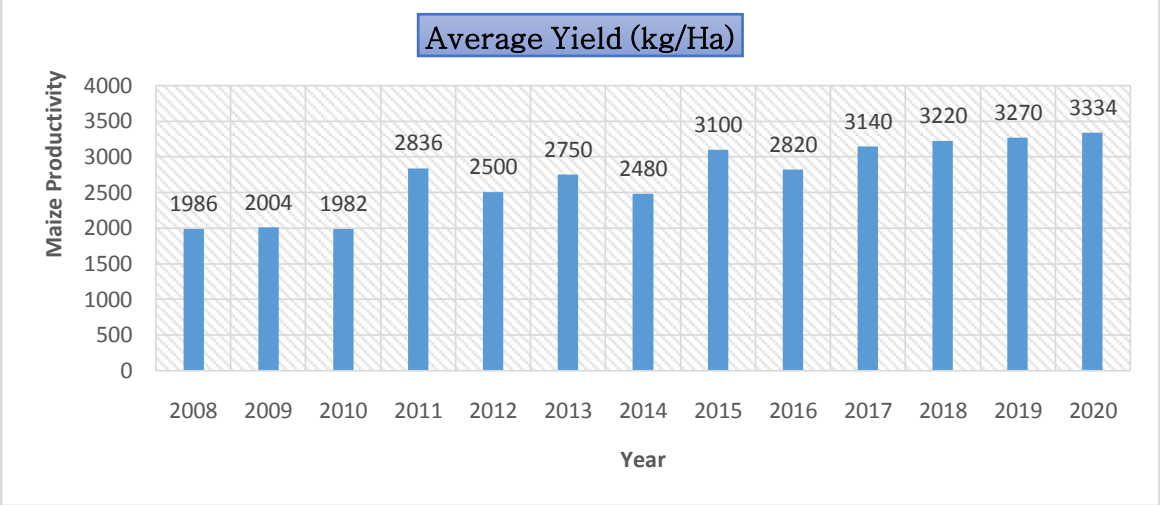
have been given?		% of Which kind of subsidy have been given?	7.7%	24.2%	31.9%
	Fertilizers and Seeds	Count	5	15	20
		% of Which kind of subsidy have been given?	5.5%	16.5%	22.0%
	Seeds	Count Which kind of subsidy have been given?	1	14	15
		% of Which kind of subsidy have been given?	1.10%	15.4%	16.5%
	Lime	Count Which kind of subsidy have been given?	5	22	27
		% of Which kind of subsidy have been given?	5.5%	24.2%	29.7%
Total		Count Which kind of subsidy have been given?	18	73	91
		% of Which kind of subsidy have been given?	19.78%	80.22%	100%
Pearson Chi-square ($\chi 2$)=5.336a Asymptotic Significance (2-sided)=.048 a.1 cells (33.3%) have expected count less than 5. The minimum expected count is 1.95					

Source: Survey data, 2022.

Objective 2: To check whether the subsidized inputs impacted maize productivity in Nyamagabe District

Figure 2 shows the Effect of Subsidy on the Increase of Maize Yields (kg/ha), which shows that in 2006, the maize yield was 916kg/Ha, and in 2020 was 3,334kg this justifies that the inputs subsidies have a significant impact on the yield in Nyamagabe District

Figure 2: Effect of Subsidy on Increase of Maize Yields (kg/ha) in Nyamagabe District



Source: Nyamagabe DDP Report, 2012 and DDS Report, 2021

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Objective 2: To check whether the subsidized inputs impacted maize productivity in Nyamagabe District

The researcher in this section presented, analyzed and interpreted the views of respondents on how they expressed their views in regard to the effect of agriculture input subsidies on yield in Nyamagabe District

The following table 3 illustrated the results, most agriculture input subsidies increased the yield and the production, except the travertine which shows the contrary whereas about 40(44%) don't see its impact on the yield. The inorganic fertilizer increased the yield and the production by 80(87.9%) and 79(86.8%) respectively Moreover, the improved seed increased the yield by 76 (83.5%) and it increased the producbyon at 72(79.1%). Forty-nine 49(53.9%) noticed the resistance of the improved seed to climate change. The use of an irrigation system increases the yield by 47(41.6%). Finally, 64(70.3%) noticed the quality of production due use of agricultural input subsidized.

Table 2: The effect of agriculture input subsidies on yield in the Nyamagabe District

The Effect of inputs subsidy on Yield	Disagree	Neutral	Agree
The inorganic fertilizer increased the yield	11 (12.1%)	0(0.0%)	80(87.9%)
The inorganic fertilizer increased the production	10(11.0%)	2(2.2%)	79(86.8%)
The usage of seed improved increased the yield	12(13.2%)	3(3.3%)	76(83.5%)
The usage of seed improved increased the production	16(17.6%)	3(3.3%)	72(79.1%)
The usage of seed improved are resistant with the change of climate	20(22.0%)	22(24.2%)	49(53.8%)
The use of travertine increase the yield	38(41.8%)	13(14.3%)	40(44.0%)
The use of an irrigation system increase the yield	30(33.0%)	14(15.4%)	47(51.6%)
The use of agricultural input subsidized increases the quality of production	13(14.3%)	14(15.4%)	64(70.3%)

Source: Survey data, 2022.

Hypothesis (H01): Inputs subsidies do not have an effect on maize yield users in Nyamagabe District

In Table 4 below, there is a similarity test between the yield produced before and after the agriculture subsidies provided to the respondents. With a 95% confidence interval of the difference, the mean difference is $-7.531*10^3$, this is because the yield obtained after the agriculture subsidies is very greater than that obtained before applying the subsidies and the probability of this test p-value =.000 < 0.05 which means that there is the similarity between these two yields and also we assume that the relationship between them can be pointed out by chance. Now, in the other analyses, the second yield was taken into consideration only.

Table 3:Comparison between the yield of production before and after agriculture subsidies provision

		Paired Differences					t	Df	Sig.(2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	What was the Yield before receiving the	-	6337.00		-	-	-	91	.000

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subsidy (Kg/Ha)					
	7.531E3	6337.00			
What is the Yield after receiving the subsidy (Kg/Ha)	3	8788.809	6274.01	11.885	

Source: Survey data, 2022.

Hypothesis (H02): Inputs subsidies do not have an impact in Nyamagabe District

These two types of yields produced by the people in the Nyamagabe district before and after the agriculture subsidies provision had to be compared in order to see if there was a significant difference between them which indicates the improvement of yield thanks to those subsidies. And at this juncture, the paired t-test (similarity test) analysis was carried out in this research.

The results from this section Table 5 allowed the researcher to either accept or reject the proposed research hypotheses. The analysis in Table 5 generated a Pearson correlation of 0.997 and a P-Value = 0.047. From the Pearson's correlation matrix, in Table 4.1 a), it is noted that input subsidies had a positive relationship with maize productivity (r = .997, p< 0.047) at a significance level of 0.05 with the highest positive coefficient of (r=.997). This expresses that the input subsidies have a positive impact to the maize productivity in Nyamagabe District.

Table 4:Correlation analysis

		Maize Productivity	Maize Productivity
Inputs Subsidized	Pearson Correlation	1	0.997*
	Sig. (2-tailed)		0.047
	N	3	3
Maize Productivity	Pearson Correlation	0.997*	1
	Sig. (2-tailed)	0.047	
	N	3	3

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Survey data, 2022.

Objective 3: To assess the socio-economic of inputs subsidies in the Nyamagabe District

Hypothesis (H03): Inputs subsidies contribute to the socio-economic development of farmers' in the Nyamagabe District

The researcher in this section presented, analyzed, and interpreted the views of respondents on how they expressed their views in regard to the Socio-Economic Development of farmers resulting from the use of agricultural input subsidized among farmers of Nyamagabe District

Table 6 illustrates the details of the results. Since the use of the agricultural input was subsidized they were following changes; 66(72.5%) pay the medical insurance easily, the purchasing power increased for 58(63.7%)

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families, forty-nine 49(53.8%) families pay easily school expenses for children, for 46(50.5%) families the crop production received the good market price and finally 62(68.1%)families get more total income from sales of food crops. In contrast, 12(13.2%)families did not start the off-farm income-generating activity. Fifty 50(54.9%) save money in Umurenge SACCO. According to the respondents, the Inputs subsidies have a positive contribution to the socio-economic development of farmers' in the Nyamagabe District

Table 5: The Socio-Economic Development of farmers resulted from the use of agricultural input subsidized among farmers of the Nyamagabe District

Socio-Economic Development of farmers to the use of agricultural input subsidized	Disagree	Neutral	Agree
My family has enough crop production for consumption	2 (2.2%)	36(39.6%)	53(58.2%)
My family gets more total income from sales of food crops than before the use of agricultural input subsidized	17(18.7%)	12(13.2%)	62(68.1%)
My family has started on off-farm income-generating activity due to the benefits of the use of agricultural input subsidized	35(38.5%)	12(13.2%)	44(48.4%)
My family finds it easier to pay school expenses for children due to increased income since we use agricultural input subsidized	20(22.0%)	22(24.2%)	49(53.8%)
The crop production receives a good market price due to the use of agricultural input subsidized	18(19.8%)	27(29.7%)	46(50.5%)
The purchasing power increased since we have a good yield due to the use of agricultural input subsidized	18(19.8%)	15(16.5%)	58(63.7%)
Since we use agricultural input subsidized, we pay the medical insurance "Mutuel de Sante" easily because of the good yield we get	10(11.0%)	15(16.5%)	66(72.5%)
We could now afford the market to buy other meal to eat	16(17.6%)	20(22.0%)	55(60.4%)
Due the income we got from our sales we save money in Umurenge SACCO	30(33.0%)	11(12.1%)	50(54.9%)
We begin to invest in off-farm activities since the use of agricultural input subsidies gave us more yield	12(13.2%)	14(15.4%)	65(71.4%)

Source: Survey data, 2022.

IV. CONCLUSION

Most important significant predictors for good or proper usage of agriculture input were age and educational level as revealed by the study. Most of the farmers have increased and improved their crops production in terms of quality and quantity as resulted from the use of agriculture input in their lands. As it showed by the finding gathered, since the farmers used agricultural input subsidized they were following changes in the socio-economic developments; the purchasing power increased for families, paying easily school expenses for children, crop production received good market price, they get more total income from sales of food crops, some of them start some off-farm income generating activity, they easily pay the medical insurance and its increase saving money in Umurenge SACCO. And in contrast the lack of knowledge of good usage of agricultural input andthe proper way to register on TWIGIRE MUHINZI it still a barriers related to the use of agriculture input as to improve the production and same time the socio-economic development of farmers of Nyamagabe District.

V. ACKNOWLEDGMENTS

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case of maize crop, which led to the successful completion of this study.

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