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Effects of irrigation Method on Household Food Security at Mugerero in Gihanga commune of Burundi

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ABSTRACT

Irrigation is a method applied to ensure sufficient soil moisture and meet crop water requirement to reduce water deficit which is a limiting factor in plant growth. It influences the entire growth process from seedbed preparation, germination, root growth, nutrients utilisation, plant growth, production, yield and quality. Moreover, Irrigation plays a crucial role in food production and improving food security by not only allowing achievement of full crop production potential in a given growing environment, but also by fighting pests through products diluted in water, protecting sensitive crops from frost, adding nutrients that are dissolved in the water, improving land physical properties, and removing excess salinity from the soil. Whence irrigation method has been considered in this study to improve food security at Mugerero, a hill of Gihanga commune. Results of the study highlighted the effectiveness of irrigation method in improving household food security through the domestication of new crops including soybean and peanuts, crops very nutritious which could improve the nutritionnel need requirement of the households. Furthermore, the outcomes revealed increased crop yield coupled with exchange of harvest between neighbors and household incomes enhancement. The people could easely supplement their diets and other needs. Whence enhancement of food security and livelihood. The study highligthed that the irrigation method has been a key tool in improving food security at mugerero hill. However further studies are recommanded in the neighboring hills to futher boost the food security in the region.

Keywords: Crop yield, Food Security, Irrigation method, Mugerero Hill.

1. INTRODUCTION

The irrigation is a method for improving production by increasing the productivity of available land and thereby expanding total agricultural production [1]. It is basically an attempt by man to alter the hydrologic cycle and promote increased agricultural productivity [2]. Irrigation is a method applied to ensure sufficient soil moisture and meet crop water requirement to reduce water deficit which is a limiting factor in plant growth [3]. Historically, it is defined as the artificial application of water to soil or land to supply the essential moisture for plant growth and development [4]. Foregoing research reported that irrigated agriculture is one of the components of world food production, which has contributed significantly to maintaining world food security and to the reduction of income poverty [1] especially for the rural households [15]. It is the critical factor affecting the productivity of many crop, and is considered as essential for crop production, income generation, and household food security [6–7]. Moreover, irrigation have many benefits to the soils including facilitating nutrients circulation within the soil profile, assist in nutrients uptake by various plants, enhance transpiration and nutrient diffusion in the soil. In many parts of the world, irrigation water has been over-exploited and over-used [8]. It influences the entire growth process from seedbed preparation, germination, root growth, nutrient utilisation, plant growth, production, yield and quality. It is necessary to ensure crop production and

yield stability in all season as highlighted by other research [9] [10] [11]. Irrigation plays a crucial role in food production and improving food security by not only allowing achievement of full crop production potential in a given growing environment, but also by fighting pests through products diluted in water, protecting sensitive crops from frost, adding nutrients that are dissolved in the water, improving land physical properties, and removing excess salinity from the soil [12]. The impact of irrigation on the development in agriculture has been profound. Whence it is an important tool to be used in agriculture, specifically in sub-Saharan Africa where agriculture forms the backbone of livelihood for majority of the population [5] especially in Burundi, a country with successive shocks due to climate disasters and limit its ability to achieve sustainable food and nutritional security. These shocks, coupled with land degradation, population growth and pauvrets, prevent the establishment of sustainable agriculture [13]. In this country, food and nutrition security are compromised, whence irrigation method has been emplemented to reverse the trend, especially at Mugerero, a hill of Gihanga commune to improve crop production in the region and the food security in general.

2. MATERIALS AND METHODS

2.1. Site description

The study was conducted at Mugerero hill in Gihanga commune of Bubanza province.

2.2. Experiment design:

The experiment was considered irrigation method with channel Photo 1.

Photo 1. Irrigation system with channel

This irrigation method was made up with three channels including the main channel which draws water from the source; the secondary channel which receive the water from the main channel and distributes this water to the tertiary cannel which irrigate the plots.

2.3. Sampling and data statistical analysis

Crops were sampled during harvesting period and were analyzed using advanced Excel 2007 and SPSS 15. A comparison among treatments were conducted ($P< 0.05$) by using least significant difference (LSD) at 5% level.

3. RESULTS AND DISCUSSION

3.1. Effects of irrigation method on new crops domestication

Results highlighted the domestication of new crops in the region due to irrigation method. These crops include peanuts and soybeans. They contain nutrients needed for human life. Specifically, peanuts are an especially good source of healthful fats, protein, and fiber. They also container plenty of potassium, phosphorous, magnesium, and B vitamins. Despite being high in calories, peanuts are nutrient-rich and low in carbohydrates [14]. Foregoing research reveiled that peanuts provide nutritional benefits and make a person feeling fuller for longer. Peanuts plays a key role in supporting heart health, maintaining a healthy weight and managing blood sugar levels. Regarding soybeans, it contain contain all of the essential amino acids necessary for human nutrition. Soybeans is one of the world's economically and nutritionally important crops. In 2018, soybean were 61% of international oilseed production with 397.9 tons

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harversted worldwide [15]. Soybeans products, namely meal and oil, are popular in a myriad of industries for their versatility and utility. Soybean oil provises the most versatility with uses in fuel, solvents, candLes, cosmetics, construction, and foam. Soybeans are healthfull and rich in protein.

Soybeans foods may reduce the risk of a range of health problems, including cardiovascular disease, stroke, coronary heart disease and some cancers, as well as improving bone health [16]. Litterature affirmed soybeans are a nutritious food that provides various health benefits.They contain fiber and protein ; lower Cholesterol; and boosts digestive Health. Considering all these benefits from these crops, households health has been improved. Moreover, food security has been also enhanced in the region due to the nutrients content in the crops.

3.2. Effects of irrigation method on crops yield

During the study, the crops harvest was recorded and weightened as can be seen in the following figure 1. The method has positively influencez the crop yield as can be seen in the figure 1. The rebuts the first highest yield for cassava with about 40.000 kg/ha and has significantly differed from others. This was due to pronounced cassava consumption in the region. It can be used as vegetable and food whence improvement of food security in the region due to nutrients content in this crop**.** The litterature revealed vitamin C and copper content in cassava crop [17]. Moreover, it provides many important nutrients including protein and ion nutrients that are more needed for women especially during pregnancy. However people should not eat it raw as there is a risk of toxicity due to naturally accurring forms of cyanide [18].

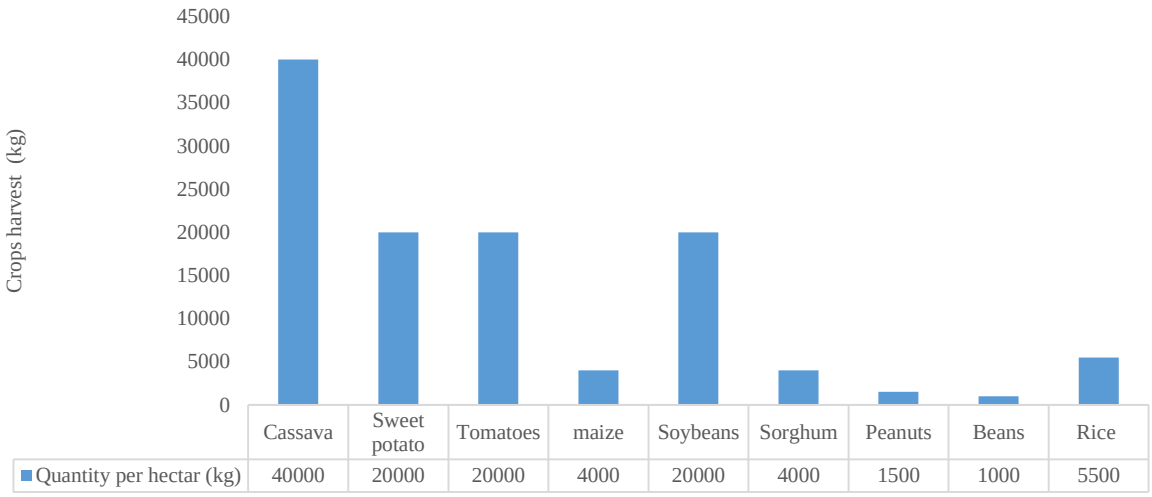

Figure 1. Effects of irrigation methods on crops harvest

The second highest weigh was observed for the sweet potato, tomatoes and soybeans which got the same weight of 20.000 kg/ha, while the lowest was recorded for beans and peanuts with 1500 kg/ha and 1000 kg/ha respectively.

Furthermore, the method was very benefic to the households due to crops cultivation in July - August and September, montas where water stress is more pronounced all over the world. Households highlighted increased crop yiled coupled with exchange of harvest between neighbors whence social relations restoration in the region.

3.3. Effects of the used method on households income

After harvest, a part of the production were sold as desplayed in the table 1.

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Tabl 1. Effects of irrigation methods on households income

Crops	Quantity (kg)	Unit price (BIF)	Total (BIF)
Cassava	40 000	350	14 000 000
Sweet potato	20 000	400	8 000 000
Tomatoes	20 000	1000	20 000 000
le maize	4 000	800	3 200 000
Soybeans	20 000	2700	54 000 000
Rice (paddy)	5 500	1650	9 075 000

The outcomes revealed highest income for soybean with about 54.000 BIF. This was due to its dual use in the country. It is used as porridge and milk. Furthermore, industries purchase this crop for flour transformation. The following highest income was recorded for tomatoes which has also multiple uses. It is consummed as fruit or used in food prepation. Moreover, The tomatoes are transformed in tomato sauce by many industries. It is an important crop for many households with lower income. Lower income was recorded for maize due to its lower quantity at harvest. In the country, many people harvest immature maize for consumption and sale to stabilize their diet and economy. Alghough this harvest reduce the harvest at maturity period, foregoing research affirmed that immature maize generally contain higher protein and digestible fiber [19], whence a little improvement of food security. As affirmed by the households, these income has played a key role in the society. They can supplement their diets, purchasing school materials and buy other needs resulting in enhancement of livelihood and food security as well.

4. CONCLUSION

Results highlighted the effectiveness of irrigation method in improving household food security through the domestication of new crop, crop yield improvement and household incomes enhancement. Specifically, with the use of irrigation method, new crop have been introduced in the region including peanuts and soybeans. These crops are very nutritious and can improve the nutrionnel need requirement of the households. Furthermore, the outcomes revealed increased crop yield coupled with exchange of harvest between neighbors whence social relations restoration in the region. Moreover, the enhancement of households incomes have been also observed. The households could easely supplementat their diets, purchase school materials and buy other needs whence enhancement of food security and livelihood. This irrigation method has been a key tool in improving food security at mugerero hill as well as the household health. Whence further studies are recommanded in the neighboring hills to futher boost the food security in the region.

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