

SMALL HOLDER FARMER INVESTMENT ON POTATO PRODUCTIVITY IN MUSANZE DISTRICT, RWANDA

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ABSTRACT: Agriculture is the backbone of Rwandan small household farmers' livelihood by which potato is the one of the priority food and cash crop in country. But potato farming in Rwanda is characterized by low productivity, inefficient use of agriculture technologies including improved inputs. The major causes are reflected to the inefficiency input affordability, the capacity and willingness of small household farmers' investment in potato farming. This study was conducted in order to assess smallholder farmer's investments on Irish potato productivity in Musanze District with objective of determining the influence of agricultural input's investment on Irish potato productivity. Multi-stage sampling, and Multiple regression analysis were employed to discuss the findings. The results revealed that the cost for purchasing improved seeds for Irish production ($p < 0.010$); has negative impact on Irish potato production by farmers. Expansion of Land cultivated by farmers ($p < 0.000$) has the highest influence on Irish potato production. Accessibility and fertilizer usage ($p = 0.002$) has a relatively moderate influence on Irish potato production. And the cost of labors used in Irish potato production, ($p < 0.000$) has a high influence on Irish potato productivity. The pesticide used to control pest and diseases for Irish potato production, ($p = 0.020$) has a moderate influence on Irish potato productivity. Farm inputs investment associated with best agricultural practices are the key in Irish potato production, therefore imparting knowledge about farm inputs to farmers in relation to Irish potato productivity.

Index Terms — Potato, investment, Multiple regression,

I. INTRODUCTION

Investing in agriculture is one of the most effective ways of promoting agricultural productivity. Indeed, improved investment would enhance agricultural productivity for smallholders [1] and [2]. However, for any investment to have a positive impact on agricultural production and productivity, it must contribute to capital formation at the farm level. In this respect, investments made by the farmers themselves are indispensable. Their investments constitute the foundation and the engine for sustainable development and the reduction of poverty and hunger [3]. For farmers, the main sources of investment finance are their own savings and their fixed capital, which are used as collateral for credit. Capital formation is certainly higher for farming households with posi-

tive savings and clear, legally recognized ownership of their land. In areas where the levels of poverty and hunger are high and agriculture is dominated by small-scale farmers, such as in South Asia, sub-Saharan Africa and parts of Latin America, the average farmer earns less than half of what is needed to cross the poverty line [4]. For small and marginal farmers with below average land holdings, the situation is even worse, both in terms of their ability to save and to secure their rights to the land for investment.

Apart from the capacity to invest through the generation of savings and fixed assets, the factors driving investment for farm-level capital formation are the growth of the food value chain from producers to

consumers, which includes agro-industries and the provision of public goods in the form of basic infrastructure, such as roads, electricity, education and technology [5]. There is no doubt that more public resources are needed for agriculture. However, there is a need for new investment strategies that are centered on agricultural producers and focuses public resources at all levels on the provision of public goods in ways that complement investments made by farmers and support inclusive and efficient agricultural and food systems at local and national level [6].

II. RESEARCH METHODOLOGY

This study adopted both qualitative and quantitative methods research design. Household surveys with structured questionnaires, were methods adopted for the primary data collection. Relevant secondary data were obtained from different publications, books, journals, newspaper articles, dissertations, year-end reports and others. A structured questionnaire (closed as well as open ended) were developed in order to retrieve the quantitative and qualitative information, pre-testing survey was done, descriptive and econometric methods of analysis were used for this study.

Study area

The Musanze district is one of the five district forming the North province. It comprises the old municipalities of Ruhengeri, Mutobo, Kinigi, Bugarura and Bukamba. Its surface covers 530.4 km², from which 60 km² corresponds to the Volcanoes National Park and 28 km² to Lake Ruhondo. The district is bordered in the North by Uganda, the DRC and the Volcanoes National Park; in the South by Gakenke district; in the East by Burera district; and in the West by Nyabihu district. Musanze district accounts 15 sectors, 68 cellules and 432 villages (Imudugudu) A

high altitude tropical climate, with an average temperature of 20°C. Rains are generally abundant, ranging from 1,400 mm to 1,800 mm annually.

Target population

The farmers (20542) that are engaged in Irish potato production. These farmers invested in Irish potatoes production in term of fertilizers usage, hired labors, improved seed usage, and expansion of land size as factors of production only 99 farmers were selected research focuses on smallholder farmer investment on irish potato production in Musanze Districts of Rwanda

Sampling technique

A simple random sampling technique will be used in the sampling of the district. Farmers will be having equal chances of selection. The list of total household heads in the selected sectors will be obtained from the sector offices.

Purposive sampling was done to capture the information from targeted and useful respondents like leaders of cooperatives, local leaders and agronomists, or representatives of different concerned agricultural institutions.

Multiple regression analysis and Hypothesis testing

The model was estimated as econometric model based on Irish potato productivity as the dependent variable and farm inputs required by farmers for Irish potato productivity as independent variables (Independent variables). We assume the household's Irish potato productivity (Y) in any time period(t) is a function of Labor usage (L), improved seeds usage (S), Land size cultivated (N), and fertilizers usage (F); and pesticide(P); Formally, we specify the aggregate Irish potato productivity equation as follow

$$Y = \alpha_0 + \alpha_1 L_t + \alpha_2 S_t + \alpha_3 N_t + \alpha_4 F_t + \alpha_5 P_t + U_t$$

Therefore, α_0 is the intercept while $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$ are coefficients and U_t represents an error term or is assumed to present other factors that may affect Irish potato productivity

III. RESULTS AND DISCUSSION

To investigate the Small holder farmer’s investments (fertilizers, land, seed, labour, pesticides) towards Irish potato productivity in Musanze District

The data used here are those concerning to Irish potato production output with interaction of production variables such as fertilizers, improved Irish potato seeds, labor intensification and land size expansion. pesticide The results revealed that; before change of farm inputs (seeds varieties, fertilizers, labors and land size pesticide), the majority (82.8%) of farmers reported that the yield of Irish potato range between (1000-2000kg); (10.1%) of farmers reported that the yield of Irish potato range between (2001-3000kg); (5.1%) of farmers reported that the yield of Irish potato range between (3001-4000kg) and (2.0%) of farmers reported that the yield of Irish potato is above (4000kg). On other hand, after

change of farm inputs, the results revealed that;(59%) of farmers reported that the yield of Irish potato is above (4000kg), (21.2%) of farmers is between (2001-3000kg), (15.2%)of farmers is between (3001-4000kg) and (4.0%) of farmers reported that yield of Irish potato range between (1000-2000kg).

Based on the results in table (4.10); it is clearly observed that, the yield of Irish potato has increased tremendously with the change of farm inputs through new technology in Irish potato production on small land area. The comparison of yields before and after change of farms inputs, the yield shifted from 1000-2000kg with (82.8%) of farmers before change of farm inputs to above 4000kg with (59.6%) of farmers after change of farm inputs. This finding are in line with Rwanda National Survey of farmers (MINAGRI, 2008) about the small scales farmers ` expenditures for improved seeds and chemical fertilizers was around 10 billion of Rwf. This means that funds for the Irish potato production hugely affected by the availability of chemical fertilizers; quantities and improved seeds; experienced labors and expansion of land size.

Table4.10: Comparison of Irish potato yield before and after use of farm inputs

Irish potato Yield (Kg)/ Are	Before		After	
	Frequency	Valid Percent	Frequency	Valid Percent
1000-2000kg	82	82.8	4	4.0
2001-3000kg	10	10.1	21	21.2
3001-4000kg	5	5.1	15	15.2
Above 4000kg	2	2.0	59	59.6
Total	99	100.0	99	100.0

Source: Primary data, 2017

Investment in Agriculture

Investment is the change in fixed inputs used in a production process. In the narrowest definition, investment is the change in the physical capital stock, that is, physical inputs that have a useful life of one year or longer (land, equipment, machinery, storage facilities, livestock). However, [7] estimated that less than 20 percent of total growth in the United States comes from physical capital formation, while [8] estimates were 10 to 15 percent.

Economists recognize that, though difficult to measure, a comprehensive agricultural investment measure should include improvements in land, development of natural resources and development of human and social capital in addition to physical capital formation. Human capital is the stock of knowledge, expertise or management ability. Since it is directly influenced by educational, training and extension institutions, variables such as education level or extension contacts are often used as proxy measures. Public and private expenditures on R & D are often used to proxy the level of human capital as well. Coen and [9] specifically include R&D, education and training as forms of human capital investment. The agricultural sector provides livelihood directly and indirectly to a significant portion of the population of all developing countries, especially in rural areas, where poverty is more pronounced.

Thus, a growing agricultural sector contributes to both overall growth and poverty alleviation. Investment is of special interest as a limiting factor to agricultural production capacity and production because an alarming trend is being observed: public and private investment in agriculture has been declining [10]. The decline in public investment is of particular concern because public investment in basic infra-

structure, human capital formation and research and development (R&D) are necessary conditions for private investment. Public investments also promote technology adoption, stimulate complementary on-farm investment and input use and are needed for marketing the agricultural goods produced [11].

Smallholder farmers' savings and Investment

What emerges from the studies is that farmers, who cannot save, cannot invest? If they cannot save, not only can they not invest, they also cannot access credit. Even when they do get credit, they use the loans for immediate consumption and become more and more indebted. Saving is also needed to generate assets (again through investment), which gives access to credit. In fact, in a situation of severe credit constraint, the saving and investment decision of an agricultural household can hardly be separated since its investment decisions are linked to its saving decisions. In a survey of 51,770 households spread over 6,638 villages across India, it was found that the estimated annual savings of all farming households during 2002-03 was negative, at 69,348 crore Indian rupees. As a result, the ratio of farm sector savings to overall GDP was estimated at -2.8 percent for the year 2002-03. This has led to increased indebtedness and a decline in farm-level capital formation in rural areas. Taking into account the indebtedness of farming households from the All India Debt and Investment Survey 2003, the proportion of cash loans as proportion of overall GDP turns out to be 3.3 percent during 2002-03. Interestingly, this ratio is quite close to the amount of savings, indicating that the gap between income and consumption expenditure is financed by borrowings.

Survey results also show that less than one percent of farmers in Zambia and less than two percent of the rural population in Nigeria have access to formal

credit [12]. In India, 45 percent of smallholder farmers do not have a formal savings account, and 69 percent do not have access to a formal credit account. Nearly 40 percent of farmers in Honduras, Nicaragua and Peru are credit-constrained [13].

At regional levels, the share of adults who do not have access to formal finance institutions is 65 percent in Latin America, 80 percent in sub-Saharan Africa, and 58 percent in South Asia and East Asia [14]. Household farm savings have long been recognized as the most important source of on-farm investment. Recent data show the continuing importance of household savings for financing investments by rural entrepreneurs, including smallholder farmers [15]

Smallholder Farmers as the biggest investors in agriculture

For any investment to have positive impact on production and productivity and hence the sector growth, it must contribute to capital formation at the farm level. In this respect, the investments made by the smallholder farmers themselves are indispensable. Public investment in agriculture and private investment in agro-industries complement farm-level investment, but cannot substitute for the investments that need to be made by the farmers themselves. The most comprehensive and readily available data for empirical measurement of investment in agriculture is the FAO estimate of on-farm capital stock. FAO has prepared estimates of on-farm capital stock for 206 countries from 1975 to 2005 based on inventories of agricultural assets contained in the FAOSTAT database. According to this dataset, farmers are the largest source of investment in agriculture for agricultural capital stock (ACS) majority of whom are smallholder in nature. On-farm investment in agricultural capital stock by farmers is nearly three times as large as other sources of investment combined,

including public investment, foreign direct investment and official development assistance. According to the FAO publication, State of the Food and Agriculture 2012 – investing in agriculture for a better future [16] in the 47 countries that are on track to achieve the Millennium Development Goals (MDGs) hunger-reduction target, agricultural capital stock per agricultural worker (a proxy for private domestic agricultural investment) has grown by 0.7 percent per year since 1992. Whereas, this ratio has declined slightly in the 25 countries where progress has been insufficient and strongly in the 15 countries where rates of undernourishment have stagnated or regressed. Available data indicates that public investment, although small relative to farmers' investment, is the second most significant contributor to farm-level capital formation, both directly through the provision of rural public goods and its effect on private investment. Hunger is more prevalent in countries where public agricultural expenditure per agricultural worker is lower, suggesting that both public and private investment in agriculture is important in the fight against poverty and hunger.

IV. CONCLUSION

Access to farm inputs (Seeds, fertilizers, labors, land and pesticides) are associated with best agricultural practices that enhanced Irish potato production. It has been realized that used improved seeds by farmers; integration of inorganic and organic fertilizers usage; expansion of land size cultivated by farmers and accessibility of farm labors and the application of pesticides to control insects pests and diseases are important factors for Irish potato productivity as they play a crucial role for increasing Irish potato productivity. The Knowledge of these factors of production by farmers is important to ensure that

farmers are able to produce the right quantities and quality of Irish potato needed on the markets.

V. RECOMMENDATIONS

The inputs distribution system to farmers should be improved upon to deliver improved seeds and fertilizers in time and reduced possibilities of damages for fertilizers and seeds which may result into reduced Irish potato yields and yield potentials in general. Therefore, Government of Rwanda should put in place mechanisms to ensure that fertilizers are

affordable and accessible by the farmers on right time. Efforts should also be made to generate hybrid seeds produced locally and adoptable in local environment. There should be supported researches to generate resistant and better yielding Irish potato varieties as they have high potential to increase Irish potato yields and the use of pesticides to control insect pests and diseases in Irish potatoes. This would increase Irish potato productivity both quality and quantity in the short run. The market access to farmers also plays a crucial role to encourage farmers to invest more in Irish potato production.

VI. REFERENCES

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