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Adoption-Diffusion Model of Farm Innovations: Its Applicability to Radical Terraces Project in Rwanda

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ABSTRACT

The farming technique of radical terracing is one of the new agricultural technologies introduced in Rwanda to enhance farming activities in the highland areas. The study was designed to analyze the applicability of the adoption and diffusion model of farm innovation on adopting radical terraces in Rwanda. It adopted a descriptive correlational research design to the farmers owned radical terraces in Nyamagabe District. The purposive sampling technique was applied to select 19 Key Informants and 192 farmers. Both quantitative and qualitative data were collected through questionnaires, face-to-face interviews, direct observation and documentary sources. Descriptive and inferential statistics were used for quantitative data analysis whereas thematic and narratives content analyses were used on qualitative. The research outcomes show that the level of farmers' adoption was medium. Besides, the farmers' access to agricultural information; and farmers' participation were found to have a positive influence on the applicability of the adoption-diffusion model on the adoption of radical terraces. The study showed that the adoption of radical terraces in Nyamagabe depended on the compatibility with the existing values and practices among farmers based on the information-contagion model and the social participation model that is widely used in the agricultural context. The study recommended the government continue sensitizing farmers on the importance of adopting radical terraces for better use and maintenance as a modern farming practice. Further research should focus on the applicability of technology characteristics user's context model on the adoption of radical terraces in Rwanda.

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Introduction

Background of the study

Adoption is defined as the incorporation of innovations into a farmer's continuing operations from end to end repetitive and continual practice (Peshin et al., 2014) although diffusion is defined as a spread of an invention over a timeframe among adherents of a societal system (Rogers, 1995). In 1962, Everett M. Rogers developed the Adoption and Diffusion of Innovation (ADOI) Theory, from the field of communications to elucidate how, over time, a product or an idea is adopted by some farmers and gains momentum and disseminates through a particular people or social system to other farmers. Hence, individual farmers, as associates of a social system, accept a new behavior and conduct, idea, or practice (Banjara, 2016).

Radical terracing is considered as a practice of landscaping a pierce of tilted land into a series of consecutively fading flat surfaces and stages, which look like stepladders, for the goals of cultivating adequately. Layered terrace steps are usually used for farming on mountainous or hilly terrain. Also, terraced pitches reduce erosion and surface runoff retaining soil nutrients (Republic of Rwanda {RoR}, 2012). Bizimana (2011) and RoR (2014) indicate that the objectives of radical terraces projects are for: Reducing run-off and its velocity and for minimizing soil erosion; preserving soil moisture and fertility and for facilitating restructured cropping processes; and promoting intensive land use and permanent crop growing on slopes and reducing shifting farming. NISR (2016) indicates that soil erosion causes a total soil loss of about 15 million tonnes per year in Rwanda, corresponding to the loss of the capability to nourish 40,000 persons yearly. Furthermore, Mupenzi et al (2014) noted that erosion caused the loss of 1.4 million tons of productive soils through water movement sideways the rivers. To reduce this problem of soil erosion, radical terracing technique was amongst the strategies adopted for

protecting land to raise farm output through mobilization of the residents living in highlands.

Historically, in Rwanda, in 1972 there was an introduction of radical terraces projects at Kisaro in Rurindo district, North Province by a religious person called Syrille Wieme. Then, in 1979, this technique was acknowledged by the Rwandan Government and was formally encouraged to all Rwandan farmers at the time (RoR, 2012). There was an estimation of 1,000,000 households which are the major part of the Rwandan agrarian community and own farming land that radical terracing is suitable and potential. In this regard, about 71% of the entire agrarian community has been targeted by the transference and dissemination of radical terracing as a new agricultural technology in Rwanda (RoR, 2012). Besides, an estimated normal cost for establishing one hectare of radical terraced land in Rwanda counting labor, basic materials like shovels, picks etc is $ 1000 tax exclusive (RoR, 2012). Nevertheless, some barriers which might hinder the proper execution of radical terraces projects in Rwanda as identified as high cost of equipment/tools; limitation of terracing technical skills; limited reference and needed information on soil depth, soil type, slope etc; and acceptability within communities, (RoR, 2012).

Moreover, RoR (2012) in the study of "Barrier Analysis and Enabling Framework for Technology Transfer and Diffusion" found that a total of 294,000 ha of arable land needed the establishing radical terraces. The required total price (USD) equaled $37,921,000 for these targeted ha. This radical terracing project was being implemented in the Nyamagabe district. In this district, from 2008-2012, 5,736 ha radical terraces were developed as an agricultural technology; and 1500 ha had to be constructed in the period 2013-2018. The cost was evaluated at $7,236,000 for both periods (Nyamagabe district, 2018). Despite the government efforts, while some of the constructed terraces are fully used, others are not used or are abandoned (RoR, 2014). There exist different barriers inhibiting the adoption of radical terraces such as limited reference information and acceptability within communities among others. Therefore, the leading goal of this research was to examine the extent to which the various aspects of the adoption-diffusion model provide an effective basis for understanding radical terracing projects in Rwanda. For achieving this, the study set out to respond to research questions stated as follows: a) Does farmers' practice of radical terraces access to agricultural information conform to that explained by the adoption-diffusion model? b) How does farmer's participation in the adoption of radical terraces relate to the adoption-diffusion model?

Scholarly Context

To diffuse farm innovation, several models can be used. Particularly, this study, therefore, seeks to assess how farmer access to agricultural information and their participation are related to information-contagion, social participation and economic constraints models in adopting radical terraces in Rwanda.

Adoption-Diffusion Model of Farm Innovations

Adoption of innovation is defined as the verdict of making a complete understanding of the concerned innovation as the greatest option of accomplishment available (Peshin et al., 2014). The Adoption and Diffusion of farm Innovations perspective was the foremost concept in the farming extension work from post-World War II until the 1970s period. Moreover, it was much developed during the 1980`s era, throughout the applicability of the "agricultural productivity and green revolution model". It remains used today in agricultural extension services and especially once an extension is focused on the adoption of a specific practice or technology (Rogers, 2003). Rogers M. Everett is the founder of the theory of adoption and diffusion of innovations (Tomas-Simin and Jankovic, 2014). For Rogers (2003) as cited by (Murwanashyaka et al., 2021, p. 146) the "diffusion of agricultural innovation concerns the collective shared process which encompasses interactive communication in which participants produce and share information among them for making an interactive mutual understanding". In this regard, the model of adoption and diffusion of innovation remains a special practice of communication connected to inventive concepts and opinions (Tomas-Simin & Jankovic, 2014). Thus, the principle of diffusion intended to trace to agrarian community agreement of pioneering thoughts and performs at the same time in sustenance and mechanized agriculture. A number of elements influence the adoption of an advanced technique and novel idea. Yates (2004) looks at the chain of reactions required in the adoption of innovation like communication networks used to spread information about the innovation and the nature of the society to which innovation has been hosted. For Chimoita (2017) diffusion of innovation denotes a route of passing on the innovative idea among societal members over the specific date by focusing on the process of making decisions that directs either to acceptance or rejection of concerning innovation.

Participation

This refers to people actively taking part in all phases of agricultural expansion focused on the delivery of free labor, materials available locally, making a decision, project design, execution, monitoring and evaluation (Wairire, 2009; Mwendwa, 2012; Kariuki, 2013). Participation is likely to optimize the utilization of local resources, indigenous experience, native talents and local technology (Mulwa, 2010). In this regard, local smallholder farmers improve the use of their land as a local resource and are experienced in radical terracing. Ouma (2016) found that the drive to participate in project activities was still wanting as the community did not seem to have inculcated a sense of ownership towards the project. Miseda (2014) reported that the source of funding was reported as the main determinant of the project's durability. It was recommended that the commitment of at least one resource by the community to enhance a sense of belonging to the projects could either be financial, skills, ideas or in the form of labor. In so doing, the farmer's contribution is the basis of community participation and is done voluntarily.

Access To Agricultural Information Sources

refers to receiving messages related to farming activities. For Odongo (2014), these messages enable interactive connectivity among agricultural extension agents and farmers to improve agrarians' information literacy, knowledge, and awareness of the existing

tendencies in agriculture to lift steps of adopting radical terraces. Odini (2014) posits that farmers need information that contributes to good decision-making and planning. Then, agricultural information is therefore seen as an important ingredient in agricultural projects and can be sourced differently. Glendenning et al. (2010) found that the main sources of agricultural information were other farmers at 16.7% and agriculture input dealers at 13.1%. Additionally, Yaseen et al. (2016) found that for 24.4% of the farmers the main source of agricultural information in Pakistan was self-experience. For Sokoya et al. (2014), farmers got agricultural information needed through mass media, agricultural extension agents, social networking, and interpersonal interaction. Drawing from these studies improved access to information on radical terraces in Rwanda was essential to its adoption among the farmers. Adoption and diffusion theory is applied in the current study since it assumes that farmers suffering problems to adopt innovative agricultural practices in terracing, would be prompted by the incapability of being involved in using radical terraces in order to lessen the threat and effort for the accomplishment it alone and as a tactic of optimizing returns from radical terraces use. Methodologically, this theory helped to evaluate the agricultural extension services and social interaction farmers in adopting new farming techniques for satisfying the food needs.

Materials and Methods

The study was conducted in May – September 2019 in Nyamagabe district, Rwanda. Rwanda is a small country located in Central East Africa with 26,338 square kilometers, bordering DRC (West); Burundi (South); Tanzania (East) and Uganda (North). Its location is between 1°04‟ and 2°51‟ of south latitude and between 28°45‟ and 31°15‟ of east longitude (RoR, 2015). In 2016, the total population was estimated at 11,809,295 with the density of the population of 407 persons/sq km (NISR, 2017). Furthermore, it is a landlocked country and is called the *"Land of a Thousand Hills*" because most of it is hilly (RoR, 2015).

However, Rwanda's economy largely depends on farming characterized by small-scale sustenance farmers harvesting most of the farming output (RoR, 2012). The agriculture sector is the foremost employer and contributed to the national gross domestic product (GDP) at 34%. The rate of dependence of Rwanda's population on agriculture was estimated at 80% of Rwandans (NISR, 2017). Also, Nyamagabe district is located in the Southern Province of Rwanda. This district had been characterized by endemic and chronic hunger and famine but nowadays it shows a great improvement in terms of socio-economic development. It has been selected as the basis study area because of its highland and agricultural and ecological conditions, mainly soil and water conservation is imperative, and there is much experience with terracing practices for fighting soil erosion and households' food shortage.

The descriptive and correlational research design was used and enabled to collection and analysis of data both qualitatively and quantitatively. The targeted population of the study was agricultural households that implemented modern agricultural practices using radical terraces. Thus, this is a category of smallholder farmers. Nyamagabe district is subdivided into 17 administrative entities known as sectors. This study selected the first 4 sectors that have carried out construction and utilization of radical terraces in the district. Those are Nkomane, Buruhukiro, Kibilizi and Gatare sectors. The researcher took 2 cells in each sector and 3 villages in each cell. At the village level, the study selected 8 smallholder farmer's households in each village purposively. The village committee helped in identifying the heads of households using the list of all households in the village. From that list, systematic sampling was used for getting a sample of 192 heads of the sampled households. Another category was made of 19 key informants of local leaders and technicians from district and sector levels who are at a certain level involved in radical terracing projects and were also purposively sampled. These were the Mayor and his Deputy in charge of Finance and Economic Development; the District Director of Agriculture and the Director of the Planning; Representative of Rwanda Agriculture Board; 2 representatives of NGOs intervening in the agriculture domain; 4 sector Agronomists; 4 representatives of agricultural cooperative and 4 Farmer field school of cells.

Different tools for collecting data were used. Firstly, face-to-face interviews in which the researcher met the respondents in person in their respective households, offices or any other place preferred. Interview schedule for key informants and semi-structured interviews for the smallholder farmers were used. Secondly, the non-participant at the same time non-controlled direct observation was applied. In so doing, with the observational checklist, the researcher selected the different sites of exploited and non-exploited radical terraces in Nyamagabe district. Lastly, this research was also interested in the documentary technique to gather the information required for the theoretical assumptions and discussions. Moreover, qualitative data analysis was organized in a methodical way offered important information from collected data which, therefore, make easy content analysis. The quantitative data analysis was performed using descriptive and inferential statistics of Pearson chi-square and correlation. The 23 version of SPSS matrixes and Excel spreadsheet package were used.

Results

Farmers' Adoption of Radical Terraces

In this study, different levels of farmers adopting radical terraces were scored then categorized. The researcher accredited 0 scores to each of the variables up to a maximum of three (3) scores based on the weight variables had in the current study (reflection on questionnaire design). Scoring for Adoption of radical terraces had 41 total scores with scores categories of variables from 0 to 20 low adoption, from 21 to 27 medium adoption, and from 28 to 41 high adoption. The adoption of radical terraces was also categorized in different levels such as low, medium, and high adoption. In this study, the level of farmer's adoption of radical terraces was scored and categorized, and respondents distributed such that 81.8% fell in the medium level of adoption (Table 1).

Table 1. Level of radical terraces farmers' adoption

Level of radical terraces adoption	Frequency	Percentage
Low level of adoption	1	.5
Medium level of adoption	34	17.7
High level of adoption	157	81.8
Total	192	100.0

Source: Primary data, May – August 2019

Table 2. Accessibility and benefits of agricultural information

		Frequency	Percent
Levels of getting agricultural information about overall farming	Low access	28	14.6
	Medium access	81	42.2
	High access	83	43.2
	Total	192	100.0
Levels of getting agricultural information about radical terraces	Low access	40	20.8
	Medium access	55	28.7
	High access	97	50.5
	Total	192	100.0
Benefits gained from various sources of information	Being self-reliant farmer	24	12.5
	Modern farming techniques	42	21.9
	Sharing experience with others	96	50.0
	Solidarity of farmers	30	15.6
	Total	192	100.0

Source: Primary data, May - August 2019

Table 3. Relationship between access to agricultural information and farmer's adoption of radical terraces

	Adoption of radical terraces							
	Low adoption		Medium adoption		High adoption		Total	
	n	%	n	%	n	%	N	%
Access to agricultural information								
Low access	1	0.5	9	4.7	0	0.0	10	5.2
Medium access	6	3.1	79	41.1	5	2.6	90	46.9
High access	3	1.6	71	37.0	18	9.4	92	47.9
Total	10	5.2	159	82.8	23	12.0	192	100.0
x^2=10.879, df=4, P=0.028								

Source: Primary data, May - August 2019

Table 4. Correlations of Access to Agricultural Information and Adoption of radical terraces

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Adoption of radical terraces(1)	1	-.149*	0.004	.186**	.276**	-0.086	.225**
Sources of agriculture information about overall farming(2)	-	1	0.041	-0.094	-.153*	-0.059	-0.093
Sources of agriculture information about radical terraces(3)	-	-	1	-0.001	0.039	-0.037	0.027
Levels of getting agricultural information about overall farming(4)	-	-	-	1	.408**	-0.057	.758**
Levels of getting agricultural information about radical terraces(5)	-	-	-	-	1	-0.031	.810**
Benefits gained from various sources of information(6)	-	-	-	-	-	1	-0.044
Overall access to agricultural information(7)	-	-	-	-	-	-	1

**P<0.01, *P<0.05; Source: Primary data, May - August 2019

Access to Agricultural Information Versus Adoption of Radical Terraces

Access to information was examined in two forms

Access to information about overall farming and access to information about radical terraces. Table 2 shows that the farmers responded that they obtained agricultural information of overall farming at the medium access 42.2% and high access 43.2%. The level of farmer's access to agricultural information about overall farming techniques was different from the level of getting agriculture information about adopting radical terraces. Also, about 50.5% of farmers got information at high access. There were benefits gained from those different sources of agricultural information.

Benefits of Agricultural Information on Radical Terraces Adoption

There were sources of farming information that were beneficial in radical terraces adoption. Those were sharing experience with other farmers at 27.1%, learning from others at 22.9% etc (Table 2).

Table 3 shows the level of access to agricultural information significantly influenced the adoption of radical terraces, (x^2=10.879, df=4, P=0.028). That is, the farmers' accessibility to different sources of agricultural information had contributed to their adoption of radical terraces.

Table 5. Farmer's participation in the decision-making of radical terraces projects

		Frequency	Percent
Farmer's involvement in decision making	Low (Rare involved)	42	21.9
	Medium (Involved)	149	77.6
	High (Full involved)	1	0.5
	Total	192	100.0
Farmer's frequencies of meetings attended	Low (1-4 meetings)	96	50.0
	Medium (5-9 meetings)	25	13.0
	High (>10 meetings)	71	37.0
	Total	192	100.0
Levels of farmer's contributions	Low	29	15.1
	Medium	86	44.8
	High	77	40.1
	Total	192	100.0
Types of contribution	Low (Negotiated)	31	16.1
	Medium (Required)	10	5.2
	High (Voluntary)	151	78.6
	Total	192	100.0

Source: Primary data, May - August 2019

Table 6. Farmer's participation versus Radical Terracing Adoption

	Farmers' Adoption							
	Low adopted		Medium adopted		High adopted		Total	
	N	%	N	%	n	%	N	%
Farmer's Participation								
Low participation	3	1.6	22	11.5	2	1.0	27	14.1
Medium participation	5	2.6	86	44.8	6	3.1	97	50.5
High participation	2	1.0	51	26.6	15	7.8	68	35.4
Total	10	5.2	159	82.8	23	12.0	192	100.0
x^2=12.342,df=4, P<0.015								

Source: Primary data, May - August 2019

Table 7. Correlations of participation and adoption of radical terraces

	(1)	(2)	(3)	(4)	(5)	(6)
Adoption of radical terraces (1)	1	0.213**	0.174*	0.134	0.268**	0.134
Participation (2)	-	1	0.658**	0.760**	0.652**	0.452**
Farmer's involvement in decision making (3)	-	-	1	.276**	0.516**	0.275**
Farmer's frequencies of meetings attended (4)	-	-	-	1	0.373**	0.246**
Levels of farmer's contributions (5)	-	-	-	-	1	0.349**
Types of contribution (6)	-	-	-	-	-	1

**. Correlation is significant at the 0.01 level (2-tailed); *. Correlation is significant at the 0.05 level (2-tailed). Source: Primary data, May - August 2019

Moreover, Pearson correlation analysis was performed to link the association between farmers' access to farming information and farmers' adoption of radical terraces (Table 4). There was a positive significant correlation between adoption and sources of agriculture information about overall farming (r =-0.149, P<0.05); levels of getting agricultural information about overall farming (r=0.186, P<0.01); levels of getting agricultural information about radical terraces (r=0.276, P<0.01), and overall access to agricultural information (r=0.225, P<0.01). While sources of agriculture information about radical terraces and benefits gained from various sources of information were not significantly correlated with the adoption of radical terraces.

These findings confirm the adoption and diffusion model which had also shown that farmers who had more access to information tended to adopt more innovations than those in the reverse situation.

Farmer's Participation in Decision Making on Adoption of Radical Terraces

Farmer's Involvement in Decision Making of Radical Terraces

Farmers were involved in the decision-making of initiating, planning, implementing, monitoring, and evaluation processes for radical terraces at different levels. Table 5 shows that farmers' involvement was medium at 77.6%. Taking part in the execution of radical terraces projects increased the awareness of farmers in adopting radical terraces.

Frequencies of the Meetings Attended by Farmers

About 80.6% of respondents agreed to have attended preparatory meetings of radical terraces projects. Table 5 shows that farmers who reported to have participated in preparatory meetings were low at 50.0% and high at 37.0%. By participating in different meetings, farmers got new agricultural techniques used in changing their traditional agriculture.

Farmer's Contributions

The study indicates different levels of farmer's contributions in terms of information provided, consultations, deciding and acting together and supporting each other's interests. The levels of contribution were high at 40.1% and medium at 44.8% of farmers (Table 5). In this regard, farmers contributed to providing labor force, materials, land, cash, and ideas for adopting radical terracing. The farmers who participated voluntarily (high) at 78.6%. In adopting radical terraces, investment of labor, materials, land, money, and ideas increased the level of farmer's contributions.

Relationship Between Adoption and Participation

Table 6 shows the relationship between adoptions of radical terraces by participation. With the Pearson Chi-square test (x^2=12.342, df=4, P<0.015), there was a significant association between the adoption of radical terraces and participation in the decision-making process of radical terraces projects. That is, participation was higher among farmers who were ahead in adopting radical terraces than among those who were not.

Furthermore, the study hypothesized that participation would influence the adoption of radical terraces. As a result, the Pearson correlation analysis discovered a positive and significant correlation between adoption of radical terraces and predictor variables of farmers' involvement in decision making (r=0.174, P<0.01), farmer's frequencies of meetings attended (r=0.134, P<0.05), levels of farmer's contributions (r=0.268, P<0.01), types of contribution (r=0.134, P<0.01), and participation (r=0.213, P<0.01) (Table 7).

The empirical findings indicated the positive and significant correlation between the adoption of radical terraces and participation.

Discussion and Conclusions

This article was set to analyze the applicability of the adoption and diffusion model of farm innovation on radical terraces adoption in Rwanda. Firstly, there was to analyze how does smallholder farmers' practice of radical terraces access to agricultural information conform to that explained by the adoption and diffusion model. Findings showed that sources of agricultural information about overall farming, levels of getting agricultural information about overall farming, levels of getting agricultural information about radical terraces, and overall access to agricultural information had significantly influenced the adoption of radical terraces. Findings are related to ideas of adoption and diffusion of the farm innovation model of the information-contagion model (Roger 1995). This model focused on the assumption that people adopt a farm innovation when sufficient information has reached them (Sonja, 2007). In this study, farmers adopt radical terraces after gaining information from different sources of agricultural interveners. Hence, the communication channel was considered as a tool for transmitting a message from agricultural extension agents and local leaders to farmers, and from farmers to farmers in interpersonal interaction. Radical terraces have to be adopted and diffused emphasizing sources like visits, social media and seminars, farm demonstrations, and farm inputs dealers used for transmitting information about radical terraces as a social process.

Secondly, there was also to assess how farmer's participation in adopting radical terraces relates to the adoption and diffusion model. The empirical discoveries of the study indicated a positive and significant correlation between the adoption of radical terraces and the participation of farmers. Farmers as members of the agrarian community and members of the entire social system participated in the decision-making process for adopting radical terraces. In so doing, local farmers at the community level might be involved in the course of assessing the community needs, planning of activities, implementing a designed program, mobilizing resources, or monitoring and evaluating the program of assigned activities (Sseguya, 2009). In this regard, the study revealed that farmers contributed and were involved in the use of radical terraces.

The greatest conspicuous feature of the diffusion model is that, for most members of a social system, the innovation-decision depends systematically on the innovation-decisions of the other members of the system, (Rogers, 2003). Moreover, time is convoluted in the innovation-decision process based on farmer's participation in the decision-making process of adopting radical terraces. The time taken for adopting farming transformation by the farmers within the social system confirmed the ideas on the adoption-diffusion model of farm innovation adopted from (Rogers, 2003). Hence, some farmers adopt the new agricultural practice of radical terraces much earlier than others do. Farmers are interdependent and interconnected to various interveners in the farming sector like financial and governmental institutions, Private Sector Federation (PSF), NGOs and cooperatives of a farmer in adopting radical terraces. In so doing, they complied with agricultural norms and technical requirements of using radical terraces as new farming practices in the agrarian social community. This was linked to the social participation model in the adoption and diffusion of farm innovation ideas (Rogers, 2003).

The adoption and diffusion of farm innovation were influenced by many factors. For Rogers (1995), several determinants affect the adoption of innovation. Firstly, the relative advantage of the radical terraces, which is avowed by agricultural operators as a better option and profits accumulate from the innovation. Farmer adopted radical terraces which have been seen as better farming practices for increasing food production. Secondly, the effects of the success of radical terraces adoption depend on the compatibility with existing values and practices among farmers. Farmers who adopted radical terraces were self-reliant farmers and radical terraces were one way of satisfying their needs. Thirdly is complexity which refers to how easy it is to use terracing. Therefore, radical terraces are suitable for the hilly region of Nyamagabe. Consequently, they reduce the level of soil erosion, retain rainwater, manure, and other fertilizers, and increase food crop products. Fourth, trialability clarifies how radical terraces can be tested before a commitment to adopt them. They were tested first in the 1980s by the extension agents who worked under the CZN project. Consequently, farmers adopted radical terraces about plot models developed in their land. Lastly, observability examines how radical terraces provide tangible results. Radical terraces have

been adopted because farmers have realized that radical terraces had a great impact on tackling food insecurity and related problems in Nyamagabe district. Most planted food crops in radical terraces were Irish potatoes, beans, maize, wheat, green peas, etc. Briefly, the adoption of radical terraces confirmed the ideas of factors influencing the adoption Rogerian context.

To conclude, the study indicated that the level of farmers' radical terraces adoption was at a medium level. Besides, the farmers' access to agricultural information; and farmers' participation were positively correlated to the adoption of radical terraces. Based on the results of this study, it was concluded that the adoption of radical terraces in Nyamagabe District depended on the relative advantage of radical terraces as the better option of farming practice, the compatibility with existing values and practices among farmers. Thus, radical terraces as the farming technique used by farmers willingly but their adoption of the terracing is determined by a complexity of factors. Therefore, radical terraces are technological innovations because they are considered to stand as a new practice by farmers as adopters. Hence, findings explained the applicability of the adoption-diffusion model of farm innovation in the adoption of radical terraces (Rogers 1983). They were aligned with the information-contagion and social participation models which are widely used in the adoption of new technology in an agricultural context (Sonja, 2007).

Focused on findings of the study, it was suggested that the Government of Rwanda should continue the sensitization of farmers of the importance of adopting radical terraces for better use. Also, farmers should be sensitized and be made aware of the importance of radical terraces as new farming technology and their role in adopting them. Moreover, there should be active farmers' participation in the design and implementation of radical terracing as a good practice in agricultural production in Rwanda if the program is going to attain the intended objectives. Finally, there should be applying the information-contagion model and the economic constraints model in the adoption and diffusion of crop farming inputs and fertilizers. Further researchers should apply Technology characteristics user's context model in the adoption of radical terraces.

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