**COLLEGE OF AGRILTURE, ANIMAL SCIENCE AND VETERINARY MEDICINE**

**SCHOOL OF AGRICULTURE AND FOOD SCIENCE**

**DEPARTMENT OF CROP SCINCE**

**OPTION OF HORTICULTURE**

**MODULE: AGRICULTTURE EXTENSION**

**COMPONENT: TECHNOLOGY TRANSFER KILLS AND STRATEGY.**

**TOPIC: One can’t apply yesterday’s method today and be in business tomorrow. Based on the said premise; innovations transfer has become vital in agriculture and allied sectors. How innovations can be spread faster in social system without lapse of time employing innovation diffusion process.**

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 **DONE AT BUSOGO ON, Ocober28th, 2020**

**INTRODUCTION**

The world is going through different challenges that has affected the sustainability of food production and agriculture systems. Since an ever-increasing and urbanization of global population that has led to shortages of natural resources and loss of biodiversity; to climate change impacts; the combination of all those challenges has contributed to the threaten of millions of family farmers globally. Hunger and malnutrition are escalating. (FAO; 2018).

In recent years; methods that were used cannot respond to nowadays challenges; innovation has played a critical role to make agriculture more competitive and sustainable. Innovation is now considered to be a driving force to transform food system; innovation is central to lifting family farmers out of poverty; tackling unemployment for youth and rural woman; and helping the world to achieve food security and the sustainable development goals.

Innovation can be described as a new technical product; scientific knowledge; application methods; and tools that facilitates problem solving for potential adoption (Tolba A and Mourad M; 2010) or Innovation is the introduction of something new either new idea; new practice new method; new device and etc.

The concept of innovation can be understood in abroad sense and may include research; extension; and other functions that promote or implement innovation. Agriculture also needs to produce more foods for growing population using a limited amount of farm land while at the same reducing greenhouse emissions to avoid worsening of climate change. This suggests that agricultural production needs to use knowledge more intensively which means it must innovate. (San Jose;2014).

Agricultural innovation can be described as a process where individuals or organizations brings new or existing products; process; or ways of organizations into views for the first time in a specific context in order to increase effectiveness; competitiveness; resilience to shocks or environmental sustainability and there by contribute to food security and nutrition; economic development or sustainable natural resources management. (FAO; 2018).

In Rwanda; agriculture innovation has been applied in different scenarios including; introduction of improved seeds; crop protection tools and other innovations that enable farmers to increase productivity such as; modern irrigation practice; crop management products; mobile technology; fertilizers; mechanization management and software. (Tonja F.;2020).

**OBJECTIVES OF THE ASSIGNMENT**

1. To describe how ideas are diffused in society and the process of diffusion of innovation.
2. To show how innovation can be spread faster in the society without lapse of time employing innovation diffusion process.

**DEFINITION OF KEY TERMS**

**Innovation**: Innovation is the introduction of something new either new idea; new practice new method; new device and new technology.

**Diffusion:** it is a process by an innovation is communicated through channels over time among members of a social system.

**Diffusion process**: is a social process of the spread of a new idea from its source of invention or creation to its ultimate use of adopters.

**DESCRIPTION OF IDEAS ARE DIFFUSED IN SOCIETY AND DIFFUSION INNOVATION PROCESS**

**DIFFUSION OF INNOVATION**

It is a theory populized by American communication theorist and sociologist; Everett Rogers; in 1962 that aims to explain how; why and the rate at which a product service or process spread through a population or social system. It explains the rate at which new ideas and technologies are spread. (en.m.wikipedia.org).

**ELEMENTS OF DIFFUSION OF INNOVATION**

There four elements of diffusion of innovation; these elements are:

* Innovation
* Communication channels
* Time
* Social system.
1. **INNOVATION**

Why do certain innovations spreads more quickly than others? The innovation to spread and be adopted should show:

the characteristics which determines an innovations rate of adoption are:

1. Relative advantages
2. Compatibility
3. Complexity
4. Triability
5. Observability to those within social system.
6. **COMMUNICATION CHANNELS**

Communication is process by which the participants create and share information with one another in order to reach a mutual understanding. The communication channel is the means by which messages gets from one individual to another. Mass media channels are more effective in creating knowledge of innovations whereas interpersonal channels are more effective in forming and changing attitudes towards a new idea, and thus in influencing the decision to adopt or rejects a new idea. Most individuals evaluate innovation not on the basis of the scientific research by experts but through the subjective evaluations of near- peers who have adopted the innovation.

1. **TIME**

The time dimension is involved in diffusion in in several ways; It is also an important aspect. diffusion is a process that unfolds over time. Thus, time is relevant when investigating how an individual or other unit of adoption gradually changes their internal state (e.g. knowledge or decision to adopt) and overt behavior (actual adoption or rejection)

Time is also an important measure when categorizing adopters into different categories or when determining an innovation’s rate of adoption, the number of adopters for an innovation in a given period.

1. **SOCIAL SYSTEM**

The fourth main elements in the diffusion of new ideas is the social system. A social system is defined as a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal. The members or units of a social system may be individuals, informal groups, organization and or subsystems. The social system constitutes a boundary within which an innovation diffuses. How the system’s social structures affects have been studied. A second area of research involved how norms affects diffusion. Norms are established behavior patterns for the members of a social system. A third area of research has had to do with opinion leadership, the degree to which an individual is able to influence informally other individual attitudes or overt behavior in a desired way with relative frequency. A charge agent is an individual who attempts to influence clients’ innovation decision in a direction that is deemed desirable by a change agency.

For social systems, diffusion research distinguishes between two different structures. The social structure influences diffusion through values, norms, roles, and hierarchies. Furthermore, the communication structure determines how messages may flow through the social system, e.g. by providing communication links between individuals.

THE INNOVATION-DECISION PROCESS

The innovation-decision process describes how individuals or other decision-making units, such as groups or communities adopt or reject an innovation. The goal of this process is to reduce the uncertainty about an innovation.

It is made out of five steps that do not necessarily need to follow each other consecutively.

Knowledge

The individual becomes aware of the innovation’s existence and starts to understand how it works.
For example, a software developer might learn about test-driven development (TDD) by reading about it in a blog post.

Persuasion

The individual develops an attitude towards an innovation.
Through a discussion with a colleague that was triggered by the blog post, the software developer realizes that using TDD could be beneficial in her work.

Decision

An individual who is aware of an innovation and has formed an attitude towards it will at some point decide whether to adopt the innovation. This often involves a trial phase by the individual herself or by a peer.
After the discussion with the colleague, the developer contemplating TDD for her development tries a tutorial she finds on the Web and then decides to start applying TDD from now on.

Implementation

The individual starts using the innovation. She continues learning about it and overcomes problems, further reducing the innovation’s uncertainty.
The software developer now uses TDD in her daily work and keeps informing herself to improve her application of TDD, for example through exchanges with colleagues who have also adopted TDD.

Confirmation

Later after practicing an innovation, a user will continue to search for information that reinforces her decision. If this leads to conflicting information, the adoption may be reversed.
The passive or active awareness knowledge and how-to knowledge, the opinions of peers, and personal trials all help a potential adopter in this process. By gradually improving her understanding of an innovation, she reduces the uncertainty associated with ideas perceived as new.

Similar to what happens in a marketing funnel, each stage in this process has the potential for the individual to reject the innovation, e.g. by forgetting about it after the knowledge stage or by simply not acting upon their positive attitude towards the innovation.

CATEGORIES OF ADOPTERS

Rogers has classified adopter within social system with an idea of innovatiness. In the book of diffusion of innovation; Rogers has proposed five classes of adopters. The adoption of innovation undergoes an S-curve shape when plotted over length of time. Those classes are:

* Innovators
* Early adopters
* Early majority
* Late majority
* Laggards.
1. INNOVATORS

Innovators are venturesome and interested in new ideas but they are less attached to local peer network (Dr. Singer L;2016). These are people with will to take risks. They have highest social status; they have enough finances; they are social and have closest contact to scientific resources and interaction with other innovators. Their risk tolerance allows them to adopt technologies that may ultimately fail. financial resources help absorb these failures.

1. EARLY ADOPTERS

Early adopters are more attached towards their local peer networks. They are much appreciated by their peers, who often seeks for advices; support and information about innovations. Early adopters serve as role models for other members of a social system. Once they have adopted an innovation, they communicate their evaluation of it to their peers, who use this evaluation to reduce their own uncertainty about an innovation.

1. EARLY MAJORITY

These are people in social system whose majority adopt early. They adopt new ideas just before the average member does. While they do not lead adoption and do not serve as opinion leaders, their interconnectedness in the social system makes them an important link in the diffusion of innovations.

1. LATE MAJORITY

They adopt an innovation after the average participants. With a high of doubt. individuals approach Their reasons for adoption are often economic necessity or increasing peer pressure. they need to be sure that the investment will be worthwhile.

1. LAGGARDS

Laggards are oriented towards the past and use it as a reference for their decisions. They are the least to adopt innovation. These individuals have an eversion to change agents. They typically tend to focus on traditions. They are also the oldest among participants as much as they interact with their families and them for life friends.

HOW INNOVATION CAN BE SPREAD FASTER WITHOUT LAPSE OF TIME EMPLYING INNOVATION DIFFUSION PROCESS

Diffusion of Innovations offers three valuable insights into the process of social change; but we will be more clear on the first point only. (Les Robinson;2009)

- What qualities make an innovation spread successfully?

- The importance of peer-peer conversations and peer networks.

- Understanding the needs of different user segments.

**WHAT QUALITIES MAKE INNOVATIONS SPREAD FASTER?**

Diffusion of Innovations takes a radically different approach to most other theories of change. Instead of focusing on persuading individuals to change, it sees change as being primarily about the evolution or “reinvention” of products and behaviors so they become better fits for the needs of individuals and groups. In Diffusion of Innovations it is not people who change, but the innovations themselves. Why do certain innovations spread more quickly than others? And why do others fail? Diffusion scholars recognize five qualities that determine the success of an innovation.

There are different factors that will alter the spread of diffusion of innovation; these factors are:

1. **Relative advantages**

This is the extent to which a new idea is accepted in a particular group of users better than the idea it has replaced and this measured in terms of economic advantage, social prestige, convenience, or satisfaction. The greater the perceived relative advantage of an innovation, the more rapid its rate of adoption is likely to be. There are no absolute rules for what constitutes “relative advantage”. It depends on the particular perceptions and needs of the user group.

1. **COMPATIBILITY**

This is the degree to which an innovation is perceived as being consistent with the values, past experiences, and needs of potential adopters. An idea that is incompatible with their values, norms or practices will not be adopted as rapidly as an innovation that is compatible.

1. **SIMPLICITY OR COMPLEXICITY**

This is the degree to which an innovation is perceived as difficult to understand and use. New ideas that are simpler to understand are adopted more rapidly than innovations that require the adopter to develop new skills and understandings.

1. **TRIALABILITY**

This is the degree to which a new idea can be implemented with on a limited basis. An innovation that is trialable show less uncertainty to the individual; specific group practicing it.

1. **OBSERVABILITY**

The more it is easier for farmers or adopters to see the results of a new idea, the more it is likely for them to adopt it. Visible results reduce doubt and also promote peer discussion of a new idea, as friends and neighbors of an adopter often request information about it.

1. **GOVERNMENTAL AND INSTUTUTION STRUCTURES.**

When there are insufficient individual demands for a particular innovation; sometime societal resistance even though there is a correct need for it. To avoid this kind of resistance which might the lapse of time; government should be key corporate in this process.

Examples we can consider here in Rwanda is Smart nkunganire. The issue of smart nkunganire about farmers was that the fertilizers was somehow expensive and they couldn’t afford to buy it and use it; so the government decided to make a discount in order to attracts farmers to buy it.

1. **BENEFIT RECEIVED FROM INNOVATION**

Clearly the most important determinant of the benefit derived from adopting a new technology is the amount of improvement which the new technology offers over any previous technology. This means that once a new technology is established for it to be spread faster must have observable benefits that will attract farmers.

1. **NETWORK EFFECT.**

the value of new technology to the consumer depends on partly on the extent to which it is adopted by other consumers, either because the technology is used to communicate with others (such as the internet, or instant messaging) or because the provision of software and services for the technology depends on the existence of a large customer base. Goods of this type are usually termed network goods by economists: their chief characteristic is that they rely on standards to ensure that they can communicate either directly or indirectly. Also having strong connection with, many people including farmers is very powerful way to communicate and spread faster the innovation.

1. **COST OF INNOVATION**

The cost of an innovation is vital for farmers to adopt it. factors affecting the decision to adopt new technology are those related to its cost. This includes not only the price of acquisition, but more importantly the cost of the complementary investment and learning required to make use of the technology. If the price of innovation is at affordable price it easily promotes faster the spread of innovation. Example; not every farmer here in Rwanda can afford greenhouse technology because of its price. (Hall. H.B; 2003)

1. **SOCIAL NETWORK**

When we talk about social network we want mean the way the society is structured. Innovation can spread through the society through different ways including:

1. **MORDENITY**

Modernity is something complex that covers several areas; among those areas we find; infrastructures including roads; proper communication (telephone; radio and TV frequency) and good organized society. For examples; if we want to introduce improved fertilizers in areas with good infrastructures it will be faster compared to one with poor infrastructures.

1. **PHYSICAL DISTANCE**

Innovation can be easily spread when people live closely. As the government of Rwanda has been promoting and encouraging people to live in imidugudu to facilitates the people to access social services. Through imidugudu we can easily spread a new innovation.

1. **OPINION LEADERS**

Opinion leaders have exposure to mass media and are cosmopolite. They participate more in their social systems than their followers and have a higher socioeconomic status. Often, opinion leaders are more innovative than their followers; but this depends on whether the social system favors change. These characteristics give opinion leaders immense influence when it comes to diffusing innovations in a social system. Because their opinions are highly respected, their followers often find them more credible than external influences such as mass media or change agents. Example; people or organizations that want to introduce change into a social system on purpose.

**SUMMARY**

In the process of diffusion, through several communication channels an innovation (new idea) can be easily spread through individuals of social system. The innovation-decision process describes the stages an individual can go through while contemplating the adoption of an innovation: after having gained knowledge about it, the individual forms an opinion about the innovation and decides whether or not to adopt it. The individual then starts using the innovation and further reduces the remaining uncertainty by practice and learning. When the innovation has been adopted, the individual continues to monitor whether adoption still makes sense for her.Adopters as well as attributes of innovations can be divided into categories established by diffusion research. Their characteristics can provide an estimate of the probability of adoption in a given situation. For innovation to be spread faster without the delay of employing innovation diffusion process; several factors have been identified and described briefly as they are proposed to be solutions to different challenges that inhibit the faster spread of innovation. Those factors are; relative advantage; compatibility; simplicity or complexity; Triability; observability; government and institution structures; benefit received from innovation network effects; cost of innovation and social network.

**CONCLUSION**

To conclude; innovation is an important factor in agricultural where it helps in successful introduction of new products, processes, and practices. Innovation needs to be spread faster in society in order to solve problems of farmers and increasing yield without laps of time. As tomorrow businessmen we need to introduce innovation that are important with a powerful content in society by timing the favorable condition or right time for bringing innovation in order for it to be adopted quickly without taking long time; where our innovation must bring changes in lives of people. Nowadays, we have many problems in agriculture, the young’s generation are needed to intervene to find solution of those challenges by coming up with innovations in our society.

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