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# **THEME: APPLIED RESEARCH AND INNOVATION FOR DEVELOPMENT**

**SUBTHEME: Entrepreneurship and  
Innovation**

**Paper Title:**

**Technology Adoption in Rural Areas for  
Sustainable Economic Development**

By

**Prof. Ng'ang'a S.I (PhD)<sup>1</sup>, Kiumbe P.M.<sup>2</sup> and Kabethi J.M.<sup>2</sup>  
Karatina University**

# Background

- Kenya ranks 128<sup>th</sup> among 169 countries in the UNDP's HDI, which measures development in terms of life expectancy, educational attainment and standard of living (IFAD 2012).
- 76% of the Kenyan population residing in the rural areas and relies on agriculture for most of its income (World Bank 2012).
- 49.1%: prevalence of absolute poverty in rural Kenya (Kenya Bureau of Statistics 2006/7). (<\$1 a day)
- The rural economy depends mainly on smallholder subsistence agriculture, which produces 75 per cent of total agricultural output (IFAD 2012).

# Background

## **Economic Development:**

- An increase in living standards, improvement in self-esteem needs and freedom from oppression as well as a greater choice. (Todaro 2011)
- Addresses the issues of Distribution of the national income across the population, the effect on the quality of life and the sustainability of the quality of life.

# Policies

## 1. Kenya Vision 2030

Aims at making Kenya a newly industrialized, middle - income country providing a high quality of life to all its citizens by the year 2030.

Pillars:

- Economic,
- Social, and
- Political.

# Vision 2030

## The economic pillar

“aims to improve the prosperity of **all Kenyans** through an economic development programme, covering **all the regions** of Kenya”(GoK, 2007).

# VISION 2030

- “no society can gain the social cohesion predicted by Vision 2030 if significant section of the population live in abject poverty” (GoK 2007).
- Kenya has to adopt development models that do not only promote the creation of more wealth, but also address the distribution of that wealth to the majority of the citizens more so in rural areas = economic development



## 2. Millennium Development Goals(MDGs)

- MDGs originated from the Millennium Declaration produced by the United Nations in November 2000.
- The Declaration asserts “every individual has the right to dignity, freedom, equality, a basic standard of living that includes freedom from hunger and violence, and encourages tolerance and solidarity”.

# MDGs

- MDGs were made to operationalize these ideas by setting targets and indicators for poverty reduction in order to achieve the rights set forth in the Declaration on a set fifteen-year timeline(by 2015).
- Eight goals with 21 targets make up the MDGs

# MDGs

## MDG GOAL No 1: Eradicating extreme poverty and hunger.

- *Target 1A: Halve, between 1990 and 2015, the proportion of people living on less than \$1.25 a day*
- *Target 1B: Achieve Decent Employment for Women, Men, and Young People*
- *Target 1C: Halve, between 1990 and 2015, the proportion of people who suffer from hunger*

# Technology

## **Technology definition:**

- The application of scientific knowledge for practical purposes, esp. in industry (Oxford Dictionary 2013)
- The scientific method and material used to achieve a commercial or industrial objective

# Technology Adoption

- The choice to acquire and use a new invention or innovation. (Beethika Khan, 2002)
- Process that begins with awareness of the technology and progresses through a series of steps that end in appropriate and effective usage (*Bridges 2005* )
- Technology is the use of knowledge tools and machines to solve a problem.

# Technology Adoption and Sustainable Economic Development

- There is a strong positive correlation between economic development and technology adoption.
- US, UK, Japan and other OECD countries are leading in technology adoption, followed by East Asian Tigers (Hong Kong, Korea, Taiwan and Singapore), Latin America (Chile and Argentina) while sub-Saharan Africa countries are lagging behind. (Bart H. 2008)

# Technology Development

- The process of research, creation, and improvement of technology.
- A process of creating new technology that is more efficient and effective.

# Technology adoption process

## Bridges 2005

- Awareness
- Assessment
- Acceptance
- Learning
- Usage

*NB: The rate of adoption slows as you go through the adoption cycle because people are less willing and in many cases less able to adopt (Bridges 2005 )*



# Why Technology Adoption?

- Cross-country variation in the adoption of technologies accounts for at least a quarter of per capita income difference's (Bart H. 2008).
- Technology development is an expensive and resource intensive endeavor. Developing countries like Kenya may not afford but can benefit from already developed technology through adoption.

# Investments in Technology Development

- **The Fraunhofer model from Germany** (2009 budget 55.7 billion euros = Ksh 6.433.874 trillion)
- **The IMEC model from Belgium** (2008 budget 270 million euros = Ksh 31,187.54 billion)
- **The ITRI model from Taiwan** (2007 budget is 573m US dollars= Ksh 48,818.8 billion) .
- **The ETRI model from KOREA** (2007 budget 0.45 trillion KRW= Ksh 35.55 billion)
- **Kenya** (Gvt. 2013/2014 budget of KShs1.65 Trillion).

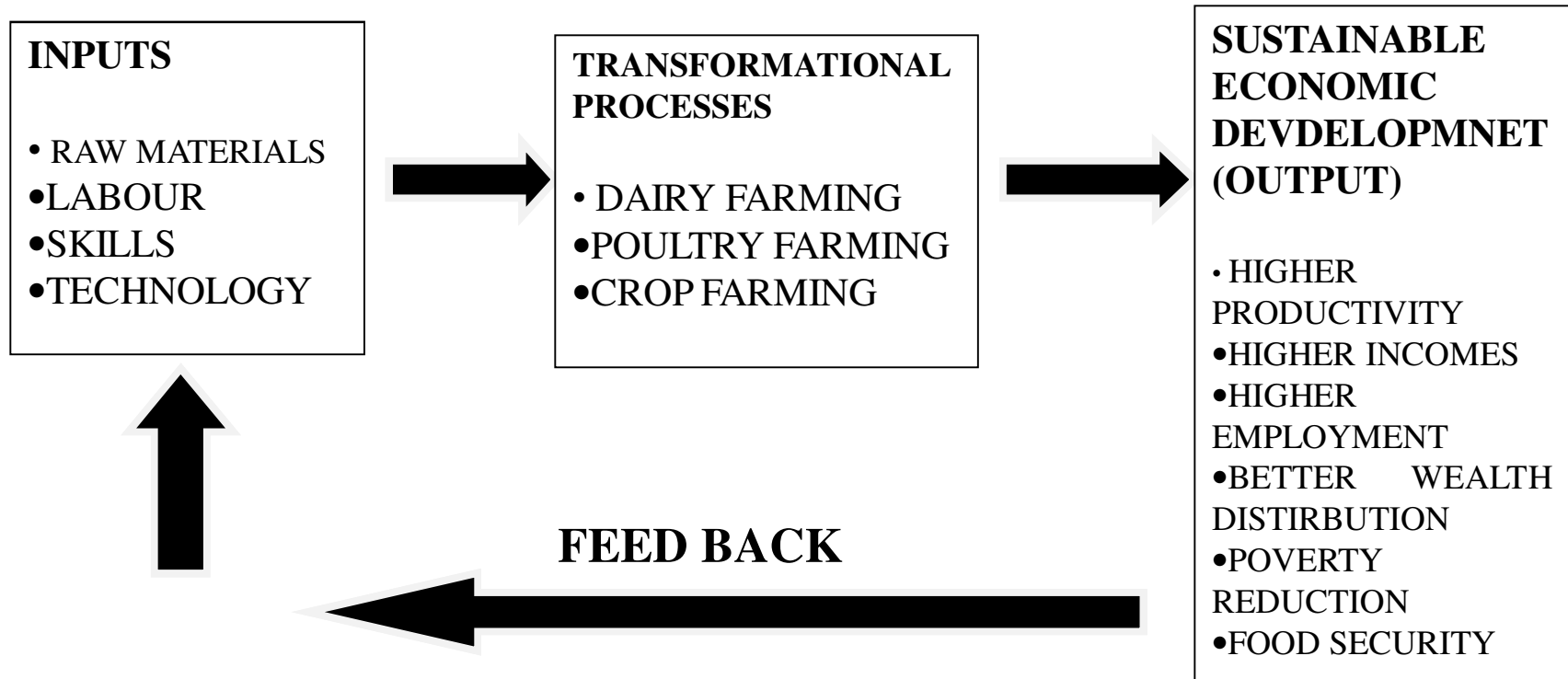
# 5I's Model

An appropriate model for developing countries like Kenya

- Importation,
- Imitation,
- Improvement,
- Innovation and;
- Invention

Adoption must be present for 5I's to work

# Conceptual Framework



Conceptual framework based on the Systems theory

# Methodology

Survey and case study approaches used.

## Survey:

- involves study of the real-life situation in their natural setting
- appropriate as the study was carried out the on adoption of technology in rural areas in dairy, poultry and crop growing sectors.

# Sampling Methods

- **Purposeful sampling:** specific farmers using the technology of interest were selected for the study with the help of agricultural officers and other opinion leaders. (17 for incubator, 20 for chaff cutter and 18 for green house)
- **Snowballing:** every farmer identified was asked to recommend others who were using the same technology

# Data collection

Data was collected the using

- Questionnaires,
- Interviews
- Observations.
- Expert opinions

# Case Methodology

Case methodology is used to describe real life context in which an intervention has occurred and for illustrative purpose.

Three cases;

- Adoption of chaff cutter in dairy cattle rearing,
- Incubators in poultry farming and;
- Green house technology in crop growing.



# Data analysis and presentation

- Data was analyzed using descriptive statistics and presented in line with the respective cases.
- The results are presented on a case by case method
- Photographs are inserted to enhance the evidence

# Case 1: Incubator Technology in Poultry Farming in Nyeri County

Data was collected from 17 farmers using incubator in hatching chicken and quail eggs.

The results were as follows:

- All the farmers reported increased number of chicks hatched per month by up to 400%
- 94% of the farmers reported a 20% decrease in number of eggs spoilt for every 100 eggs.

# Case 1: Incubator Technology in Poultry Farming in Nyeri County

- 82% of the farmers had shifted from chicken farming to quail farming which was much more profitable.
- Quail is a small wild bird which is smaller in size than chicken. The eggs are said to have magical medicinal value.
- The eggs of a quail costs three times that of a chicken and the demand is overwhelming.
- A mature quail uses 20g of feed per day while a chicken uses 150g and hardly requires any drugs

# Case 1: Incubator Technology in Poultry Farming in Nyeri County

- The farmers said that space requirements had gone down by 75% and the bird lays an egg daily.
- On average the respondents increased levels of income by more than 200% since the adoption of incubator technology and quail farming.
- The major challenge that was observed was a general lack of operational management skills to meet the demand for the products.

**A Quail bird**



**Quail eggs**



**An incubator under construction**



**Eggs in an incubator**



## Newly hatched chicks from incubator



## Fully grown quail birds



## **Case 2: Chaff Cutter Technology in Cattle Rearing; Nyeri County**

Data was collected from 20 farmers who were using chaff cutters in cattle rearing. The results were as follows:

- 90% reported that fodder usage had gone down by 50%,
- 90% said labour requirements had gone down by 40%.
- 55% of the farmers reported that milk production had gone up by 40%



# Case 2: Chaff Cutter Technology in Cattle Rearing; Nyeri County

- 55 % had doubled the number of animals kept.
- 55% said income had gone up by 40%
- The only disadvantage was a decrease in manure by 50% as reported by majority (95%) of the farmers which could be explained by the reduced fodder wastage.

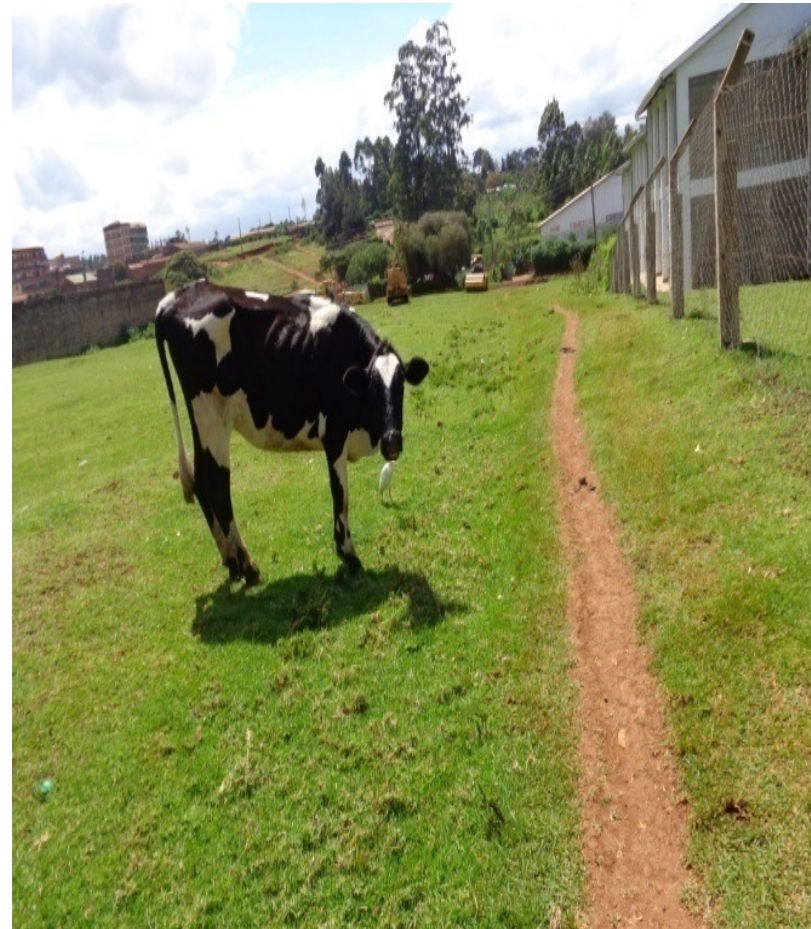
# Challenges

- 10% reported that the utilization of the machine increased the risk of personal injuries.
- 15% reported increased security challenges in the farm from robbers who may want to steal the electric motor that runs the electric chaff cutter.

**Cattle farming without chaff cutter**



**A cow grazing by the road side**



**Chaff cutter slicing the fodder**



**Fodder ready for feeding the animals**



## Farmers have doubled the animals kept with chaff cutter



# Case 3: Green House Technology in Nyeri County

Data was collected from 18 farmers who were using green houses in crop growing. The results were as follows:

- Majority (80%) reported that the output of their farms had increased by 100%
- 70% of the respondents reported that Labour requirements had dropped by 50%.
- 50% of the respondents reported that there was a decrease in chemical/sprays by up to 70%.

# Case 3: Green House Technology in Nyeri County

- Majority(80%) of the farmers reported higher income levels by up to 90%.
- 44% of the respondents said water for irrigation had increased because in green house you use irrigation water all the time even during the rainy season
- Requirements for manure and fertilizer was reported to be higher by about 75% by 45% of the respondents due to longer lifespan and higher productivity of plants growing in a green house

# Challenges

- High initial cost: about Ksh 400,000 for industrial and about Ksh 100,000 for locally fabricated one
- some farmers (20%) reported that some pests (e.g. white fly), attacked the crops more in the green house conditions as compared to the open field.
- Some farmers (36%) had planted ordinary varieties recording low harvests.



# Challenges

- Some farmers (20%) found the continuous watering of crops even during the rainy season rather awkward
- Failure to observe proper crop rotation had led to dismal tomato harvests for several (10%) of the farmers as their crop was affected by bacteria wilt.

**Flowers growing in an open field**



**Tomatoes growing in an open field**



**Flowers growing in an open field**



**Green house ready for planting**



## Industrial fabricated green house



## Locally fabricated green house



**A variety of flowers in a Green house**



**Capsicum growing in a green house**



**Tomatoes growing in a green house**



**Flowers growing in a green house**



# Conclusions

1. Adoption of technology has contributed to increased productivity;
  - Poultry farming chicks hatched by 400%,
  - Cattle farming milk production by 40%
  - Crop growing by 100%
2. The higher productivity has led to higher incomes for the farmers
3. This has made agricultural activities a worthwhile economic endeavor.

# Conclusions

4. This has the potential of attracting more unemployed people especially the youth into farming activities leading to higher employment, higher productivity, higher incomes, improved food security and sustainable economic development in general.
5. Adoption of appropriate technology rather than invention of new technology is the key to improved productivity in rural areas.



# Recommendations

1. There is need to fast track the adoption of appropriate technology especially in agricultural activities. E.g. Effective publicity through farm demonstrations, hosting of farmers field days as well as use of mass media may go a long way in creating the necessary awareness for technology adoption
2. There is need for the establishment of effective linkages between farmers, financial institutions, research institutions, learning institutions and industry to facilitate the flow of information and other resources on appropriate technology to the farmers.

# Recommendations

3. There is a need for continual farmer education on appropriate utilization of any the technology once acquired.

**Thanks for your attention.**