

## **Agricultural Green Innovation: constraints and opportunities**

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### **Executive summary**

The term Green innovation (or eco innovation) encompasses constructs coined to mean innovations which improve environmental performance, such as sustainable-driven innovation, eco innovation, and environmental innovation. It brings a wider perspective to the innovation discourse, moving beyond economic aspects of value creation to embrace environmental and social factors. This study explores eco innovation in the context of the agricultural sector in Uganda and focuses on SMEs. It outlines the benefits of eco-innovation, the driving factors, constraints, opportunities and the implications for land and water management.

Innovation constraints underpin deterioration of business productivity, as exhibited among SMEs in Uganda. This partly explains the negative behavior of SMEs towards the environment. For a country that depends on agriculture, the negative collective actions of individual entrepreneurs pose a big threat to the environment and food security. The evidence from this study reveals that inadequate access to knowledge and resources to finance innovation account for the continued mismanagement of land and water resources. However, the adaptive behavior of some SMEs presents opportunities for investment in the environment. A typical example is the potential to use indigenous knowledge and cost-friendly technologies as a coping mechanism. Similarly, promotion of eco-literacy among customers may yield benefits in the short run.

### **1.0 Introduction**

Access to credit is a well-known limitation for small enterprises in sub-Saharan Africa. Without credit they can barely invest in new knowledge and technology. Although SMEs in Uganda encounter serious obstacles, which relate to costs and access to knowledge for innovation, many do not give up. It is noted that market and organizational innovations are mainly common because these are less costly, compared to process and product innovations. Product innovation stems from new technologies and skills, which are lacking in Ugandan SMEs. Although elsewhere, SMEs that lack resources often depend on co-operating partners with potential to invest in innovation, SMEs in Uganda still find a lot of difficulty in forging co-partnerships for innovation. Therefore, green firms in the agricultural sector mainly depend on indigenous knowledge and other affordable sources of information, such as suppliers, for product and process innovation.

### **2.0 Methodology**

Given the limited data on the constraints to and opportunities for innovation in green SMEs within the agricultural sector in Uganda, the study employed mixed methods to maximize results, including use of existing survey data, extensive literature review, and three case studies (for in-depth analysis). Secondary data (Uganda National Innovation Survey, 2014) was sourced from the Uganda National Council of Science and

Technology. The survey captured data on innovation activities and expenditure, types of innovation, sources of information, collaborating partners for innovation, effects of innovation, factors hampering innovation and intellectual property rights from 423 firms. The case study approach provided deep insights of owner-manager experiences, a deeper understanding of opportunities for each of the cases, and the implications for resources management.

### 3.0 Findings

Enabling SMEs to change unfavorable environmental behaviors requires strengthening the driving forces or weakening the resistant forces to eco innovation or a combination of both (Tilley, 1999). This study reveals the main constraints to and opportunities for innovation in green enterprises, and provides guidance that seeks to promote positive environmental behavior and sustainable businesses.

#### 3.1 Constraints

The factors that limit enterprises from introducing an innovation or influence decisions to abandon innovation activities are divided into four, namely market factors, knowledge factors, cost factors and other factors. These factors are further divided into sixteen subcategories, as illustrated in Table 1. The main constraints are cost factors, which include: lack of funds within the enterprise, high innovation costs, lack of finances from sources outside the enterprise and excessive economic risks perceived by entrepreneurs (35%). These are followed by knowledge factors including difficulty in finding collaborative partners for innovation, lack of information on technology, lack of skilled personnel and lack of information on markets, which cumulatively accounted for about 25 percent. These constraints are attributed to the weak education system that is not producing graduates with the requisite skills to promote innovation.

The constraints can be categorized as internal and external to the organization. Internal factors relate to the firm's characteristics, management structure and human resources, while external factors include institutional factors, access to finance, access to information on technologies, among others. The external factors that are perceived as

important in deterring innovation relate to markets and other institutional factors. Under the category of markets, dominance of established firms, uncertain demand for innovative goods and services and the tendency by firms to imitate innovation developed by other firms were perceived as major constraints to innovation. The factors related to institutional barriers include: limitation of science and technology public policies and insufficient flexibility of regulation or standards.

#### 3.2 Opportunities

The factors that present opportunities to entrepreneurs in Uganda to participate in eco-friendly business practices are:

**1. New clients demanding eco-efficient products:**

Ugandan SMEs mainly depend on customers for innovation. This explains the reason why market innovation is very common. However, for green enterprises, not all customers matter. The main markets for green products are the customers from Europe and Asia. With the increasing number of foreign companies, especially from Brazil, Russia, India, China and South Africa, local demand for green products has greatly increased, yet local supply is still limited. This development has triggered new imports of eco-friendly products, mainly from South Africa and Kenya, although local products still have space on the shelves.

**2. New suppliers offering eco-efficient inputs:**

Most of the innovations in Ugandan SMEs are incremental, and mainly based on adaptation and learning. There is a great opportunity for local entrepreneurs to learn from both foreign and local suppliers that produce low-cost inputs. Suppliers who provide affordable and easily adaptive technologies are in big business with small firms.

**3. Indigenous knowledge and technologies:**

Indigenous knowledge is an important national resource that offers new models for business performance. The companies covered in this study show a clear demonstration of how this knowledge is being used to create economic value, improve food security and environmental performance. The use of indigenous knowledge tackles both the cost and knowledge constraints to innovation.

Hampering factors		%	Cumulative %
Cost factors	• Lack of funds within your enterprise or group	10.1	35.4
	• Innovation costs too high	9.6	
	• Lack of finance from sources outside your enterprise	8.1	
	• Excessive perceived economic risks	7.5	
Knowledge factors	• Difficulty in finding co-operation partners for innovation	6.7	25.4
	• Lack of information on technology	6.5	
	• Lack of qualified personnel	6.2	
	• Lack of information on markets	6.0	
Market factors	• Market dominated by established enterprises	7.9	20.5
	• Uncertain demand for innovative goods or services	7.1	
	• Innovation is easy to imitate	5.5	
Reasons not to innovate	• No need because of no demand for innovations	4.0	7.7
	• No need due to prior innovations	3.7	
	• Limitations of science and technology public policies	5.9	
Other factors	• Organizational rigidities within the enterprise	5.0	10.9
Total		100.0	100

### Mushroom growing

**Table 1: Constraints to innovation for Ugandan SMEs**  
**Source: Author computations, based on UNCST data, 2014**

**4. High demand for knowledge on green technologies:** There is potential to exploit the knowledge gap on green farming practices in the farming communities of Uganda. Until recently, the Government of Uganda was financing the private sector-led agricultural extension system, which created model farmers (farmers that formed a nucleus for other farmers to learn from) across the country. The model farmer method reinforced confidence in farmer-to-farmer learning approaches and provided regular income to model farmers to support the core production areas. However, the recent government decision to revert to public extension system has created inefficiencies in the agricultural knowledge

extension system, but also opportunities for entrepreneurs who have capacity to offer solutions to plug these gaps.

**5. Potential for local fertilizer market and cottage industry:** Uganda is ranked as the lowest consumer of industrial fertilizers in the East African region. The low consumption of artificial fertilizer is attributed to the dominance of subsistence farming, where majority of farmers cannot afford to buy fertilizer for their gardens. However, with the land in most parts of the country overused, productivity has declined, posing a threat to food security. To reclaim soil fertility, subsistence farmers have to try out the affordable options that are locally available. As a result, the demand for organic fertilizer is steadily growing. The entrepreneurs introduced low-cost alternatives, including: earthworms, compost manure and human waste in trying to improve soil fertility.

### 3.3 Implications for water and land management

**1. Application of urine as a fertilizer:** The use of urine as a fertilizer reduces the volume of water that is collected for irrigation. For example, in the flower plantation and greenhouses, the amount of water required to keep plants adequately watered reduces, where the farmers opt for urine fertilizer. The use of urine saves water, compared to the use of industrial fertilizer. However, there were fears among some farmers of the long-term impact of continuous application of urine on land and surface water.

**2. Application of organic pesticides:** The use of indigenous technologies, such as tobacco, red chili and wood ash as pesticides was found to be cheap and effective in the control of nematodes in banana plantations. Specifically, the use of such technologies does not disrupt microorganisms in the ecosystem, thereby maintaining soil structure and fertility.

**3. Utilizing hydrated lime for neutralizing mushroom substrate:** The use of hydrated lime in neutralizing the mushroom substrate was found to improve soil productivity. Moreover, the residues from the mushroom substrates were sold to farmers as compost manure. And for some farmers, these

were used in making charcoal briquette for cooking. These innovations do not only increase soil productivity, they also provide a low-cost and eco-friendly source of fuel for cooking.

**4 The use of plastic bags for mushroom growing:** The evaluation found the use of plastic bags in making the growing bags for mushrooms very risky for the environment. When plastic dries up, it breaks down into small pieces, which remain in compost manure that is sold to farmers. Plastic pollution remains the most common environmentally unfriendly practice among mushroom farmers. Plastic bags are typically used for a short period of time in growing mushroom but require hundreds of years to break down in the garden. The large pieces of plastic bags were picked out for burning, increasing greenhouse gas emission.

#### 4.0 Conclusion and Policy Implications

In conclusion, to enable SMEs change their environmental behaviors requires strengthening the driving forces or weakening the resistant forces to eco innovation or a combination of both.

1. Since customer requirements form a driving force for innovation in Ugandan SMEs, we propose strengthening of this driver through customer training and promoting eco-literacy among the general consuming public as a potential option to stimulate eco-innovation among SMEs in Uganda.
2. Given that the main hindrances to innovation in SMEs are the high costs, inadequate knowledge and market factors, the government should consider using its existing research




institutions to assist SMEs to innovate and the latter should partner with research institutions, where they can access new knowledge.

3. Whereas SMEs may have to depend on co-operation with partners to invest in innovation, the role of private sector apex and umbrella institutions like Uganda National Farmers Federation, Uganda Private Sector Foundation, among others is crucial to foster these linkages.
4. Given that local and indigenous knowledge plays a critical role and is accessible to farmers undertaking innovation, strategies should be developed to promote its exploitation and investment, through policies, frameworks and regulations.
5. The use of urine and other materials as organic fertilizer and organic pesticides should be scaled-up through formulation of appropriate policies by the government. More so that it has considerable demand and saves irrigation water for use on plants.
6. Although most of the technologies employed by green SMEs have a positive impact on the environment, the traces of polymer materials that were introduced as part of process innovation should be addressed through legislation. Farmers should be encouraged to use environmentally friendly materials instead.

#### References

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Tilley, F., 1999. The gap between environmental attitudes and the environmental behavior of small firms. *Business Strategy and the Environment*, 8, 238-248.

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