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# Looming Long-term Economic Effect of Climate Change on Uganda's Coffee Industry

## Executive Summary

Predictions demonstrate that climate change is likely to stifle the coffee development program in Uganda at three levels: (i) by reducing survival rate of coffee seedlings to expand coffee acreage; (ii) exacerbate productivity challenges in an inherently constrained rain-fed low input coffee production system; and (iii) contributing to reduction in quality of coffee beans (specifically bean size) produced leading to losses in absolute value in export earnings. This is likely to slow down the low middle-income status by 2020 target of exporting 20 million (60 Kg bags) annually. The farmers' ownership model piloted by the National Union of Coffee Agribusinesses and Farm Enterprises (NUCAFE), where a smallholder farmer is guaranteed premium prices for value addition, offers a strategy to sustainably invest in climate smart agriculture<sup>1</sup> (involving use of irrigation and fertilizer)<sup>1</sup> in coffee production.

## Introduction

Coffee is Uganda's most valuable agricultural export commodity—it contributed US\$ 544 million in 2016/17 (about 20 percent of total export earnings).<sup>2</sup> Furthermore, the crop, employs over 3.5 million households.<sup>3</sup> To accelerate social and economic transformation to the low middle income status, the country targets to increase coffee annual production to 20 million (60 kilogram bags) by 2020, as opposed to the current 4.6 million bags. However this important crop commodity to the economy is under serious threat due to effects of climate change. Climate change is having negative impact on coffee output via three avenues i.e. (i) slowing down expansion of acreage under coffee by limiting the seedling replanting programme; and meteorologically reducing arable land conducive for coffee growing (Figure 1); (ii) constraining the potential yield attainable in a rain-fed low input production system to figures below the 600kg per hectare; (iii) reduction in quality of green coffee beans produced, hence reducing the value of coffee exported. Uganda's rainy seasons are becoming increasingly unpredictable and characterized by long stretches of drought. These limitations are expected to worsen in several coffee growing areas since coffee



cultivation is spread towards marginal lands, where water shortage and unfavorable temperatures constitute major constraints to coffee yield.<sup>4</sup> The variations in climate may be considered minimal, but the consequences for the coffee sub-sector in terms of quality are far reaching. In this brief, we highlight the lead pathways through which climate change is likely to negatively impact on Uganda's coffee industry.

<sup>1</sup> Climate-smart agriculture (CSA) aims to: sustainably increase agricultural productivity and incomes; building resilience to climate change; and reduce and/or remove greenhouse gas emissions, where possible (Republic of Uganda, November 2016).

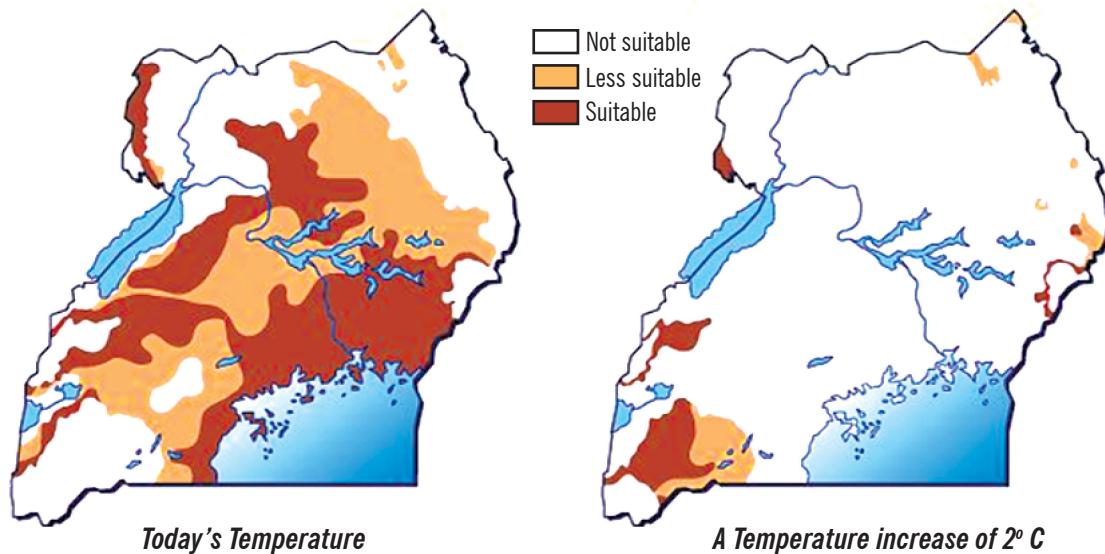
**Effect of climate change on arable land for Robusta Coffee**

Figure 1 shows the projected changes in areas in Uganda suitable for coffee cultivation as a result of climate change. It is shown that climate change is expected to result in actual shifts in where and how coffee may be produced in future. In particular, rising temperatures are expected to render certain low altitude areas less suitable or even completely unsuitable for robusta coffee growing. Implying that

**Effect of drought on survival rates of coffee seedlings**

The advent of climate change is a double blow to the technologically constrained coffee production system in Uganda. Between 2007 and 2016, Uganda lost coffee seedlings worth US\$ 10 million. In 2015/2016 alone, seedlings worth US \$ 3 million did not germinate due to drought.<sup>8</sup> Further, the evaluation report by the Operation

Figure 1: Impact of temperature rise on Robusta Coffee Production Land



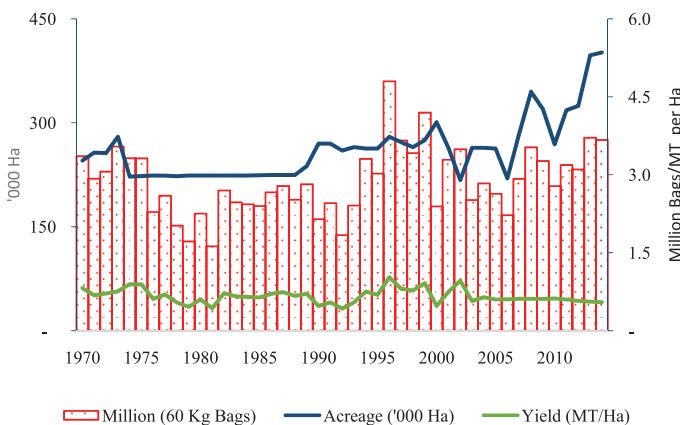
Source: Otto Smonett (1989)<sup>7</sup>

fewer parts of Uganda will be suitable for coffee production<sup>5</sup>. With an increase in temperature of only 2°C, there would be a dramatic decrease in amount of land suitable for growing robusta coffee in Uganda. As suitable robusta coffee growing areas reduce, some farmers will try to push further up the mountains. This will bring coffee into conflict with other land uses and driving migration out of coffee-producing areas to sustain production.<sup>6</sup>

Wealth Creation together with the President's office shows that because of drought, the survival rate of 93 million coffee seedlings planted during the first season of 2016 was only 42 percent (39 million seedlings survived).<sup>9</sup>

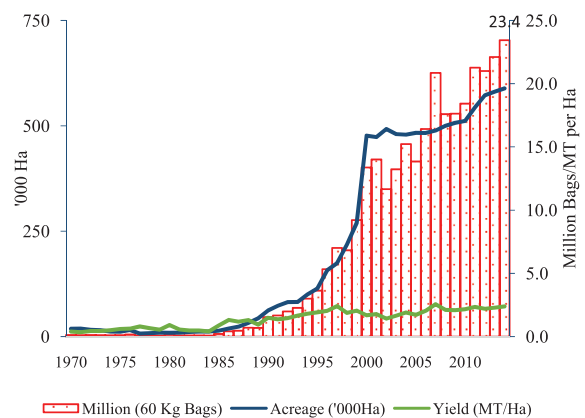
Expanding acreage has been the main option pursued by government to get to the 20 million bags of coffee target. It is apparent that

Figure 2: Coffee in Uganda (Inhibited Progress)



Source: FAO Stat (2017)

Figure 3: Coffee in Vietnam (Steady Progress)

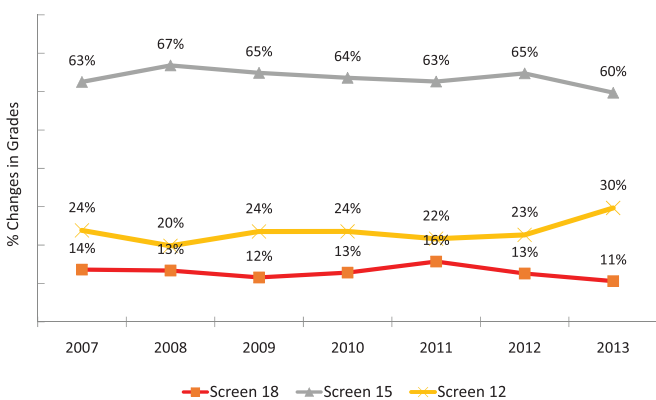


since early 2000s till 2015, Uganda has by and large promoted coffee acreage expansion from about 320 to about 402 thousand hectares, while paying minimal attention to improving productivity. As a result an average threshold of 600 kilograms per hectare has been maintained—under ‘a low input rain-fed’ production farming system. As a consequence, this has had limited impact on output—which has remained stuck at 3.5 million bags (Figure 2). It is worth noting that countries such as Vietnam aggressively adopted both extensive (through planting), and intensification (with irrigation) in raising yield per hectare to 2,100 kgs. For Vietnam, this approach led to steady progress in increasing coffee production and export and by 2015, the country had attained annual export volumes of 23.4 million bags of coffee (Figure 3).

### Financial effect of drought on Coffee Grades

Based on the 1994 Coffee Regulations, there are three main grade of quality for Ugandan coffee—Screen 18 (biggest bean size); Screen 15 (medium bean size) and Screen 12 (smallest bean size). These grades command different prices; for instance, in September 2017, the unit prices Screen 18 and Screen 15 were 10.4 % and 5.5% respectively higher than Screen 12.<sup>10</sup> Due to climate change effects, there have been reductions in the share of higher quality grades of coffee beans exported. (Figure 4). Specifically, between 2007 and 2013, the country lost 3% (US \$ 5 Million) of its screen 18 and 3% (US \$ 27 Million) from its screen 15 earnings due to deteriorating coffee quality. During the same period, the country only gained 6% (US \$ 2 Million) from its small bean sized coffee and as such was unable to offset both the Screen 18 and 15 loses. The above trends are worrying and very detrimental to a country aspiring to achieve export of 20 million bags by 2020. A 2015 economic analysis by government projected that due to climate change and without significant adaptive measures, Uganda’s coffee production will be cut into half by 2050.<sup>11</sup> This implies that getting the 20 million bags of coffee (predicted to be valued at US \$ 2 billion) to bring about

Figure 4: Effect of drought on Robusta Coffee Grades (2007-2013)



Source: Authors computation from UCDA annual Reports

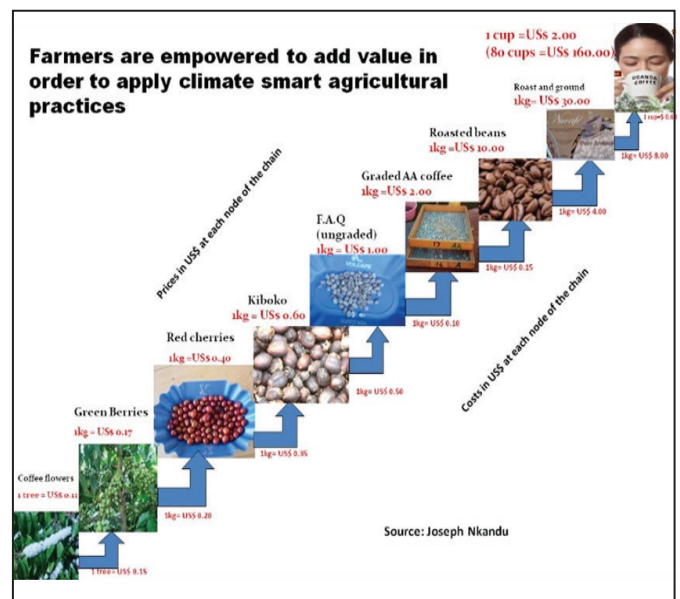
social and economic transformation in Uganda is likely to be slowed down due to climate change.

### Farmer ownership model: An adaptation strategy to climate change in Coffee

Given the devastating effects of climate change on coffee (i.e. decreasing arable land, low survival rate of seedlings, and eventual resulting low grades). It is also important to note that farmers will have to cope with additional farm investments required to adapt to climate change. One of the avenues is allowing farmers have a fair share of profit margins that accrue deeper along the value chain as proposed and practiced by the National Union of Coffee Agribusinesses and Farm Enterprises (NUCAFE).

This institutional mechanism dubbed ‘farmer ownership model’ (Figure 5) piloted by NUCAFE allows farmers to benefit from additional profits associated with value addition along each node of the entire value chain. For example in figure 5, if a farmer were to sell ungraded coffee, she/he earns 1 US\$, but with further value addition (through grading), a farmer earns 2 US\$ for graded AA coffee. It is with access to such additional income that will enable farmers to invest in small innovation strategies like drip irrigation, manure application, mulching and shade tree inter-planting. The Uganda Coffee Development Authority (UCDA) in partnership with NUCAFE can replicate such institutionalized best practices to promote sustainability in reinvestment in climate smart technologies by farmers.

Figure 5: Farmer ownership model in coffee



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## Conclusion and Policy recommendation

Most coffee farmers are ill prepared to tackle climate change, and are unlikely able to invest in small innovation strategies to cope with climate change. The solution lies in having strong and effective institutional arrangements that guarantees stability in incomes from coffee and hence high returns on coffee farm investment. The farmer ownership model now provides a sustainable value chain adaptation strategy the UCDA should scale up for more efficient climate smart agriculture. It is apparent that;

- Using farmer ownership model, coffee farmers earn additional income from value added to the coffee at the various nodes of the chain. Such added incomes can offset some of the costs to apply climate smart agricultural practices. Once the coffee farmers are reasonably paid, they will be able to reinvest in quality improvement for better returns.<sup>12</sup>
- NUCAFE, estimates that if Uganda were to

roast and package all coffee beans exported as raw green beans worth US \$ 400 million, the export earnings could more than quadruple to US \$ 2 billion.<sup>13</sup>



## Endnotes

- 1 Republic of Uganda (November 2016). Achieving Uganda’s Development Ambition. The Economic Impact of Green Growth: An Agenda for Action. A Report by the Government of Uganda and the New Climate Economy Partnership [Economic Policy Research Centre (EPRC). The New Climate Economy; Global Green Growth; and Coalition for Urban Transitions], November 2016.
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- 13 Accessed at: <http://news.nationalgeographic.com/2017/08/climate-change-drought-uganda-coffee/>

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