



Economic Assessment of the Impacts of Climate Change in Uganda

Briefing Note: Arabica Coffee Production in the Mount Elgon Region

An Economic Assessment of the Impacts of Climate Change has been completed at the national level in Uganda. As part of this nation-wide study, this case study seeks to assess the impacts of climate change and their costs on Arabica coffee production in Bududa District, drawing on national projections of climate change. For further information see www.cdkn.org or <http://ccd.go.ug/index.php/projects/cdkn> or contact olivier.beucher@baastel.com

The Mount Elgon region, heavily dependent on coffee production, is one of the most vulnerable in Uganda to climate variability. Yields and quality of coffee crops have been declining over the last 30 years, in part owing to poor management practices and in part because of an increase of the frequency of droughts, landslides and floods. Climate change is expected to result in higher temperatures, changes in rainfall and more extreme events, and, as a result, lower coffee yields. An analysis comparing the costs and benefits of coffee farming under "Business as Usual" (BAU) and "Climate Smart Agriculture" (CSA) scenarios was undertaken, in both the current situation and under climate change projections. The analysis demonstrates that there is an economic case for investing in CSA (defined in this study as involving planting of trees, mulching and trench construction), and a complementary programme of institutional support, both now and even more-so under future predicted climatic conditions. It should be stressed, however, that these are preliminary estimates based on limited data and evidence on the effectiveness and impacts of CSA, and in particular a number of assumptions regarding the take up of CSA practices by farmers and the actual improvements in yields that could be achieved. As such the results presented must be treated with caution, and we recommend further work to improve the evidence base.



Figure 1: Bududa district, Uganda

Introduction

In 2010-12 coffee represented around 3% of Uganda's Gross Domestic Product (GDP) and 20-30% of the country's foreign exchange earnings. The coffee sector employed over 3.5 million households in 2011. Arabica coffee production, the focus of this study, contributes 43% of Uganda's total direct coffee export earnings. The case-study has focused on the Bududa district of Mount Elgon, which is typical of agro ecological zones in the region and well covered by coffee cooperatives and private companies.

Current conditions

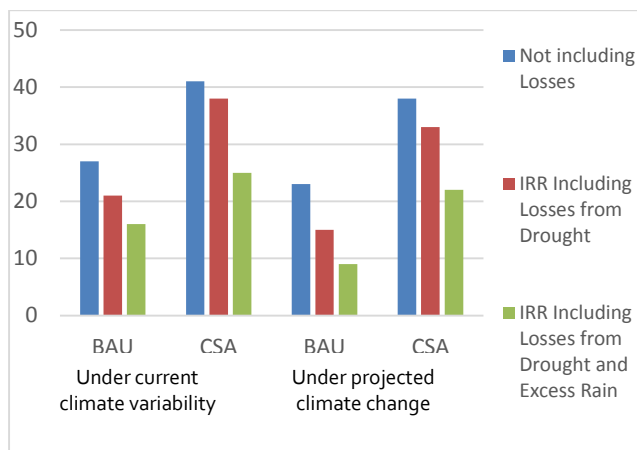
Arabica coffee is very sensitive to weather conditions: optimum mean temperature range is 18-21°C and excessive moisture, heat, or dry conditions directly affect yields. The case study firstly considered the costs and benefits of coffee production under a "Business as Usual" (BAU) scenario and a "Climate Smart Agriculture" (CSA) scenario, considering current climate variability, over a 15 year period, and based on the information collected in the field. The Internal Rate of Return (IRR), which corresponds to the profitability of investments, increases from 27% (BAU) to 41% (CSA), indicating that even under

current conditions, investment in climate smart agriculture will deliver greater benefits than costs. The difference in returns between BAU and CSA is similar when losses from drought, and losses from drought and excess rain are incorporated into the model, as we can see in Fig 2.

Climate Change

Climate change projections indicate an increase of temperatures in Mount Elgon, which might negatively affect Arabica coffee production, in particular at lower altitude ranges, and a slight decrease in total annual rainfall. The number of days with moderate to average rain might increase in future, which can have an effect on pests and affect crop growth. Extreme events (excess of rainfall and droughts) are also likely to increase in frequency and intensity. Assuming increases in such events, over a 30 year period, the benefits of CSA over BAU are similarly strong.

Figure 2. Returns to coffee growing in the Bududa District (IRR %) under current climate variability and projected climate change



Adaptation

Seven main types of adaptation options were highlighted as critical by stakeholders in the district, and the study focused on the two that stakeholders considered to be most important: CSA and institutional support measures (or extension services).

The study found that although quite costly, investments in CSA are likely to be justified, as probable benefits outweigh the costs, both under current conditions, and even more so when expected climate impacts are considered. The study indicates that likely investment costs are in the range of US\$2.4

million in 2016, rising to US\$4.9 million by 2019, over and above the current institutional support programme of Bududa's District Local Government, which has a budget of only around US\$ 214,329. The analysis shows investment in these two complementary programmes – CSA and institutional support - would have an internal rate of return of around 36%. If combined with other adaptation approaches, such as complementary policies or providing better climate information, there is, in the view of the study team, potential to sustain coffee cultivation in Bududa, both now and under future predicted climatic conditions.

The study provides an illustration of the potential economic case for investment in CSA for coffee cultivation in the Bududa district. However, there needs to be further consensus before undertaking any major investment programme. It recommends that further research and analysis is conducted in order to identify:

- (i) The impact of climate variability on coffee yields in the Mt Elgon region, and other coffee growing regions in Uganda.
- (ii) The cost and benefits of different approaches to CSA in the coffee sector, in particular to identify 'low regret' options and options where there are co-benefits.
- (iii) The economic viability of coffee growing under BAU and CSA in different regions in Uganda, in order to focus investment where there is a stronger economic case in the long term.
- (iv) Barriers and enablers that effect the adoption of CSA practices by farmers, in order to identify what wrap-around support might be needed, and an analysis of how support may be best delivered.
- (v) The costs and benefits of alternative livelihoods in Bududa, including cultivation of other crops and non-farming activities, versus coffee cultivation.

The above actions would help to inform the design of a CSA programme for coffee, including practical measures as well as institutional support, and help to identify what additional complementary strategies might be needed. Critically, the development of such a programme should also involve the private sector, and an analysis of the market and value chain for coffee, to enable improved commercialisation.

Further, given the high level of investment that is potentially required, it is recommended that any CSA programme is first piloted in order to establish whether expectations around costs, benefits, and yields, etc, are borne out in reality in Uganda.