

Scenario impact analysis for \$80m investment in the Ugandan coffee sector

Report for the
National Steering Committee of the
Uganda Coffee Platform



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Abstract

This report analyses the impact of 6 investment scenarios on the Ugandan coffee sector. Figure 1 gives an overview of the principle evaluation criteria of the six investment scenarios that are discussed in this report.

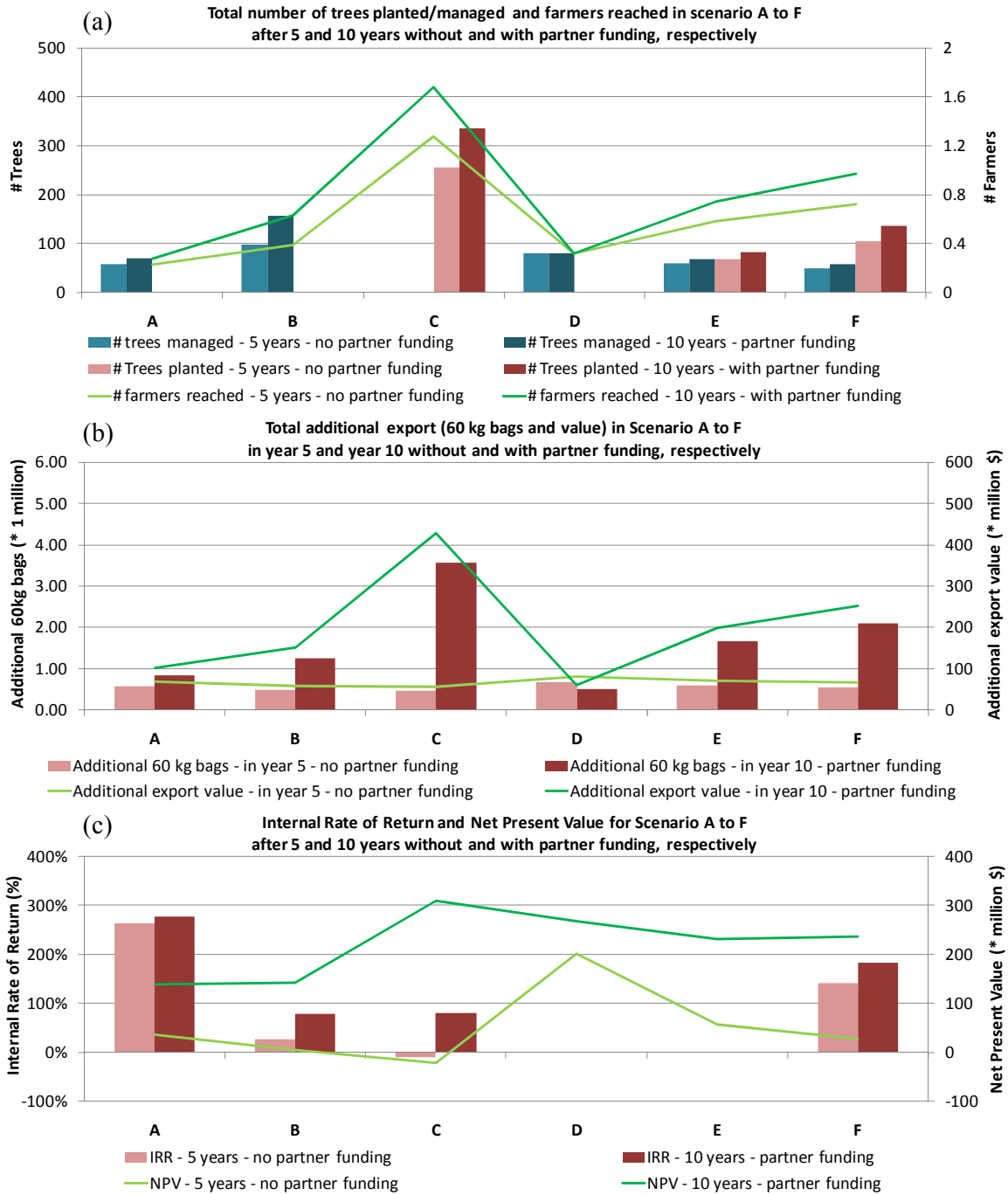


Figure 1: Impact of six investment scenarios in 5 years (\$80 million by USAID; no partner funding) and in 10 years (\$80 million by USAID + \$25 million by partners) on a) Total number of planted and managed trees and total number of farmers reached; on b) Additional export (60 kg bags and value); and on c) Internal Rate of Return (IRR) and Net Present Value (NPV). Scenario A = coffee improvement teams; B = up/out-scaling of existing projects, programmes and farmer organisations; C = replanting campaign; D = fertiliser scheme; E = equal mix of strategies a-d; and F = unequal mix of strategies a-d. Note that the IRRs of scenario D and E approach infinity and are therefore not included in Figure 1c (no negative financial balance in year 1).

1. Introduction

With the aim of reducing poverty and under-nutrition by 50%, the U.S. Government anticipates a five-year \$150m commitment to three commodity chains in Uganda through its Feed the Future (FtF) initiative¹. The coffee value chain has been identified as one of the three strategic commodities. On 1 March 2011, part of the USAID agriculture team presented the outline of the FtF initiative to the National Steering Committee of the Uganda Coffee Platform. They indicated that their target is to double Uganda's Robusta coffee production by an annual investment of around \$20m for a five year period in the coffee sector.

The FtF initiative was more widely presented during a coffee breakfast meeting on 7 April 2011 that brought together 58 coffee stakeholders from the private, public and NGO sectors. In the preparation for this breakfast, the FtF team invited the National Steering Committee of the Uganda Coffee Platform to present their view on how the proposed funding could be used to double Robusta production in Uganda.

The members of the National Steering Committee held several discussions on how to spend the proposed investment. This resulted in the identification of **four strategies** to increase Robusta production:

- Strategy a: Coffee improvement teams
- Strategy b: Up-scaling and out-scaling existing projects, programmes and farmer organisations (PPFOs)
- Strategy c: Multiplication and replanting campaign
- Strategy d: Fertiliser benefit scheme

The National Steering Committee members are of the opinion that the above strategies will address the key constraints to Robusta production in Uganda: i) low productivity per tree due to poor management and low input use; and ii) reduced number of coffee trees as a result of the Coffee Wilt Disease (CWD) epidemic.

Café Africa, as secretariat to the National Steering Committee, was asked to quantify the possible impact of the above four strategies on Uganda's coffee production. Using the assumption that the FtF initiative will spend \$80m over 5 years on Robusta production, Café Africa analysed the following **six scenarios**:

1. Scenario A: all funds used on strategy a - coffee improvement teams
2. Scenario B: all funds used on strategy b – up-scaling and out-scaling of existing PPFOs
3. Scenario C: all funds used on strategy c – multiplication and replanting campaign
4. Scenario D: all funds used on strategy d – fertiliser benefit scheme
5. Scenario E: equal mix of strategies a, b, c and d - 25% to each of the four strategies
6. Scenario F: non-equal mix of strategies a, b, c and d - emphasising the replanting campaign

For each scenario, the impact on Robusta production and costs was analysed for **three situations**:

1. Impact after 5 years; funding by FtF (\$80 million) in years 1 to 5
2. Impact after 10 years; funding by FtF (\$80 million) in years 1 to 5
3. Impact after 10 years; funding by FtF (\$80 million) in years 1 to 5 and by partners (\$25 million) in years 6 to 10

By carrying out an ex-ante scenario impact analysis of the six proposed scenarios, Café Africa and the National Steering Committee hope to contribute to the discussions around the proposed FtF investment in the Ugandan coffee sector by:

¹ USAID/Uganda, 2011

- Quantifying the impact of the six proposed scenarios, using realistic yield and price figures, on the following key indicators:
 - Number of trees planted and/or managed
 - Number of farmers reached
 - Number of additional 60 kg bags of Robusta (i.e. number of bags produced as a result of the implementation of one of the six scenarios, in addition to existing production)
 - Additional export value (\$) (i.e. value of additional 60 kg bags of Robusta produced)
 - Net Present Value (NPV; \$)²
 - Internal Rate of Return (IRR; %)³
- Evaluating the time frame that is required to double Robusta production by the proposed scenarios
- Evaluating the proposed scenarios

As a reference level, 2.4 and 2.0 million bags of Robusta were exported in 2008/9 and 2009/10, respectively, representing an export value of \$212 and \$164 million, respectively⁴. The total number of coffee farmers in Uganda is estimated at 1.3 million⁵, with an average farmer having roughly 250 trees.

The impact assessments presented in this report are based on expected increases in coffee productivity per tree as a result of improved management (strategies a, b and d) and/or the expected additional production (per tree) as a result of the multiplication and replanting campaign (strategy d). Yield and price data in the scenario analysis are largely based on results from the Uganda Coffee Farmer Alliance (UCFA) project in Mityana. Instead of using yield data from demonstration plots, we used average yield data from participating farmers. This gives a much more realistic assessment of the potential impact of the scenarios because it takes into account the mix of fast, moderate, slow and non-adopters of improved management technologies as will be the case in any project. All yield and price data were thoroughly crosschecked with Stefan Cognini of the Neumann Foundation and approved by the members of the National Steering Committee that attended a meeting on 6 April 2011.

The following six chapters each present a summary of the impact analysis for one of the analysed scenarios. The full analysis was done in Excel. The spreadsheets are too large for inclusion in this report, but can be obtained from Café Africa at amf@cafeafrika.org. Details on the specific assumptions that were used for the analysis of each scenario are given in the respective chapters. In addition, the following **overall assumptions and principles** were used:

- Farmers are interested in increasing the productivity of their coffee trees;
- Robusta coffee prices remain profitable to farmers;
- Robusta coffee production is not affected by droughts or new pests and diseases
- No compromise on the “Coffee as a business” principle: farmers contribute to the cost of plantlets, fertiliser vouchers are only given on an incentive basis and are phased out in 5 years;
- A supportive Coffee Policy is available and implemented;
- There is a stable and supportive political atmosphere; and
- There is a functional, well-funded coffee research establishment

² The NPV is an indicator of how much value an investment or project adds to the investor. When the NPV > 0, the investment adds value to the investor. The scenario with the highest NPV is the most desirable from a financial point of view. The NPV was calculated using a discount rate of 20% for all scenarios.

³ The IRR is an indicator of the efficiency of an investment. An investment is considered acceptable if its IRR is larger than an established minimum acceptable rate of return. As all scenarios invest the same amounts of money, the scenario with the highest IRR is the most desirable from a financial point of view.

⁴ UCDA annual reports 2009 and 2010

⁵ Uganda Bureau of Statistics, 1995

2. Scenario A: Coffee improvement teams

2.1 Introduction and assumptions

In scenario A, all available funds are used on strategy a – the use of coffee improvement teams. Coffee improvement teams consist of 3 persons that are duly trained and operate at parish level. Their main task will be to promote stumping, pruning and general Good Agricultural Practices (GAPs) in the coffee gardens within their operating area. To maintain coffee production over time, coffee trees require regular stumping (removal of all stems, except one ‘breather stem’ which is removed one season later). Stumping should be carried out every 7 years on average, but is rarely done in Uganda as farmers lack knowledge on how to carry out stumping and/or they do not want to lose production in the two seasons following stumping. The coffee improvement teams will visit individual farmers and offer to stump all coffee trees that require stumping over a period of 3 years. To compensate for the yield loss in the year of stumping, the teams will manage (i.e. prune, weed and fertilise) one ‘compensation’ tree for each tree they stump.

Secondly, the teams have an important educational function. They will intensively interact with farmers when they collaboratively manage the coffee gardens, showing them the fine details of stumping, pruning, chemical weed control and fertiliser application. As stumping is a seasonal activity, the coffee improvement teams will spend approximately 50% of their time on providing extension services to the coffee farmers in their working areas. This includes detailed training and promotion of the concept of ‘farming as a business’ and on GAPs. To ensure that the coffee improvement teams will work efficiently and effectively, they will be supervised by an area supervisor and paid on a performance basis. Table 1 gives an overview of the general assumptions that were used for the impact analysis of scenario A.

Table 1: General assumptions for scenario A

Table 2: Assumptions on the impact of scenario A on Robusta tree productivity

Type of trees	Yield (kg FAQ per tree)
Trees without management	0.5
Stumped trees – year of stumping	0.2
Stumped trees – year following stumping	0.75
Stumped trees – subsequent years	1.0
‘Compensation’ trees – year of stumping	1.2
‘Compensation’ trees – subsequent years	0.75

Robusta coffee trees that are not managed under scenario A are assumed to produce an average 0.5 kg of Fair Average Quality (FAQ) per tree (Table 2). In the year of stumping, production drops to 0.2 kg FAQ per tree (coffee on 'breather stem'). Due to the use of fertiliser and improved weed control in the year of stumping and the subsequent year and an assumed 50% adoption of fertiliser thereafter, yields will increase to 0.75 kg FAQ per tree in the year following stumping and to 1.0 kg FAQ per tree in subsequent years. 'Compensation' trees that are managed for one year as compensation for the yield loss due to stumping are expected to produce 1.2 kg FAQ in the year of management and 0.75 kg FAQ per tree in subsequent years, due to partial adoption of improved management practices. Costs of the coffee improvement teams are expressed on a per tree basis (Table 3). Labour, supervision, transport and training costs are included in the cost per stumped tree (\$0.7), whereas input use is included in the cost per 'compensation' tree (\$0.4).

Table 3: Assumptions on costs for scenario A

Activity	Costs per tree (\$)
Stumping - labour + transport + supervision + tools	0.7 per stumped tree
Fertiliser, pruning & weeding + tools	0.4 per 'compensation' tree

2.2 Impact analysis of scenario A

Table 4 and Figure 2 give an overview of the impact of scenario A on selected key indicators in three situations. With a total investment of \$80 million from the FtF initiative in year 1 to 5, the number of operational coffee improvement teams will grow from 521 in year 1 to 1458 in year 3 to 5. Without partner funding, the coffee improvement teams will cease to exist after year 5. In case of a total of \$23 million of partner funding in year 6 to 10, 260 coffee improvement teams can remain operational after year 5.

Table 4: Impact of scenarios A1, A2 and A3 on selected key indicators and total costs

Indicators	Scenario A1	Scenario A2	Scenario A3
	5 years impact No partners	10 year impact No partners	10 year impact Funding partners
Total # established new trees	0	0	0
Total # managed trees	57m	57m	70m
Total # farmers reached	228,000	228,000	278,000
Total # coffee improvement teams	521 – 1458	521 - 1458 – 0	521 - 1458 – 260
Additional Robusta production (60kg bags)			
Annual	30 - 570,000	30 - 700,000	30,000 – 840,000
Total for period	1.4m	4.9m	5.2m
Additional Robusta export value (US\$) ¹			
Annual	4 - 69m	4 – 86m	4 - 101m
Total for period	162m	583m	625m
Total costs (US\$)			
USAID FtF	80m	80m	80m
Funding Partners	0	0	23m
Internal Rate of Return (IRR; %)	264	277	277
Net Present Value (NPV; \$)	36m	136m	139m

¹ The additional Robusta export value is calculated using a price of \$2.0 per kg FAQ

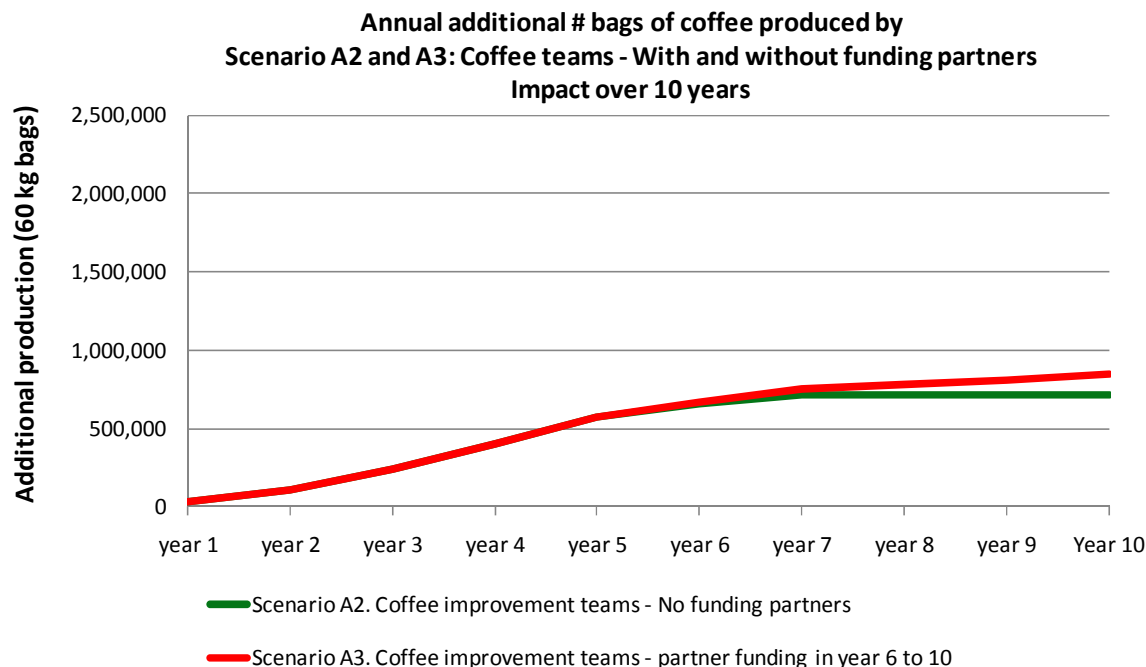


Figure 2: Impact of scenario A2 and A3 on additional coffee produced in a time period of 10 years, with and without additional funding partners from year 5 onwards

With 5 million trees being stumped in the first year, 10 million in the second year and 14 million in each of the last three years of the FtF funding, a total of 57 million trees may be stumped in scenario A1. A similar number of ‘compensation’ trees will be managed for one year in order to compensate for yield losses due to stumping. Assuming each farmer has an average of 250 coffee trees that all require stumping within the 5 years of the project (see Table 1), a total of 228,000 farmers may thus be reached by the coffee improvement teams. With partner funding in year 6 to 10, the stumping programme will be continued at a rate of 2.5 million trees per year and a total of 70 million trees may be stumped and managed within 10 years, whereas the number of farmers benefitting directly from the team’s interventions increases to approximately 278,000 farmers. The number of farmers benefitting from the extension services of the teams may be much larger.

As a result of the investments, the number of additional bags of Robusta coffee being produced is projected to increase from about 30,000 bags in year 1 to 600,000 bags in year 5 and 700,000 bags in year 10, or an additional export value of \$86 million per year in year 10. With additional partner funding, the additional annual export is projected to increase to about 840,000 bags in year 10, which is equivalent to an annual export value of \$101 million.

2.3 Evaluation of Scenario A

Targeting all available funds to the coffee improvement teams will result in a maximum 42% increase in Robusta production in 10 years (scenario A3), compared to the 2009/10 Robusta export of 20 million bags. With an IRR of > 200%, the returns to investments of scenario A are very high at both the medium (5 years) and longer term (10 years). The NPV is high (\$36 million) at a medium term and very high (> \$130 million) at the longer term.

The use of coffee improvement teams will bring GAP knowledge and implementation directly to the gardens of roughly a quarter of all Uganda’s coffee farmers. Coffee projects show that once farmers have

had a hands-on experience with the benefits of improvement management, they are likely to (partially) adopt the GAPs. In addition, the coffee improvement teams will form an excellent opportunity to reach an even larger number of Robusta farmers with training and extension. As they operate at parish level, the coffee teams may be well placed to bring extension services to farmers that are not organised in a group. As Uganda's coffee farmers currently harvest only 0.5 kg FAQ per tree, while their colleagues in Vietnam harvest on average 2 kg FAQ per tree, a thorough investment in the knowledge level of Uganda's coffee farmers may well form the basis of a sustained increase in coffee production.

To increase the sustainability of the coffee improvement teams' work and to reach out to more farmers, the supply of free inputs (fertiliser, herbicides) for management of the 'compensation' trees could be tied to stumping by the farmers themselves:

- In year 1, the coffee improvement teams are responsible for all the stumping and management;
- In year 2, the farmer is required to work alongside the coffee improvement teams and stump half of the trees to be stumped him/herself as a condition for receiving the free inputs for his/her 'compensation' trees; and
- In year 3, the farmer must stump all his/her trees that require stumping as a condition for receiving the free inputs for his/her 'compensation' trees.

Having appreciated the benefits of good management and stumping and having had hands-on training in year 1, coffee farmers should be sufficiently motivated and knowledgeable to take on this challenge to earn free inputs in year 2 and 3.

Targeting all available funds to the creation of coffee improvement teams will require more than 1,500 trained field workers in year 1 and more than 4,500 field workers in year 3 to 5. The training and supervision of such large number of people over a relatively short time period may not be very realistic.

3. Scenario B: Up-scaling and out-scaling of existing projects, programmes and farmer organisations

3.1 Introduction and assumptions

In scenario B, all available funds are used on strategy b – the up-scaling and out-scaling of existing projects, programmes and farmer organisations (PPFOs). In the Ugandan coffee sector, farmer organisations co-operatives, exporters and non-governmental organisations have implemented a range of projects and programmes. Some of these PPFO's are mainly involved in collective marketing of coffee, but many use a value chain approach and have combined marketing with the supply of inputs and extension services in one form or the other. In order to facilitate marketing, the formation of farmer or producer groups form an essential part of each PPFO. At the same time, such groups form an excellent entry point for extension services. A relatively large number of the PPFOs have been created to supply certified coffees to the international market. According to an initial survey of the National Steering Committee of the Uganda Coffee Platform, there are just below 100 smaller and larger PPFOs active throughout Uganda. Some are very small (<1,000 farmers), while others are relatively large (15,000 farmers). In total about 140,000 farmers are thus organised in PPFOs.

Scenario B envisions the identification of the most successful PPFOs and up-scaling and out-scaling their approaches to a much larger number of farmers. Table 5 gives an overview of the general assumptions that were used for the impact analysis of scenario B.

Table 5: General assumptions for scenario B

1.	26 PPFOs will be up or out-scaled, each having 15,000 farmers after 5 years
2.	After year 5, membership of the PPFOs will continue growing by 10% per year, without additional investment
3.	There are enough interested farmers in areas of operation
4.	PPFOs do not plant new trees in this scenario, but focus on improving management of existing trees
5.	Average farmer has 250 trees

As a guideline for the costs of up-scaling and out-scaling a PPFO that reaches 15,000 farmers, this scenario uses a rough estimation of the total costs of establishing the Uganda Coffee Farmer Alliance project in Mityana, as invested by the Neumann Kaffee Gruppe and other donors (Table 6). With an estimated cost of \$3 million per PPFO, scenario B can fund the up-scaling and out-scaling of 26 PPFOs.

Table 6: Assumptions on costs for scenario B

Unit	Costs (\$)
Costs per PPFO reaching 15,000 farmers	\$3 million
Costs per farmer	\$200

Robusta coffee trees that are not managed under scenario B are assumed to produce an average 0.5 kg of FAQ per tree (Table 7). We assume that in the first year of up-scaling and out-scaling, the impact of the PPFOs does not yet translate into improved productivity of the coffee trees of member farmers. Tree productivity of member farmers is assumed to gradually increase from 0.65 kg per tree in year 2 to a maximum of 1.1 kg per tree in year 5 and onwards. The increase in yield is due to partial adoption of improved GAPs, especially pruning, mulching, weed control and soil fertility management.

Table 7: Assumptions on the impact of scenario B on Robusta tree productivity

Type of tree	Yield (kg FAQ per tree)
Trees outside PPFOS	0.5
Trees in PPFOS – year 1	0.5
Trees in PPFOS – year 2	0.65
Trees in PPFOS – year 3	0.80
Trees in PPFOS – year 4	1.00
Trees in PPFOS – year 5-10	1.10

3.2 Impact analysis of scenario B

Table 8 and Figure 3 give an overview of the impact of scenario B on selected key indicators in two situations. With a total investment of \$80 million from the FtF initiative in year 1 to 5, a total of 390,000 farmers may be organized into 26 PPFOS at the end of year 5. Assuming a 10% growth rate after year 5, by year 10 their number will have grown to 628,000. A total of 98 and 157 million trees may be benefitting from the up-scaling and out-scaling of PPFOS in year 5 and 10, respectively. There is no need for additional partner funding in this scenario as it is assumed that the PPFOS that are created will be sufficiently strong to continue growing by their own means after year 5.

As a result of the investments, the annual number of additional bags of Robusta coffee being produced may reach about 0.5 million bags in year 5 and 1.3 million bags in year 10. This represents an annual additional export value of \$59 million in year 5 and \$150 million in year 10.

Table 8: Impact of scenarios B1 and B2 on selected key indicators and total costs

Indicators	Scenario B1	Scenario B2	Project is self-Sustaining ¹
	5 years impact No partners	10 year impact No partners	
Total # established new trees	0	0	-
Total # managed trees	98m	157m	-
Total # farmers reached	390,000	628,000	-
Additional production (60kg bags)			
Annual	0 – 0.5m	0-1.3m	-
Total for period	0.9m	5.9m	-
Additional export value (US\$) ²			
Annual *	0 - 59m	0 - 150m	-
Total for period	109m	711m	-
Total costs (US\$)			
USAID / FtF	78m	78m	-
UCDA & NAADS	0	0	-
Internal Rate of Return (IRR; %)	27	78	-
Net Present Value (NPV; \$)	4m	141m	-

¹ No funding partners required as projects will sustain themselves after 5 years

² The additional Robusta export value is calculated using a price of \$2.0 per kg FAQ

3.3 Evaluation of scenario B

Targeting all available funds to the up-scaling and out-scaling of PPFOs will result in a maximum 65% increase in Robusta production in 10 years time (scenario B2), compared to the 2009/10 total Robusta export of 2.0 million bags. At the short term (5 years), scenario B results in a moderate IRR (27%) and a low NPV (\$4 million), but on the longer term (10 years) the IRR increases to a good 78% and the NPV improves drastically to \$141 million.

Under the current assumptions, up-scaling and out-scaling of existing PPFOs may result in more than half Uganda's coffee farmers benefitting from collective marketing and extension support in ten years time. However, it may not be realistic to expect PPFOs to continue growing by 10% per year after the end of the project. After 6 years of operation, there are still many coffee farmers in the Mityana project of the UCFA / Neumann Kaffee Gruppe that have not yet joined the project. This may be a clear indication that we cannot expect all farmers to be motivated to join a PPFO. To better understand the reasons why farmers do not join a PPFO, it may be helpful to carry out an evaluation study among farmers that did not join an active PPFO in their area. The insights of such a study may help to improve the set-up of new PPFOs and attract more farmers.

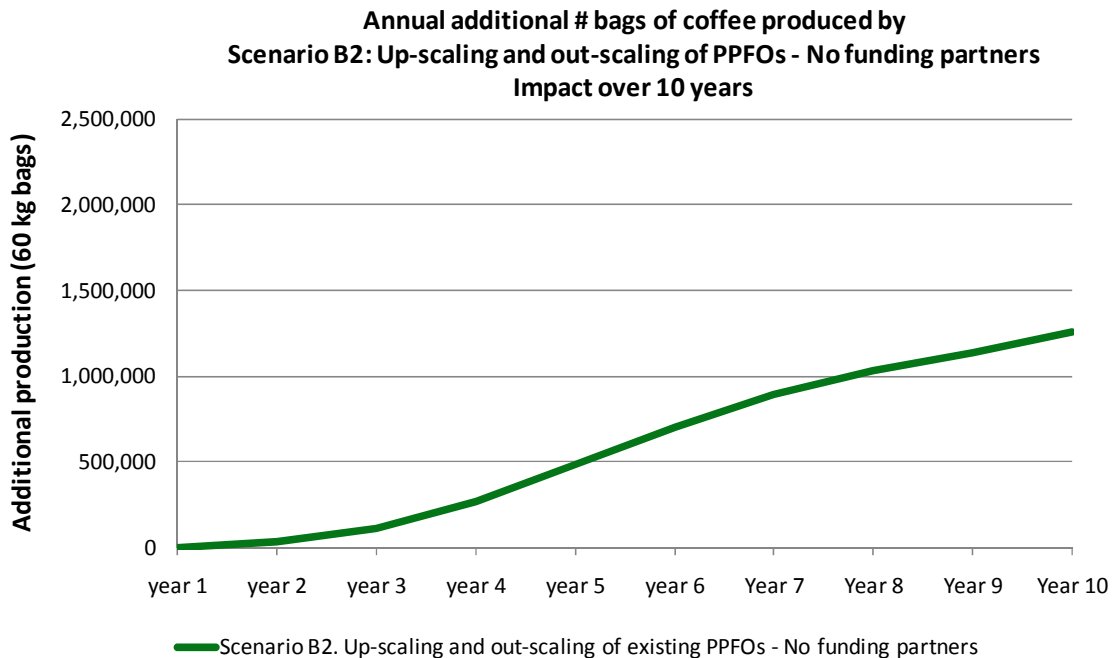


Figure 3: Impact of scenario B2 on additional coffee produced in a time period of 10 years, without additional funding partners

4. Scenario C: Multiplication and replanting programme

4.1 Introduction and assumptions

In scenario C, all available funds are used on strategy c – a large scale multiplication and replanting programme. To combat the devastating impact of the CWD epidemic on Robusta production, which destroyed as much as 45% of all Robusta trees in Uganda, the Uganda Coffee Development Authority (UCDA) and its partners have carried out several replanting programmes since the late nineties. Though these programmes have made a positive contribution, their impact has been limited. As a result of the very low Robusta prices from 2000 to 2003 (\$0.4 - 0.6 per kg of exported FAQ) and the unavailability of CWD resistant planting materials, farmers lacked motivation to seriously re-develop their coffee gardens.

The 2011 situation is very different. Robusta prices have been steadily rising since the beginning of 2010. In February 2011 the average export price of FAQ was \$1.85 per kg, the highest price for FAQ since 1994/5. Moreover, international coffee experts are predicting that coffee prices will likely remain stable or even increase due to a structural lower supply than demand on the world markets. Consequently, it pays for Ugandan farmers to now invest in Robusta coffee production. In addition, the Coffee Research Centre (COREC) has partially released 7 Robusta lines that are resistant to CWD and has another 6 promising lines in the last stages of their breeding process. The time to invest in a large-scale replanting campaign to increase the number of Robusta trees in the country therefore seems right.

Considering that some of the 7 CWD resistant lines reportedly have very low survival rates with clonal propagation methods, mass multiplication of the lines likely has to be done through tissue culture. The produced plantlets can then be weaned, hardened and distributed by private players, consisting of a combination of tissue culture facilities, centrally located large-scale commercial nurseries and medium and small-scale nurseries throughout the Robusta area. We further assume that the new trees will be used to gap fill and expand existing or new coffee fields, will be managed under current low input levels and will have a survival rate of 80% once planted in the field (Table 9).

Table 9: General assumptions for scenario C

-
1. Mass multiplication of CWD resistant plantlets is done through tissue culture
 2. Weaning, hardening and distribution is done by private players
 3. New trees are 100% farmer managed (i.e. low input levels)
 4. Each farmer is willing and capable to buy 250 trees
 5. New trees are used to gap fill and expand existing coffee fields
 6. Newly planted trees have a survival rate of 80%
-

Table 10: Assumptions on Robusta yields for new trees planted in scenario C

Year after tree is planted	Yield (kg FAQ per tree)
Year 1 & 2	0.0
Year 3	0.25
Year 4	0.50
Year 5	0.65
Year 6 onwards	0.75

After planting, trees are assumed to start producing their first harvest in year 3 and gradually increase their production to 0.75 kg FAQ per tree from year 6 onwards (Table 10). We assume a cost price of 1,000 Ush per plantlet (Table 11). This price is based on discussions with P. Benders, director of Exclusive Uganda, who developed in 2007 a proposal for mass multiplication of Robusta plantlets for the USAID APEP

project. In line with the ‘Farming as a business’ approach and increase ownership of the plantlets, farmers are assumed to pay 400 Ush for a plantlet (clonal plantlets currently cost between 400-700 Ush).

Table 11: Assumptions on costs for scenario C

Unit	Unit cost (\$)
Plantlet	\$0.25

1. One plantlet costs 1000 Ush, whereby 600 Ush is paid by the project and 400 Ush is paid by the farmer
2. Costs are incurred in the year preceding the planting of the new trees

4.2 Impact analysis of scenario C

Table 12 and Figure 4 give an overview of the impact of scenario C on selected key indicators in three situations. With a total investment of \$80 million from the FtF initiative towards a large-scale multiplication and replanting campaign, a total of 1.3 million farmers could potentially establish about 256 million trees in 5 years (no trees are planted in the first year of operation, 20 million trees in year 2 and 100 million trees are planted in year 3 to 5; 80% survival rate).

As Figure 4 shows, the impact of a massive replanting campaign on coffee production will only be noticed from year 5 onwards, but as the newly planted trees come into production their impact on coffee production grows very rapidly over time. As a result of the investments, the annual number of additional bags of Robusta coffee being produced is projected to increase from 0.5 million bags in year 5 to 3.2 million bags in year 10. In case of partner funding from year 6 onwards (\$25 million over 5 years; 20 million trees planted per year; 80% survival rate), the additional annual production increases to 3.6 million bags by year 10. This represents an annual additional export value of \$64 million in year 5 for scenario A1 (only FtF funding) and \$429 million in year 10 for scenario A3 (with partner funding).

Table 12: Impact of scenarios C1, C2 and C3 on selected key indicators and total costs

Indicators	Scenario C1	Scenario C2	Scenario C3
	5 years impact No partners	10 year impact No partners	10 years impact Funding partners
Total # established new trees	256m	256m	336m
Total # managed trees	0	0	0
Total # farmers reached	1.3m	1.3m	1.7m
Additional production (60kg bags)			
Annual	0 - 0.5m	0 – 3.2m	0 – 3.6m
Total for period	0.5m	12.7m	13.4m
Additional export value (US\$) ¹			
Annual	0 - 56m	0 - 384m	0 - 429m
Total for period	64m	1.5b	1.6b
Total costs (* million \$)			
USAID / FtF	80m	80m	80m
Funding partners	0	0	25m
Internal Rate of Return (IRR; %)	-11	82	81
Net Present Value (NPV; \$)	-22m	304m	310m

¹ The additional Robusta export value is calculated using a price of \$2.0 per kg FAQ

**Annual additional # bags of coffee produced by
Scenario C2 and C3: Multiplication & Replanting campaign
-With and without funding partners
Impact over 5 years**

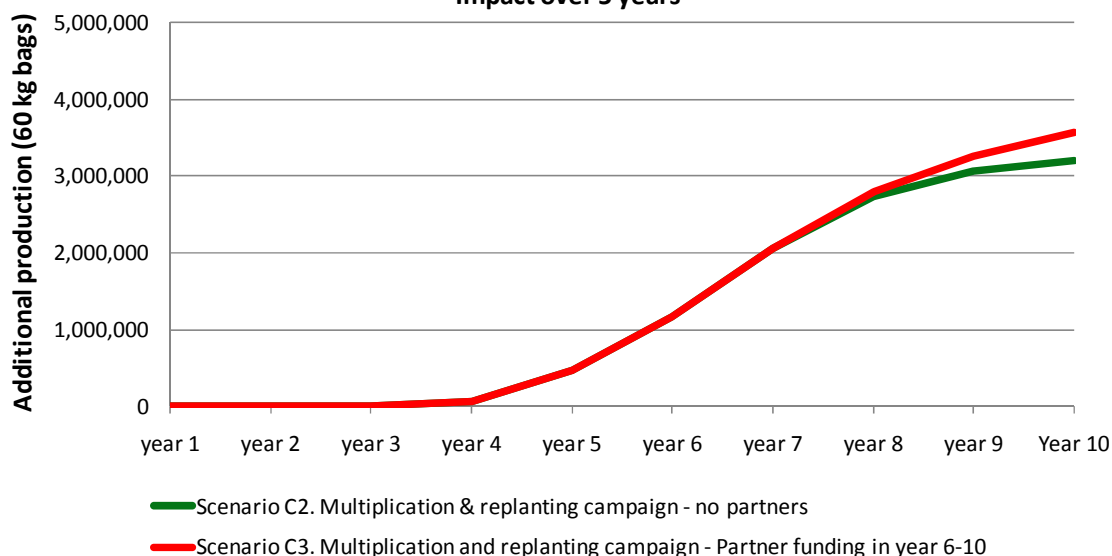


Figure 4: Impact of scenario C2 and C3 on additional coffee produced in a time period of 10 years, with and without additional funding partners from year 5 onwards. Note that Y axis deviates from other figures in this report (up to 5m instead of 2.5m additional bags).

4.3 Evaluation of scenario C

In case all the FtF funding would be targeted to a massive multiplication and replanting programme, Robusta production would double within 7 years, compared to the 2009/10 production of 2.0 million bags (see Figure 4). As it takes time for the newly planted trees to come into production, the IRR and NPV are negative on the medium term (-11% and -22 million, respectively). However, on the longer term (10 years) the massive impact on production translates into very high IRRs (>80%) and extremely positive NPVs (>300 million).

Nonetheless, it is completely unrealistic to expect any replanting programme to sell 100 million seedlings per year, successfully plant over 230,000 acres with coffee in 5 years and reach every coffee farmer in Uganda. There is not enough capacity in the country to produce and distribute such large number of seedlings, while farmers will be financially unable to buy such numbers of seedlings, prepare the required gardens and ensure good management in order to facilitate seedling survival.

5. Scenario D: Fertiliser benefit scheme

5.1 Introduction and assumptions

In scenario D, all available funds are used on strategy d – a fertiliser benefit scheme. In contrast to other coffee producing countries in Asia and Latin America, fertiliser use is extremely low in Uganda. The large majority of coffee farmers never apply chemical fertilisers. Soil fertility management in coffee gardens is based on the use of (limited) amounts of manure and coffee husks and mulching with (mainly) banana residues. In most cases, such strategies do not offset nutrient removal rates by harvesting and leaching and do not resolve specific nutrient deficiencies other than partially overcoming Nitrogen deficiencies.

Results from demonstration gardens installed by the USAID APEP project and other coffee projects (i.e. the Neumann Kaffee Gruppe) have shown that coffee responds very favourably to fertiliser use and production per tree can be doubled or tripled. Nonetheless, adoption of fertiliser use among coffee farmers has been observed to be slow, even by project farmers. To encourage adoption, it is essential to persuade farmers to try out fertilisers in their own coffee gardens so they can appreciate the benefits of fertilisers on their own trees. Scenario D therefore proposes the introduction of fertiliser vouchers to temporarily reduce the cost of fertiliser use for farmers. A fertiliser benefit scheme needs to be complemented with extension services on 'farming as a business' to encourage farmers to re-invest part of their production gains into fertilisers and other inputs to sustain increased production over time.

One pitfall of using fertiliser vouchers is that farmers can cheaply obtain fertilisers, which are then resold on the black market instead of being applied to their crops. In an effort to reduce this, farmers will only have access to fertiliser vouchers when they have pruned and weeded their coffee fields (Table 13). In this scenario analysis, it is envisioned that fertiliser vouchers will reduce the cost price of fertiliser by 75% in the first three year, and then will be gradually phased out towards the end of the project (Table 14).

Table 13: General assumptions for scenario D

1. Farmers only earn fertiliser vouchers when they have pruned and weeded their coffee fields
2. Farmers are willing and capable to buy fertiliser with the obtained vouchers and apply it to their trees
3. Value of fertiliser vouchers will reduce from 75% of cost price in year 1-3, to 50% in year 4 and to 25% in year 5 to phase out the project
4. In scenario D3, funding partners continue funding the fertiliser vouchers at 25%
5. The same trees remain fertilised throughout the project
6. The average farmer has 250 trees
7. There is no corruption around the vouchers

Table 14: Assumptions on the costs of scenario D

Unit	Costs (\$)
Fertiliser per kg	\$0.83
Fertiliser per tree (0.4 kg per year)	\$0.33
75% voucher per tree	\$0.25
50% voucher per tree	\$0.17
25% voucher per tree	\$0.08

During the first three years of the project, when vouchers are valued at 75% of the fertiliser price, it is assumed that farmers will apply the required quantity (0.4 kg of NPK per tree) per tree. As the coffee gardens are pruned and weeded, fertiliser response will likely be high and the projected average yield per

coffee tree is 1.2 kg FAQ (Table 15). When the value of the fertiliser vouchers decreases over time, the average amount of fertiliser applied per tree will likely decrease. This is reflected in a lower yield per tree (1.0 kg FAQ). When the voucher programme completely stops (scenario D2), we assume that there will be a 25% adoption of fertiliser use (half the recommended rate on 50% and average yields will drop to 0.75 kg FAQ per tree (50% above the average Robusta yield in Uganda).

Table 15: Assumptions on the impact of scenario D on Robusta tree productivity

Type of fertilisation strategy	Average yield (kg FAQ per tree)
Unfertilised trees:	0.50
Project trees fertilised with 75% voucher in year 1 (response in 2 nd harvest only)	0.80
Project trees fertilised with 75% voucher in year 2 & 3	1.20
Project trees fertilised with 25 or 50% voucher in year 4 & 5	1.00
Project trees no longer receiving vouchers (25% Adoption of fertiliser use)	0.75

5.2 Impact analysis of scenario D

Table 16 and Figure 5 give an overview of the impact of scenario D on selected key indicators in three situations. With a total investment of \$80 million from the FtF initiative in year 1 to 5, some 320,000 farmers may be able to annually fertilise 80 million trees. Assuming that the same farmers will benefit from the fertiliser scheme every year, their number does not change in scenario A2. With a partner funding of \$24 million that is used to provide fertiliser vouchers at 25% of the fertiliser cost, 60 million trees may continue to benefit from the fertiliser scheme from year 6 onwards.

Table 16: Impact of scenarios D1, D2 and D3 on selected key indicators and total costs

Indicators	Scenario D1	Scenario D2	Scenario D3
	5 years impact No partners	10 year impact No partners	10 years impact Funding partners
Total # established new trees	0	0	0
Total # managed trees	80m	80m	80 - 60m
Total # farmers reached	320,000	320,000	320,000 – 240,000
Additional production (60kg bags)			
Annual	0.9 - 0.7m	0.9 - 0.3m	0.9 - 0.5m
Total for period	3.6m	5.3m	6.1m
Additional export value (US\$) ¹			
Annual	112 - 80m	112 - 40m	112 - 60m
Total for period	432m	632m	732m
Total costs (US\$)			
USAID FtF	80m	80m	80m
Funding partners	0	0	24m
Internal Rate of Return (IRR; %)	-	-	-
Net Present Value (NPV; \$)	202m	250m	268m

¹ The additional Robusta export value is calculated using a price of \$2.0 per kg FAQ

² As fertiliser use will directly translate in higher yields that have a higher export value than the value of the vouchers, the net financial balance of this scenario is positive from year 1 onwards and the IRR approaches infinity.

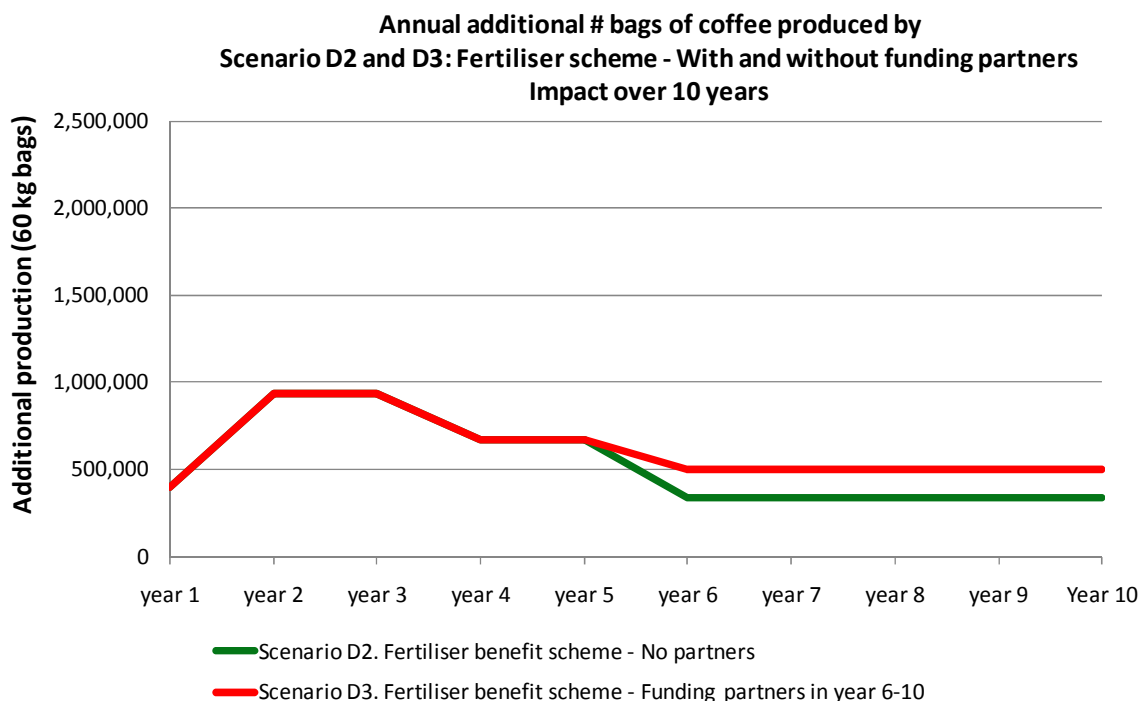


Figure 5: Impact of scenario D2 and D3 on additional coffee produced in a time period of 10 years, with and without additional funding partners from year 5 onwards

In contrast to scenarios A, B and C, the impact of scenario D on coffee production is likely to be largest in the first years of the project (see Figure 5). As a result of the investments, 0.9 million additional bags of Robusta coffee are projected to be produced in year 2 and 3. This represents an additional export value of \$112 million per year. Then, as a result of decreasing voucher values and the assumed associated drop in fertiliser application rates, the annual number of additional bags of Robusta coffee being produced decreases to 0.7 million in year 5 and to 0.3 million in year 10 (scenario D1 and D2). This represents an additional export value of roughly \$80 and \$40 million, respectively. In case of partner funding (scenario D3), the additional coffee production may stabilise at 0.5 million bags per year, or an additional export value of \$60 million per year.

5.3 Evaluation of scenario D

Targeting the FtF funding fully to a fertiliser benefit scheme may result in a quarter of Uganda's coffee farmers being able to experiment with fertiliser use in their coffee gardens and roughly 80 million trees being fertilised, on top of benefitting from an overall better management.

Production gains will be largest in the years that the fertiliser vouchers cover the largest part of the fertiliser cost price and amount to a maximum increase in Robusta production of 45% during year 2 and 3 of the project. Due to the immediate yield increase in response to fertiliser and the resulting additional export having a higher value than the value of the vouchers used, the IRRs for scenario D approach infinity (no negative financial balance in year 1). Consequently, the NPV is extremely positive (> \$200 million) at both the medium (5 years) and the longer term (10 years).

The largest risk of the fertiliser benefit scheme lies in the assumptions that i) farmers will apply all fertilisers obtained with the fertiliser vouchers on their coffee gardens; ii) farmers are willing and financially able to buy fertilisers and iii) there is no corruption around the use of the vouchers. These may be too optimistic

assumptions. To encourage farmers to try out and then continue using fertiliser on their coffee trees, the fertiliser benefit scheme may need to be complemented by a national promotion campaign on fertiliser use and individual farmer trainings on the need to reinvest part of the additional profits into buying fertilisers for next year's crop. To tackle the issue of corruption, the set-up of a fertiliser benefit scheme needs to be carefully designed and take into account lessons learned from past experiences with voucher programmes in Uganda and Africa.

The fertiliser benefit scheme will require an extensive distribution and redemption infrastructure. As no data were available to estimate the administrative costs of such an infrastructure, these costs were not included in the above impact assessment. Inclusion of these costs reduces the number and/or value of the fertiliser vouchers that can be sponsored and thus decreases the additional exports generated by this strategy.

6. Scenario E: Equal mix of strategies a, b, c and d

6.1 Introduction and assumptions

In scenario E, the available FtF funds are equally distributed among the four proposed strategies to increase coffee production (i.e. approximately 25% of the funds going to each of the strategies presented in chapter 2 to 5). The four strategies are implemented using the same assumptions as presented for each individual strategy. We assume, for simplicity's sake, that farmers are benefitting from one strategy only.

6.2 Impact analysis of scenario E

Table 17 and Figures 6 and 7 give an overview of the impact of scenario E on selected key indicators in three situations. With a total investment of \$81 million from the FtF initiative in year 1 to 5, some 579,000 farmers may be reached by one of the four strategies within 5 years and some 68 million trees will be established (i.e. 10 to 25 million trees per year; survival rate of 80%) as a result of the replanting programme. In addition, some 60 million trees will benefit from improved management practices, either through the 339 coffee improvement teams that are created, the up-scaling and out-scaling of 7 PPFs or the fertiliser benefit scheme. Scenario E2 shows that the number of benefitting farmers may increase to 643,000 in year 10 as a result of the assumed 10% annual growth rate of the 7 PPFs after the FtF funding has ended. With a partner funding of \$23 million in year 6-10, the number of benefitting farmers may increase to 743,000 in year 10, an additional 15 million trees may be planted, while an additional 6 million trees benefit from improved management practices.

Table 17: Impact of scenarios E1, E2 and E3 on selected key indicators and total costs

Indicators	Scenario E1 5 years impact No partners	Scenario E2 10 year impact No partners	Scenario E3 10 years impact Funding partners
Total # established new trees	68m	68m	83m
Total # managed trees	60m	62m	68m
Total # farmers reached	579,000	643,000	743,000
Additional production (60kg bags)			
Annual	0.1 - 0.6m	0.1 - 1.4m	0.1 - 1.7m
Total for period	1.7m	7.6m	8.3m
Additional export value (US\$) ¹			
Annual	13 - 70m	13 - 173m	13 - 199m
Total for period	198m	906m	992m
Total costs (US\$)			
USAID / FtF	81m	81m	81m
Funding partners	0	0	23m
Internal Rate of Return (IRR;%) ²	-	-	-
Net Present Value (NPV; \$)	57m	222m	231m

¹ The additional Robusta export value is calculated using a price of \$2.0 per kg FAQ

² As fertiliser use will directly translate in higher yields that have a higher export value than the value of the vouchers, the net financial balance of this scenario is positive from year 1 onwards and the IRR approaches infinity.

Figure 6 shows that in the short term (year 1-3), strategy d (fertiliser benefit scheme) is responsible for 72-92% of the total impact of scenario E on additional coffee production. On the long term, however, strategy

c (multiplication and replanting campaign) contributes the largest part (55%) of the achieved impact, followed by strategy b (PPFOs) with 20% of the total impact.

Scenario E results in an additional annual production of 0.1 million bags in year 1 to 0.6 million bags in year 5 (scenario E1) and 1.4 million bags in year 10 (scenario E2). This represents an annual additional export value of \$13 million in year 1, \$70 million in year 5 and \$173 million in year 10. With the assistance of funding partners in year 6 to 10, the additional annual production may increase to 1.7 million bags or an annual export value of \$199 million.

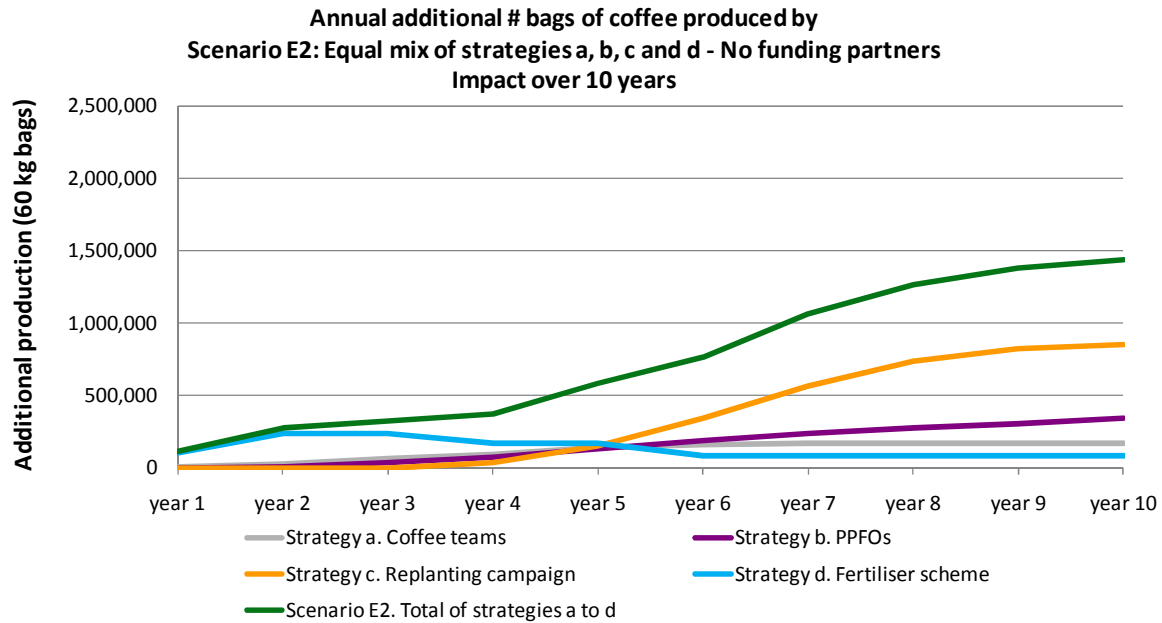


Figure 6: Contribution of the individual four strategies a, b, c and d to the total impact of scenario E2 on additional coffee produced in a time period of 10 years, without additional funding partners

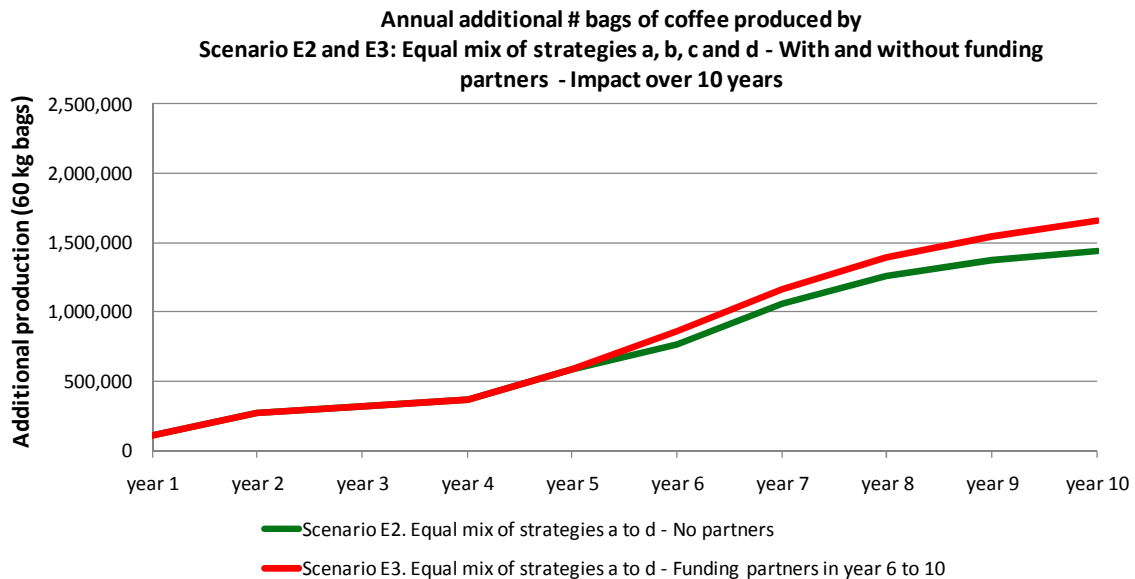


Figure 7: Impact of scenario E2 and E3 on additional coffee produced in a time period of 10 years, with and without additional funding partners from year 5 onwards

6.3 Evaluation of scenario E

Compared to the 2009/10 total Robusta export of 2.0 million bags, scenario E3 increases annual Robusta production by 83% in 10 years time. Due to the immediate yield increase in response to fertiliser and the resulting additional export having a higher value than the annual costs of scenario E in all years, the IRRs for scenario D approach infinity. The NPV is high at the medium term (5 years; > \$50 million) and increases to extremely positive values at the longer term (> \$200 million).

Dividing the FtF funding equally over the four proposed strategies to improve Robusta production may result in about half of Uganda's coffee farmers being reached by one of the four implemented strategies, in case the strategies do not target the same farmers. It will, however, be very likely that the four strategies may be implemented in the same areas and thus target the same farmers. Though this will result in a lower number of farmers being reached by the project, it may result in important positive synergies. For example, the extension services provided by the coffee improvement teams and the PPFO's may improve the management of seedlings being planted under the multiplication and replanting programme and thus increase survival rates and even improve yield levels. And farmers that benefit from the fertiliser scheme may be much more likely to continue using fertilisers on their coffee when they are supported by coffee improvement teams or are part of a PPFO.

To build in more positive synergies between the various strategies, the access to fertiliser vouchers can be linked to the purchase of coffee seedlings for planting and/or to the stumping campaign of the coffee improvement teams; i.e. for every seedling bought or for every tree stumped, a farmer will receive a fertiliser voucher to fertilise one coffee tree. This will create an additional incentive for farmers to buy and plant coffee seedlings and/or stump their gardens.

7. Scenario F: Non-equal mix of strategies a, b, c and d

7.1 Introduction and assumptions

In scenario F, the available FtF funds are unequally distributed among the four proposed strategies to obtain a larger increase in coffee production than under scenario E. Considering that the largest long-term impact on coffee production will be achieved by the multiplication and replanting campaign, more funding (39%) is allocated to this strategy, whereas less funding (12%) is targeted to the fertiliser benefit scheme as this may be the most controversial of the four strategies and contributes relatively little to the increase in coffee production on the longer term. The percentage of funding allocated to the multiplication and replanting campaign is based on the production of 40 million seedlings per year as was suggested to be technically possible in the proposal of Exclusive Uganda for the USAID APEP project in 2007.

The four strategies are implemented using the same assumptions as presented in the previous four chapters. We again assume, for simplicity's sake, that farmers are benefitting from one strategy only.

7.2 Impact analysis of scenario F

Table 18 and Figure 8 and 9 give an overview of the impact of scenario F on selected key indicators in three situations. With a total investment of \$82 million from the FtF initiative in year 1 to 5, some 719,000 farmers may be reached by one of the four strategies within 5 years and some 104 million new trees will be established (i.e. 10 to 40 million trees per year; 80% survival rate) as a result of the replanting programme. In addition, some 50 million trees will benefit from improved management practices, either through the 339 coffee improvement teams that are created, the up-scaling and out-scaling of 7 PPFOs or the fertiliser benefit scheme.

Table 18: Impact of scenarios F1, F2 and F3 on selected key indicators and total costs

Indicators	Scenario F1 5 years impact No partners	Scenario F2 10 year impact No partners	Scenario F3 10 years impact Funding partners
Total # established new trees	104m	104m	136m
Total # managed trees	50m	52m	59m
Total # farmers reached	719,000	783,000	986,000
Additional production (60kg bags)			
Annual	0.1 - 0.6m	0.1 – 1.8m	0.1 – 2.1m
Total for period	1.3m	8.6m	9.3m
Additional export value (US\$) ¹			
Annual	7 - 66m	7 - 222m	7 - 253m
Total for period	150m	1.0b	1.1b
Total costs (US\$)			
USAID / FtF	82m	82m	82m
Funding partners	0	0	24m
Internal Rate of Return (IRR; %)	142	183	183
Net Present Value (NPV; \$)	27m	227m	236m

¹ The additional Robusta export value is calculated using a price of \$2.0 per kg FAQ

Scenario E2 shows that the number of benefitting farmers may increase to 783,000 in year 10 as a result of the assumed 10% annual growth rate of the 7 PFOs after the FtF funding has ended. With a partner funding of \$24 million in year 6-10, the number of benefitting farmers may increase to 986,000 in year 10, 136 million new trees may be established (partner funding allows for 8 million trees to be planted annually from year 6 onwards; 80% survival rate), while a total of 59 million trees may benefit from improved management practices.

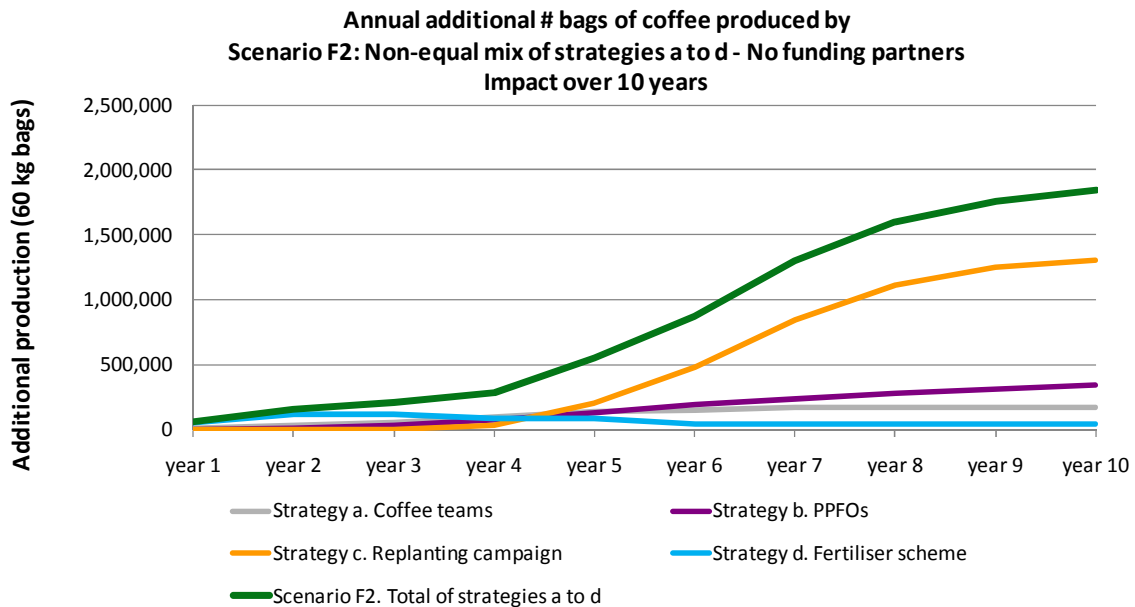


Figure 8: Contribution of the individual four strategies a, b, c and d to the total impact of scenario F2 on additional coffee produced in a time period of 10 years, without additional funding partners

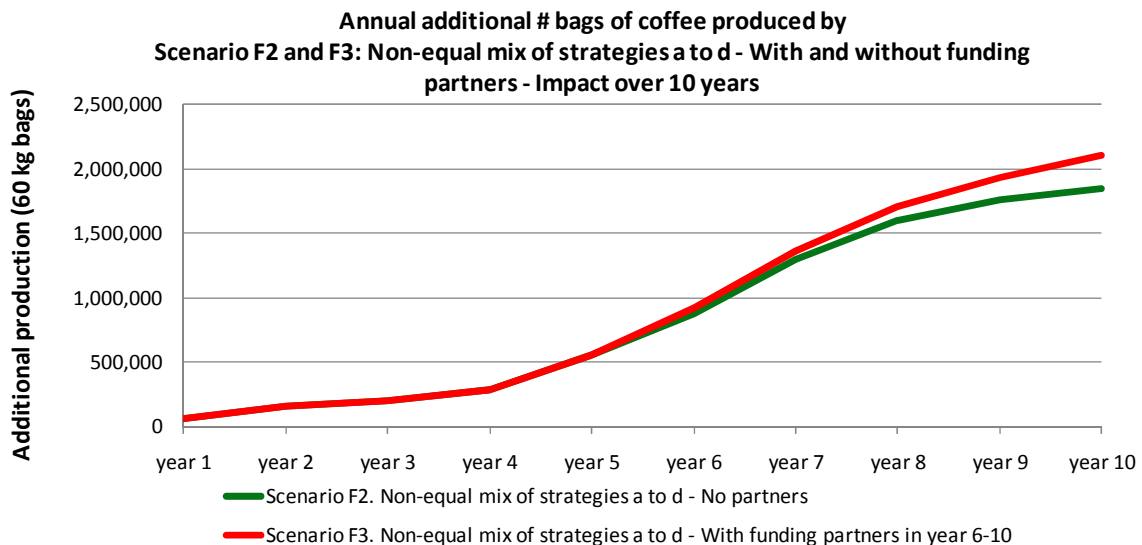


Figure 9: Impact of scenario F2 and F3 on additional coffee produced in a time period of 10 years, with and without additional funding partners from year 5 onwards

Figure 8 shows that on the short term (year 1-3), strategy d (fertiliser benefit scheme) is responsible for 57-86% of the total impact of scenario F on additional coffee production. On the long term, however, strategy

c (multiplication and replanting campaign) contributes the largest part (70%) of the achieved impact, followed by strategy b (PPFOs) with 18% of the total impact.

Scenario F results in an additional annual production of 0.1 million bags in year 1 to 0.6 million bags in year 5 (scenario F1) and 1.8 million bags in year 10 (scenario F2). This represents an annual additional export value of \$7 million in year 1, \$66 million in year 5 and \$222 million in year 10. With the assistance of funding partners in year 6 to 10, the additional annual production may increase to 2.1 million bags or an annual export value of \$253 million.

7.3 Evaluation of scenario F

Compared to the 2009/10 Robusta export of 2.0 million bags, scenario F3 achieves a doubling of Robusta production in Uganda in 10 years time. The IRR is very high (> \$140 million) at both the medium (5 years) and longer term (10 years), whereas the NPV is high (\$27 million) at the medium term (5 years), and increases to extremely high values at the longer term (10 years; > \$225 million).

Allocating a larger proportion of the FtF funding to the multiplication and replanting campaign and a smaller percentage to the fertiliser benefit scheme may result in about 60 to 75% of Uganda's coffee farmers being reached by one of the four implemented strategies, whereby the largest proportion of the farmers is reached by the replanting programme. The analysis assumes that the four strategies do not target the same farmers. Like with scenario E it will, however, be very likely that the four strategies may be implemented in the same areas and thus target the same farmers. Though this will result in a lower number of farmers being reached by the project, it may result in a lot of positive synergies as discussed under scenario E (see 6.3). Additional positive synergies may be built in by linking the access to fertiliser vouchers to buying and planting coffee seedlings and/or stumping coffee trees (see 6.3).

Whether or not scenario F may represent a realistic scenario depends strongly on the efforts given to multiplication and replanting component. The production of 40 million seedlings per year, as proposed under this scenario, may be technically feasible in case sufficient effort is given to upgrade and out-scale the available tissue culture facilities in Uganda (COREC's lab in Kawanda and AGT, a private lab) and weaning and hardening of the plantlets is done by professional players to minimise mortality rates. The biggest snag will be the successful distribution and selling of 10 to 40 million seedlings per year and providing farmers with enough support to minimise mortality rates after transplanting in the field.

The integrated approach of scenario F may be a (partial) answer to this problem. Farmers will likely receive sufficient information to ensure proper transplanting and high survival rates, when seedlings are sold through nurseries of:

- i) existing PPFOs (140,000 farmers);
- ii) the 7 PPFOs that are up-scaled and out-scaled under scenario F (170,000 farmers); and
- iii) other private players that collaborate with the 339 coffee improvement teams that are operational under scenario F (54,000 farmers benefitting directly, many more indirectly through their extension services)

Key to the success of this scenario will be an attitude change amongst farmers so they regard coffee again as one of the most profitable livelihood strategies they have. The CWD epidemic and the very low coffee prices at the turn of the century have discouraged many farmers from producing coffee. In order to encourage farmers to increase on their coffee acreage, they will need to understand the benefits of producing coffee under the current very good market prices and the availability of CWD resistant planting materials. This requires strong extension activities on 'Coffee farming as a business' backed up by a national coffee promotion campaign.

8. Conclusions

Four possible strategies to double Robusta production in Uganda have been identified by the Uganda Coffee Platform. They include:

- a) Coffee improvement teams
- b) Up-scaling and out-scaling of existing PFFOs
- c) Multiplication and replanting programme
- d) Fertiliser benefit scheme

Assuming a total investment of \$80 million over 5 years by USAID / FtF, Café Africa Uganda analysed the impact of these strategies in the form of 6 scenarios. In scenarios A, B, C and D all funds are allocated to one of the four individual strategies. Scenario E equally allocated the funding over the four strategies, whereas scenario F allocates a larger proportion of the funding to the multiplication and replanting campaign (strategy c) and less to the fertiliser benefit scheme (strategy d).

The following conclusions can be drawn from the impact assessment of the six possible scenarios (see also Table 19):

Doubling of Robusta production

- Scenarios A, B, D and E do not result in a doubling of Robusta production within 10 years
- Scenario C (replanting programme) may double Robusta production in 7 years through the establishment of 256 million new trees over a period of 5 years
- Scenario F (all strategies, focus on replanting) may double Robusta production in 10 years with partner funding

Evaluation of scenarios on other indicators

- No coffee seedlings are planted in scenarios a, b and d. In the remaining scenarios, the amount of planted trees ranges from 83 million in scenario E (equal allocation of funds to all strategies) to 336 million in scenario C (replanting programme)
- The number of trees that benefit from improved management ranges from 59 million in scenario F (all strategies, focus on replanting) to 157 million in scenario B (PFFOs)
- The number of farmers directly benefitting from the FtF funding ranges between 278,000 for the coffee improvement teams in scenario A that work very intensively with individual farmers to 1.7 million in scenario C (replanting programme)
- From a financial point of view, all scenarios, except the replanting programme (scenario C), are evaluated positively (NPVs > 0 and IRRs > 20%) within the duration of the FtF investments (5 years). Due to their immediate impact on production as a result of the fertiliser vouchers, and consequently high to very high NPVs and IRRs that approach infinity, scenario D (fertiliser benefit scheme) and E (equal mix of the four strategies) are considered the best investment opportunity. Within a 5 year period, the replanting programme does not have sufficient impact on coffee production to be an interesting investment opportunity.
- At the longer term (10 years), however, all analysed scenarios are considered extremely good investment opportunities from a financial point of view (IRR > 78% and NPV > \$139 million). Scenario D and E are still considered the best value for money, but the replanting campaign and the unequal mix of strategies (scenario C and F) represent very attractive alternatives.

Table 19: Overview of the impact of the six analysed scenarios on 5 main indicators in year 10, and their main weaknesses and strengths, in case FtF funding in year 1-5 is followed by partner funding in year 6-10.

Scenario	Annual additional production (60 kg bags)	Total # new trees established	Total # trees managed	Total # farmers reached	IRR (%)	NPV (million \$)	Main weaknesses	Main strengths
A (coffee teams)	0.8 m	0	70 m	278,000	277	139	Very high number of field workers required	Direct impact on management level in farmer fields; Intensive extension contacts with farmers
B (PPFOs)	1.3 m	0	157 m	628,000	78	141	Unrealistic to expect half of Uganda's coffee farmers wanting to join a PPFO	Proven successful in Uganda; holistic approach; Easy to link in other components
C (replanting programme)	3.6 m	336 m	0	1.7 m	81	310	Completely unrealistic to plant 100 million seedlings per year	Strategy with biggest impact on long-term production
D (fertiliser benefit scheme)	0.5 m	0	80 m	320,000	-	268	Risk of fertilisers not ending up in coffee fields; Fertiliser still too expensive for poor farmers; Corruption; Least sustainable strategy	Strategy with biggest impact on short-term production; Introduces large number of farmers to fertiliser use
E (equal mix)	1.7 m	83 m	68 m	743,00	-	231	-	High likelihood of synergies between strategies
F (unequal mix)	2.1 m	136 m	59 m	986,000	183	236	Planting 40 million seedlings per year is a big challenge	High likelihood of synergies between strategies; Bigger impact than scenario E

Strengths and weaknesses

Table 19 points out the main strengths and weaknesses of the analysed scenarios. Though scenario C shows that the biggest impact on long-term production can be achieved through a replanting programme, it is, however, quite impossible to successfully plant 100 million seedlings per year. Combining the replanting programme with other strategies in scenarios E and F results in more realistic replanting objectives of 10 to 40 million seedlings per year. Nonetheless, such quantities require enormous dedication and concentrated efforts by a range of stakeholders.

The proposed fertiliser benefit scheme (scenario D) is the only strategy that will have a direct impact on Robusta exports. In addition, a quarter of Uganda's coffee farmers will be able to appreciate the benefits of fertiliser use in their own coffee gardens. However, this scenario will likely target only the richer farmers, who can afford to spend money on fertiliser and its impact will reduce over time when farmers no longer have access to the vouchers. The biggest snag of this scenario is the high risk of corruption that is so often undermines voucher programmes.

Scenario A (coffee improvement teams) and B (PPFOs) both have a strong extension component. Due to their presence at parish level, the coffee teams will work hand in hand with farmers to improve their management practices. This, however, requires large amounts of trained field workers. Extension methods used by PPFOs (lead farmers, demo plots, farmer field schools etc.) require less field staff than the coffee teams and farmers also benefit from collective marketing activities and organisational capacity development. Nonetheless, it will be unrealistic to expect that half of Uganda's coffee farmers are ready to join a producer group.

Combining the four strategies into one scenario (E or F) brings together the strengths of each strategy, while reducing on their weaknesses. Both scenarios have an important impact on production and can be considered very good investment opportunities. In addition, they may benefit from synergies created between the various strategies as explained in chapter 6. Considering the larger impact of scenario F on long-term productivity through a strong and realistic replanting strategy and a reduced risk for corruption through a small fertiliser benefit programme compared to scenario E, the National Steering Committee of the Uganda Coffee Platform therefore recommends scenario F to the USAID agriculture team as their vision on how to double Robusta production in Uganda. It realises that the successful implementation of the proposed scenarios depends fully on the commitment of all stakeholders in the Ugandan coffee sector.

9. Acknowledgements

I would like to thank the members of the National Steering Committee of the Uganda Coffee Platform for bringing their wealth of experience and knowledge on coffee farming to the table in order to develop the six scenarios that form the basis of this impact assessment. Special thanks go to Stefan Cognini of the Neumann Foundation for sharing his insight on tree productivity and costing of the proposed scenarios with me. I'm indebted to Rita Laker-Ojak of AT Uganda for her generous offer to proof-read the document and her valuable suggestions for improvements, which include facilitating the economic comparison of the scenarios by using the IRR and NPV as indicators for financial performance.