Service Delivery Model Analysis

Mountain Harvest Ltd., Uganda

Case report

June 2022

Introduction of IDH and the SDM analysis

Importance of Service Delivery

Agriculture, including forestry, plays a key role in the wellbeing of people and planet. 70% of the rural poor rely on the sector for income and employment. Agriculture also contributes to climate change, which threatens the long-term viability of global food supply. To earn adequate livelihoods without contributing to environmental degradation, farmers need access to affordable high-quality goods, services, and technologies.

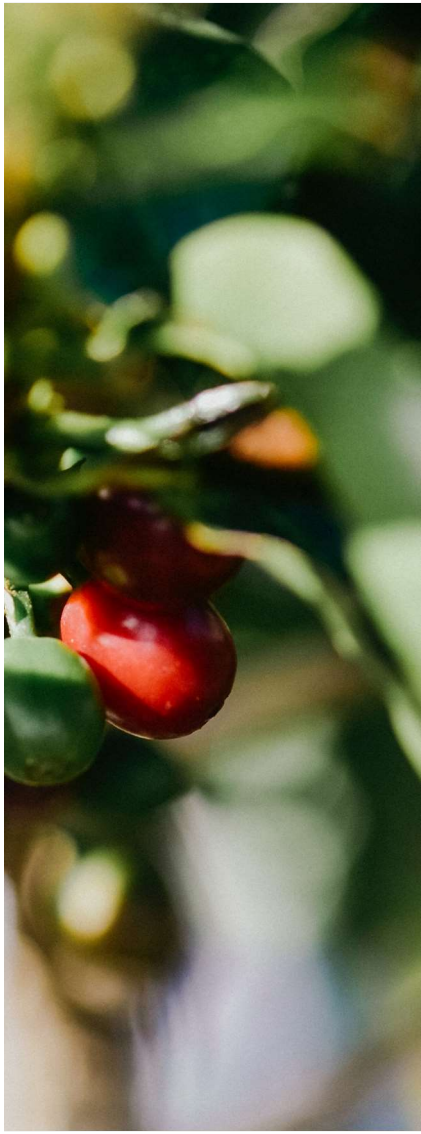
Service Delivery Models (SDMs) are supply chain structures that provide farmers with services such as training, access to inputs, finance, and information. SDMs can sustainably increase the performance of farms while providing a business opportunity for the service provider. Using IDH's data-driven SDM methodology, IDH Farmfit analyzes these models to create a solid understanding of the relation between impact on the farmer and impact on the service provider's business.

Our data and insights enable businesses to formulate new strategies for operating and funding service delivery, making the model more sustainable, less dependent on external funding, and more commercially viable. By further prototyping efficiency improvements in service delivery and gathering aggregate insights across sectors and geographies, IDH Farmfit aims to inform the agricultural sector and catalyze innovations and investment in service delivery that positively impact people, planet, and profit.

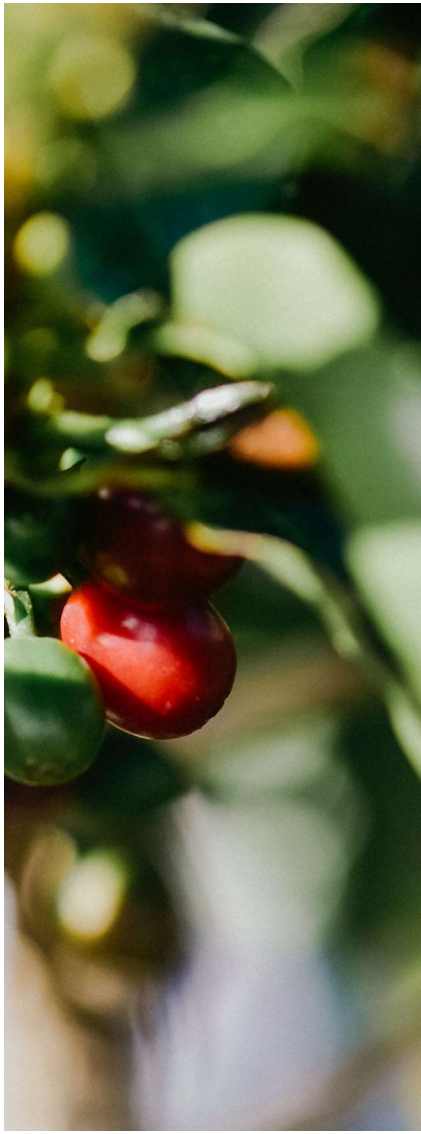
Farmfit Intelligence

The data collected through this SDM analysis is aggregated with other data collected through Farmfit's interventions. The aggregation of these insights enables both the benchmarking of different SDMs and the ability to better identify trends and best practices. Farmfit Intelligence's learning takes place at three different levels:

1. Business- and farm-level: Under what conditions can SDMs and coalitions/partnerships of SDMs be effective, cost-efficient, resilient, and create a sustainable return on investment, at scale?
2. Enabling environment: What are the key barriers in the enabling environment that constrain the functioning of SDMs and smallholder agricultural markets?
3. Market-wide: How can SDMs and interventions improve the inclusivity, sustainability, and commercial viability of smallholder agriculture markets?



Introduction of IDH and the SDM analysis



Coffee Farmer Income Resilience Program (CFIRP)

In 2020, IDH developed new impact pathways to drive the organization's work. They are:

1. Better Income: more income, stable income and equitable income
2. Better Jobs: more remuneration, worker representation and health & safety
3. Better Environment: better water, soil and forest & natural ecosystem

All impact pathways are linked and often complementary. The proposed Coffee Farmer Income Resilience Program (CFIRP) centers around improvement of smallholder income through utilizing regenerative agriculture practices and is therefore aligned with the Better Income and Better Environment pathways. While most programs and projects are not intended to target all three elements within an impact area, the proposed program having regenerative agriculture practices as focal point integrates several elements due to the innovation and opportunity to support farmers in their income diversification efforts.

For Better Income, the CFIRP covers 1) more income through potential income increases, 2) stable income through income smoothing due to diversified income sources with complementary harvest/payment periods, and 3) equitable income through the commitment to improve outcomes for men and women, as well as improved environmental outcomes through regenerative agriculture, targeting soil health and agro-forestry.

For Better Environment , the Coffee Farmer Resilience Programme covers 1) soil health and 2) functional plant diversity. Results for our research in regenerative agriculture have been delayed, and therefore alignment between this impact pathway and regenerative agriculture will commence later in the year.

Thanks

IDH would like to express its sincere thanks to Mountain Harvest Ltd (MH). for their openness and willingness to partner through this study. By providing insight into their model and critical feedback on our approach, Mountain Harvest Ltd is helping to pave the way for service delivery that is beneficial and sustainable for farmers and providers.

Chapter overview

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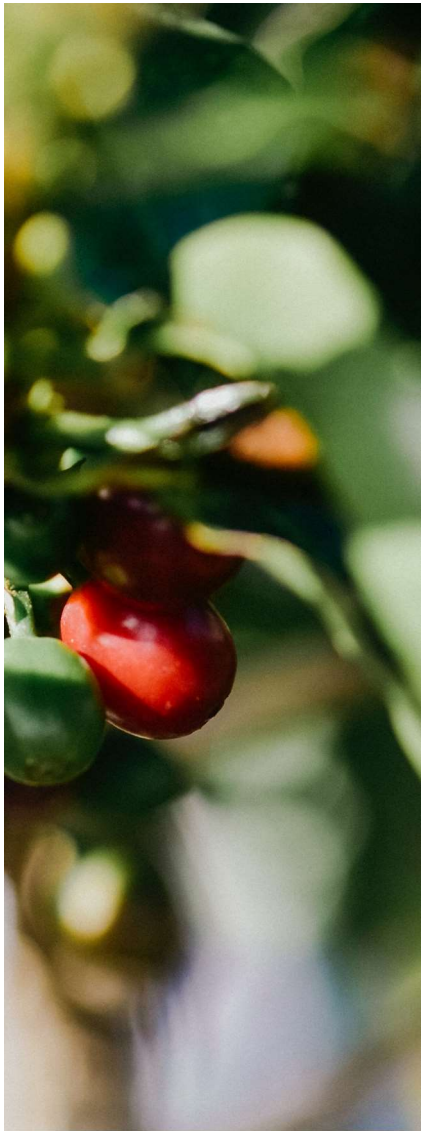
1. Executive Summary	• Situation and purpose of the analysis • Main findings, recommendations and potential next steps	Visit →
2. Scoping	• Strategy of Mountain Harvest Ltd • Scoping and segmentation of studied farmer base	Visit →
3. Recommendations	• Overview of recommendations • Supporting arguments and analyses	Visit →
4. Annex	• Context of the SDM • Strategy and financial performance of Mountain Harvest • Farmer segments' business case • Underlying assumptions	Visit →



1. Executive summary

This section:

- *States the current situation and the purpose of the analysis*
- *Lays out the main findings, recommendations and potential next steps*

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This SDM analysis aims to answer the question: "How can Mountain Harvest support coffee farmers transitions to a regenerative farming system in a commercially viable way, while improving farmers livelihoods? "

Situation

Mountain Harvest (MH) was established in 2017 in response to the collapse of the Gumutindo Cooperative. As a coffee trader and exporter focused on specialty coffee, MH aims to improve the livelihoods of the farmers it sources from. MH works with 800 farmers from six districts on the slopes of Mount Elgon.

Its coffees are Organic. Located in Mbale- Uganda, MH has internalized extensive knowledge on high quality Arabica coffee production and export to speciality markets. MH's mission is to, **"generate an ecosystem based on quality, promoting better terms of trade in the communities, ensuring stable incomes, and generating a positive social and environmental impact",** the strategy to execute the same is centred around:

- Farmer Centric: Farmer s**ervices are based on farmer needs**, inclusive, generate **shared value and increase living income**.
- Environmentally Friendly: MH services are designed to **transition from degradation to regeneration** and promote ecologically sustainable practices.
- Mutually Beneficial: Farmer services **create a business case for the farmer**, are data-driven, and **incorporate services beyond coffee.**

These services include but are not limited to: coffee buying at farm-gate, access to finance, agronomy inputs on credit and certification.

Complication

The smallholder coffee farmers on **Mt Elgon (Uganda)** are often plagued by lower than potential coffee yield, poor farm practices result in lower quality of coffee and hence **low farm income**. Due to the low income, farmers are constrained to invest in improving farm productivity and resort to taking loans from middlemen at high interest rates. Mountain Harvest intends to break this cycle by engaging with the farmers to improve coffee farming and undertake crop diversification to increase farm income and income resilience.

Coffee farmers in Mt Elgon (Uganda) do not reach optimum coffee yields due to the use of **conventional cultivation methods**, cultivation on **degraded soils**, negative effects from **climate change**, and a lack of access to **finance**, **information/knowledge**, and **high-quality inputs**.

Finally, MH aims to **secure and increase its sourcing volume** from farmers it currently directly sources from but is limited in achieving a sustainable level of farmer loyalty.

Solution

The key question therefore is: **"How can Mountain Harvest support farmers transition to a regenerative farming system in a commercially viable way, while improving farmers livelihoods?**

- Continue to provide coffee crop services to farmers that will enable them to reach a higher income from coffee, while adopting sustainable farm practices, which is imperative to continue cultivating coffee in the long-term.
- Strategic crop diversification will not only enhance farmer incomes but also holistically improve farm systems making farm income more resilient.
- Interventions to stimulate the transition towards regenerative agriculture will only be sustainable with adequate investments in increasing the access to finance, diversified markets and data sharing.

Based on the outcomes of the analysis, we have identified recommendations that should be prioritized by the SDM operator and other actors involved

Recommendation	Conclusions
Increase coffee yield quality and access to premium markets	• To increase coffee yield, Mountain Harvest should support farmers: i) restoring soil health and implementing of GAP; ii) deploying professional teams for pruning/harvesting and close supervision of wet-milling operations to produce high quality coffee; and iii) invest in marketing and branding of Mt Elgon coffee in specialty coffee markets • Implementation of regen agri by farmers involves investments, know-how and effort by both MH and farmers. Farmers and MH need to **collaborate closely**, more so in the initial years, to ensure successful adoption of regenerative agriculture practices.
Promote viable regenerative agriculture practices to make farm income resilient	• Strategic crop diversification as part of regen agri would require MH to 1) select diverse crop portfolio that complement one another in an RA system; 2) successful transition to regen agri would enable farmers reach living income and achieve income resilience; and 3) tailor services to women to increase their participation in value-chains while improving their access to farm income. • Our analysis show the farmers implementing regen agri by year-5 can **earn significantly higher total income while** only seg-3 and seg-4 can earn higher than living income of USD7,669 (seg-1&2 farmers have 1.4 acres of land while seg-3&4 has 3.6 acres of total land) • Crop diversification need to be carefully selected to reduce the risks associated with diversifying into new enterprises by farmers
Provide blended services to farmers to support diverse crop portfolio and access to finance	• Transitioning to regen agri will needs MH to i) provide blended services for entire farm portfolio; ii) enable farmers and MH to invest in diverse crops; and iii) provide market access to diverse crops by partnering with other value chain players • The study reveals that farmers need an average of 4 years to implement an regen agri system and 7 to 8 years to fully transform to regen agri system – the cashflow from diverse crops (excluding coffee) is expected to be positive from year-1. The total farm investment required to be made by farmers into diverse crops is not substantial and can be met from the additional income from diverse crop themselves. • Regen Agri can benefit MH by i) increasing and sustaining coffee yield thus supply of coffee ii) high quality of coffee and marketable brand narrative around Mt Elgon coffee iii) providing opportunities for MH to participate in other crop value chains that can **potentially result in additional income to MH**

For these recommendations we have identified the required next steps, potential partners to involve, as well as the need for technical, financial or other support

Recommendation	Actions required to execute this recommendation	Type of actor most strongly positioned for driving the service	Service providers and/or other stakeholders to collaborate with	Support required?	Next step to be taken
High priority					
Soil health restoration Demonstrate to farmers the critical need for soil restoration and chart out a plan to implement the same	1. Test and analyze soil to find the level of soil degradation 2. Establish demo plots to contrast conventional farm and RA farm 3. Explain to farmers the perils of not transitioning to RA	• SDM Operator (MH)	• Soil testing labs • RA experts from academia, individuals or other institutions	Yes, support is required: • Soil testing services • Detailed soil restoration plan	• Reach out to RA experts for making soil testing and restoration action plan
Strategic diversification Select high potential crops and livestock that complement one another in a RA system and design services required to sustain them	1. Macadamia, avocado, rabbits, bees and banana play key role in a RA system and for income potential to farmer 2. Plan timeline of transition and prepare for launch of new services to farmers 3. Identify potential inputs and other service providers	• SDM Operator (MH) • VCP partners – Golden Bees, Pearl Seeds Limited, White Oak Holdings	• IDH program team in helping design new services • Organic and botanical input providers (compost and crop protection) • VCP partners for respective crops	Yes, support is required: • Support in choosing suitable crops and analyzing market potential • TA on finalizing further value chain investments	• Undertake agronomic study of crop choice in a RA system • Experimental demo plots • Detailed implementation roadmap of diversification for a typical farmer
Market access to diverse crops and access to finance Facilitate finance to farmers during initial 3 years can substantially ease the burden on their cashflows	1. Offtake agreements with VCPs and develop necessary infrastructure to handle diverse farm produce 2. Design microloans of right size, tenure and interest rate in collaboration with financial partners	• SDM Operator (MH) • VCP partners – Golden Bees, Pearl Seeds Limited, White Oak Holdings • Opportunity Bank	• VCP partners for off take of the diverse crop produce at competitive rates • Financial institution for access to finance	Yes, support is required: • For designing systems to facilitate aggregation and market access of diverse crops • Tap impact investors for co-funding or guaranteeing farm loans	• Analyse farmers income, cashflow pattern and credit behaviour • Develop a business proposal for collaborating with financial institution

Scoping

This section:

- *Strategy of Mountain Harvest*
- *Scoping and segmentation of studied farmer base*

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MH works closely with farmers in Mt Elgon region to produce high-quality Arabica coffee and further make farm incomes resilient by supporting crop diversification through blended service provision and access to finance

Goals & Aspirations

Aspirations

- *Secured supply* – MH aspires to secure the supply of coffee from small holder farmers, and maintain the current and future need to meet continual operational requirement of the company.
- *Sustainable supply* – MH aspires to increase the sustainability of its sourced coffee to align with its eco-friendly corporate values and customer requirements.
- *High-quality supply*– MH intends to significantly improve the quality of coffee sourced from SHFs and process it at highest standards resulting in speciality status to Mt Elgon coffee.

Where to Play

To secure coffee supply,

- MH organizes farmers into farm groups, maintains year-round relationships with farmers by providing blended services for coffee and diverse crops in their farms and enable them to access banking services and finance.

To secure sustainable supply,

- MH cares for the planet, farmers and great coffee and works to create an innovative ecosystem that prioritizes all three.
- MH supports smallholders to prevent harm to the environment or to re-enforcing the environment by regenerative agri-cultural practices

To secure high quality supply,

- MH believes in elevating coffee to highest standards, through improved production and processing practices.
- MH is committed to paying farmers stable, above-market prices for their coffee.

How to Win

Secure supply

- Providing of inputs on credit, helping farmers get cash loans and other services increases MH's engagement and widens touch points with farmers resulting in high loyalty
- Serve broader needs of farmers by providing blended services and capture business opportunities that go beyond coffee.

Sustainable supply

- Adopting regen agri practices by farmers will reduce usage of agrochemicals, restore soil health and increase coffee farm resilience to climate change and deepens sustainable farm practices
- Crop diversification will improve coffee farmer income resilience.

High quality supply

- Set out to create additional profit centres (such as avocado and macadamia value chains) that will be good for business and better for farmers.
- Deploy MH's and external consultants deep expertise in coffee production and processing activities to produce high quality coffee

Capabilities Required

Critical capacities

- **Knowledge and expertise** on smallholder service provision, especially to sustain productivity and mitigate risks due to degenerative soils and climate change;
- **Network and collaboration** with government (e.g., UCDA) and value chain players (VCPs) to develop market access;
- **Network, pilot experience, and vision** on diversification activities and continuous development to establish and tailor diversified service provision;
- **Knowledge and expertise** on the building of providing blended services that go beyond coffee;
- **Ability to incentivize farmer behavior** to increase both farmer loyalty and adoption.
- **Ability to provide digital and banking solutions** to farmers to increase traceability and sustainability.
- **Ability to model and analyze** the financial and environmental output of (to be) implemented interventions on farm and business level.

Go to Living income expl.→

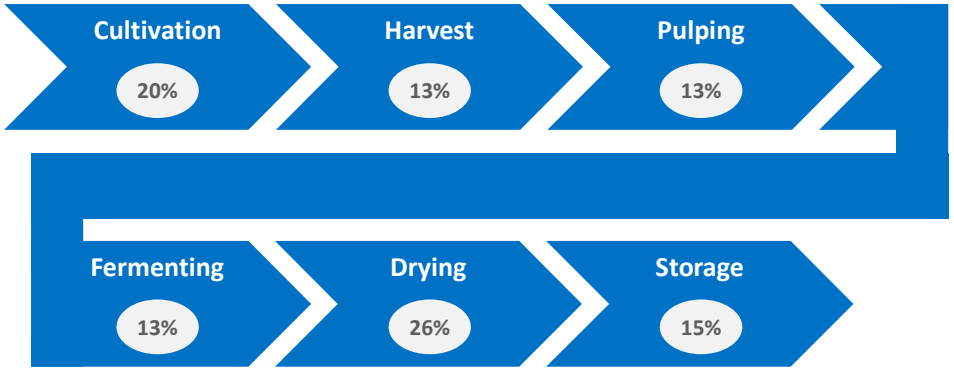
The majority of coffee farmers in Uganda cultivate diversified crops, but lack of land, minimal use of inputs, and limited access to finance cause most farmers to earn just above the poverty line.

Discussion

- In Uganda, it is estimated that **1.8 million households grow coffee** with a proportion of female-headed coffee households of about 40%[6)]
- In Uganda, the **average coffee farm size is 0.44 acres,** representing 20% of the total farm.[11)] **In the Mt Elgon area**, farmers dedicate 55% to coffee and have an **average coffee plot size of 2.1 acres**.[7)]
- Most coffee farmers in Uganda also grow **bananas, beans, rice, maize and cassava for food, however earnings from coffee remain a vital source of cash funds.**[8)]
- In the Mt Elgon region, income from coffee accounts for around 70% of household income of coffee farmers, while the remaining 30% comes from food crop production and non-farm activities. [3)]
- Arabica coffee yield in Uganda is considered low with around 0.5-1kg per tree. Farms typically have a tree density of 660 trees/acre). [3,5)]
- Poor farm-level processing of harvested cherries and improper storage of coffee parchment results in low quality coffee cherries and parchment. [3,5)]
- Ugandan coffee farmers are considered relatively old, but experienced with an average age between 35 and 55. They have a large household with an average of 8 members, 4 of whom are under the age of 18. [7)]
- In the Mt Elgon area, there is one long **coffee harvest from September to February**. Although individual farmer generally monetize their crop in a 4 to 8 week period. [3)]

Farmers can increase quality most by investing in GAP and Drying techniques

% of impact of key coffee processing activities on coffee quality.[2)]



Sources: 1) Global Coffee Platform (2018); 2) Pitch FNC Innovation; 3) Mountain Harvest interview; 4) CGIAR (2019; 5) FAO (2020); 6) ICO (2019); 7) Baseline study CFIRP IDH (2021); 8) Morjaria and Sprott (2018) Ugandan Arabica coffee value chain opportunities; 9) UCDA

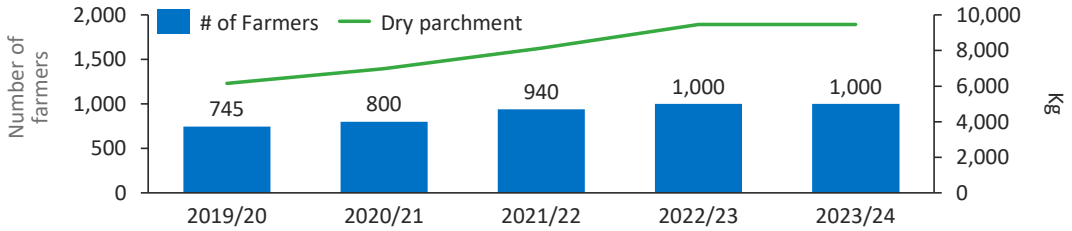
Mountain Harvest works with a select group of farmers on Mt Elgon to ensure good quality Arabica coffee and improving farmer resilience by increasing their household income through coffee and diversification.

Farmer base

- MH prioritizes quality of coffee over the scale of their service delivery model.
- MH currently works with 940 farmers from six districts on the slopes of Mount Elgon in Uganda.
- MH only provides services and directly sources from high-performing farmers who cultivate specialty Arabica coffee:
  - Cupping score of 84 or higher
  - Certified farmers for Organic standard
- MH will support those farmers from whom it is sourcing parchment in improving their practices via training, kits and decentralized processing stations (now Pulp and Go, later Community Washing Stations). [2)]
- For its highest quality coffees MH is buying cherry and processing it themselves. By selling those beans for significantly higher prices, MH can buy cherry at a premium, sharing the increased profit with farmers. [2)]

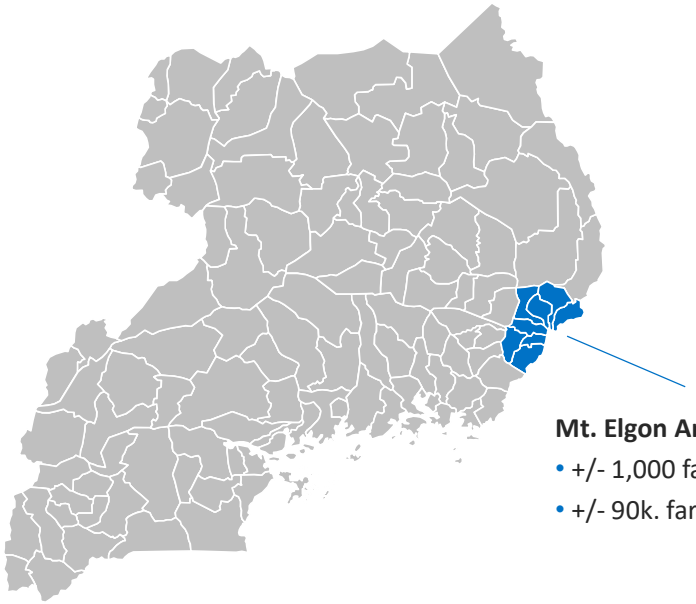
Scale of farmers and sourced volumes

Number of farmers per year and dry parchment per kg per year



Mountain Harvest's business if focused solely in the Mt Elgon region

Scope of SDM analysis with indication of (total) Arabica farmer base.



Mt. Elgon Area

- +/- 1,000 farmers in SDM
- +/- 90k. farmers total [1)]

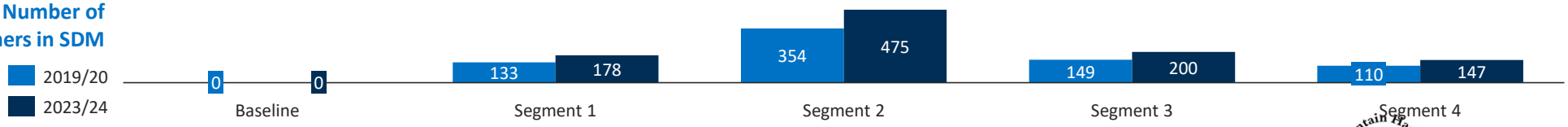
Sources: 1) Morjaria and Sprott (2018) Ugandan Arabica coffee value chain opportunities; 2) Mountain Harvest interviews

The farmers Mountain Harvest works with are segmented into four Segments, who differ in land size, coffee tree density, but have a similar approach to Regenerative Agriculture.

	Baseline	Segment 1	Segment 2	Segment 3	Segment 4
Description	• Farmer is part of the SDM • Does not apply GAP, organic fertilizer or professional pruners or harvesters	• Farmer is part of the SDM • Applies GAP, organic fertilizer or professional pruners or harvesters			
Farm profile	• Coffee: 0.8 or 3.6 acres • Other crops: 0.6 acres • Coffee tree density: 477-1240 trees/acre	• Coffee: 0.8 acres • Other crops: 0.6 acres • Low coffee tree density: 477 trees/acre	• Coffee: 0.8 acres • Other crops: 0.6 acres • High coffee tree density: 1,240 trees/acre	• Coffee: 3.6 acres • Other crops: 0.6 acres • Low coffee tree density: 477 trees/acre	• Coffee: 3.6 acres • Other crops: 0.6 acres • High coffee tree density: 818 trees/acre
RA portfolio	*Beans + Banana*	*Beans + Banana* *Avocado* *Honey + Rabbits*	*Beans + Banana* *Macadamia* *Honey + Rabbits*	*Beans + Banana* *Avocado* *Honey + Rabbits*	*Beans + Banana* *Macadamia* *Honey + Rabbits*
Services	• Market for coffee	• Training (+ Certification) • Organic Fertilizer • Bean seeds • Avocado seedlings • Beehives and rabbits (per farmer group) • Coffee pre-financing • Market for coffee and avocado	• Training (+ Certification) • Organic Fertilizer • Bean seeds • Macadamia seedlings • Beehives and rabbits (per farmer group) • Coffee pre-financing • Market for coffee and macadamia	• Training (+ Certification) • Organic Fertilizer • Bean seeds • Avocado seedlings • Beehives and rabbits (per farmer group) • Coffee pre-financing • Market for coffee and avocado	• Training (+ Certification) • Organic Fertilizer • Bean seeds • Macadamia seedlings • Beehives and rabbits (per farmer group) • Coffee pre-financing • Market for coffee and macadamia

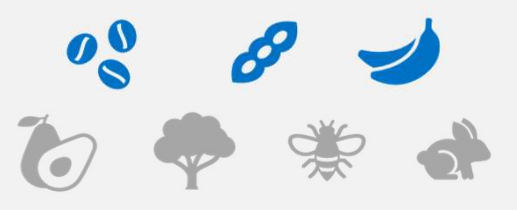
Go to RA Strategy →

Number of farmers in SDM



Depending on coffee tree density and regional suitability, farmers can have fewer banana trees and grow either avocado or macadamia as shade trees. All farmers will support beekeeping and rabbit farming.

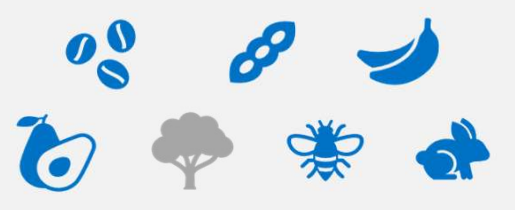
Baseline



Acre characteristics

- Coffee – 477-1240 trees/acre
- Beans – 60 kg seeds /acre (75% of total farm)
- Banana – 150-250 trees/acre

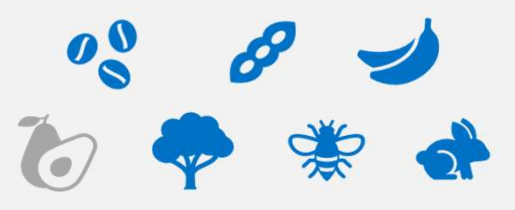
Segment 1 & 3



Acre characteristics

- Coffee – 477 trees/acre (optimal 650 trees/acre)
- Beans – 60 kg seeds /acre (75% of total farm)
- Banana – 250 trees/acre
- Avocado – 20 trees/acre – start production year 2
- Beekeeping – 20 beehives per farmer group
- Rabbits – 30 rabbits per farmer group

Segment 2 & 4



Acre characteristics

- Coffee – 818-1240 trees/acre (optimal 650 trees/acre)
- Beans – 60 kg seeds/acre (75% of total farm)
- Banana – 150 trees/acre
- Macadamia – 20 trees/acre – start production year 4
- Beekeeping – 20 beehives per farmer group
- Rabbits – 30 rabbits per farmer group

3. Recommendations

This section:

- *Contains all the recommendations to improve the business model and overcome challenges*
- *Provides all the supporting arguments to back up the recommendations*

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The core recommendations are backed up by supporting arguments

Go to Pillar 1 →
Go to Pillar 2 →
Go to Pillar 3 →

[Key question] How can Mountain Harvest support farmers transition to a regenerative farming system in a commercially viable way, while improving farmers livelihoods?

[Solution] Mountain Harvest can support a regenerative farming system in a commercially viable way and improve SHFs' livelihoods by ① focusing on coffee quality, ② designing a profitable regenerative agriculture system , and ③ providing blended services (extension, inputs), finance and market access for diversified crops.

By investing in quality coffee production and branding — *Pillar 1*

- **1.A** MH services increase coffee quality (both cherry and parchment) and loyalty
- **1.B** MH benefits from accessing specialty market to realize high prices and farmers profit from higher premium

By designing a profitable regenerative agriculture system for the farmers — *Pillar 2*

- **2.A** MH provides soil testing and organic fertilizer to improve soil health
- **2.B** MH help farmers choose a feasible portfolio of diverse crops

By providing access to blended services (extension, inputs), finance and markets for diversified crops — *Pillar 3*

- **3.A** MH enables access to regenerative agriculture services
- **3.B** MH provides access to finance to farmers to enable farm investment
- **3.C** MH enables access to markets for additional crops

Enabling SHFs to transform to economically sustainable regenerative agriculture approaches

Recommendation 1:
Continue to invest in improving coffee yield and quality, which will be the main driver of farm income increase.

Pillar 1

1.A

Tailor services towards improving coffee yield and quality .

1.B

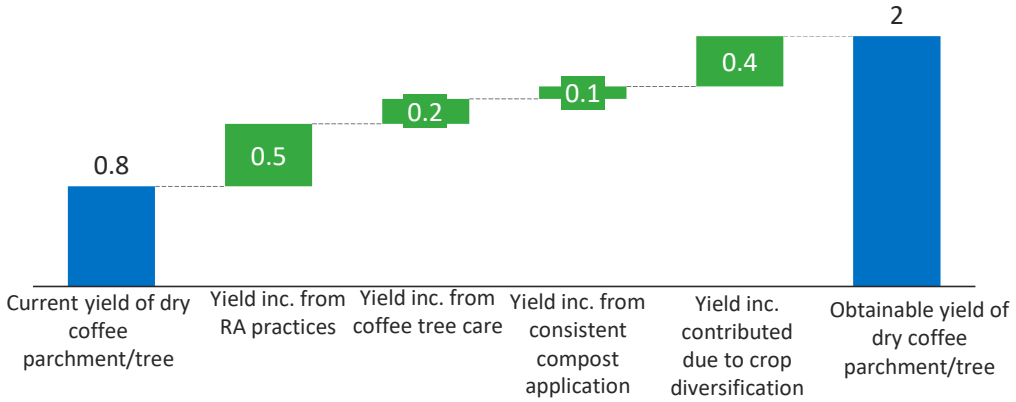
Invest in marketing and branding of Mt Elgon coffee for accessing premium markets

Go to Cherry yield-curve →

Provide coffee farmers service package aimed at improving coffee yield and quality that will sustainably increase coffee yield and consistently improve coffee quality

Coffee yield increase resulting from adopting of Regen Agri practices including of crop diversification

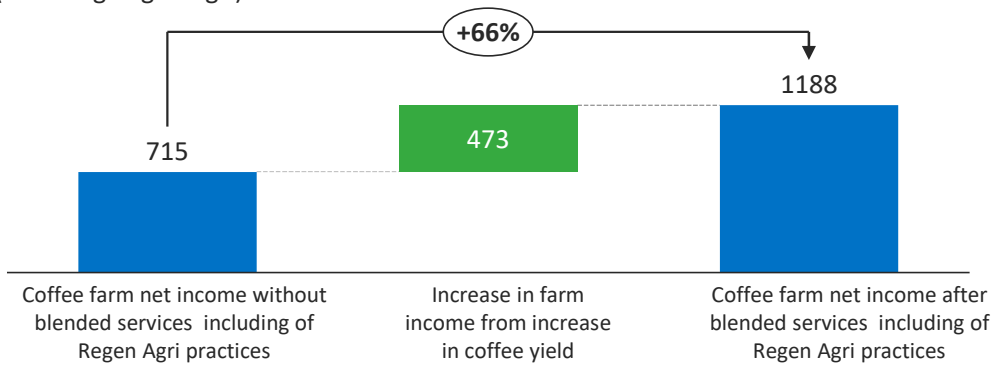
Annual (main + fly) dry parchment yield in kg/tree of full mature coffee-tree



- Current coffee yields in the Mt Elgon region are an average of 0.8 kg of parchment (4kg of cherry) per tree, which is way below potential yields of nearly 3 KG/tree in best managed farms – such low yield is commonly **attributed to soil degradation, lack of GAP, and lack of use of high quality inputs** over the years. Without restoring soil health through a comprehensive program, the soil may continue to degrade.
- Restoring soil health is crucial for improving the coffee yield by making **soils responsive**, which can be achieved by the application of compost, effective microorganism (EM) fertilizers, implementation of GAP and other RA practices such as mixed cropping, planting of shade trees, mulching and maintaining crop cover over the entire farm for the most of the year.

Service package leads to higher coffee yield and quality and consequently increase in farm income

Farm (Seg-1) net income from coffee in year-5 without and with blended services (including Regen Agri) in USD[1)]



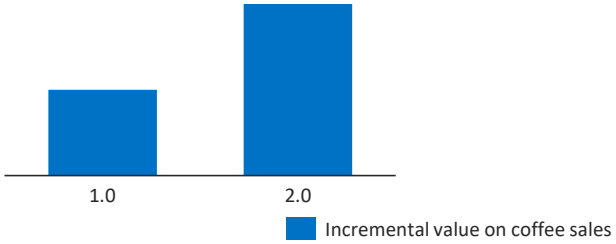
- On a net basis, the farm income of Seg-1 farmer (0.5 acre of coffee) from coffee increases by 66% to USD 1,118 by year-5 due to the adopting of coffee GAP, soil restoration and crop diversification practices (Regen Agri).
- The net income from coffee increases due to the coffee yield increase of nearly 59% per tree (from 0.8kg of dry parchment to 2 KG/tree).
- In current situation, farmers aren't spending much on chemical fertilizers or crop protection and hence to be conservative, we haven't considered reduction in production cost by reducing usage of inputs

Go to RA assumptions →

Invest in marketing and branding of Mt Elgon coffee for accessing premium markets that can significantly improve the profitability of Mountain Harvest and income of coffee farmers

Incremental value created for farmers[1] from cupping scores improvement (USD/year) in year-5

For a volume of 36 containers of green coffee



[1] Assumes a 50% pass through of premium price to farmers

- MH works closely with farmers to improve the quality of cherry by helping farmers adopt GAP practices, deploying professional pruning and harvesting teams and closely supervising wet-milling operations
- On an average, we are assuming the price of coffee increase by $0.5/lb for every one point increase in cupping score. The price premium increases a lot higher than average particularly at higher cupping score ranges. There is no linear and straight correlation between cupping score and price, for sake comparison we are making an approximate estimate of the link between the same.
- In year-5 considering the increase in coffee yield, MH farmers are still left with 36 containers of coffee and if they realize $0.25/lb higher price for a single point increase in cupping score, will result in an additional income for all the farmers in the SDM put together.
- Any increment in coffee prices due to accessing premium markets or from better branding and marketing of Mt Elgon coffee will benefit all the players in the value chain including smallholder farmers and MH
- We recommend MH to link the marketing & brand spend to incremental revenue generated from better branding of Mt Elgon coffee, this will lead to sustaining demand and getting better prices for Mt Elgon coffee in the long-run.

Strategic diversification will enhance farmer incomes and make farm income resilient

Recommendation 2:
Design and implement a regenerative agriculture system which can significantly increase and diversify farmer incomes.

Pillar 2

2.A

Start with soil tests and devise a plan to rejuvenate soil health that will benefit farmer income.

2.B

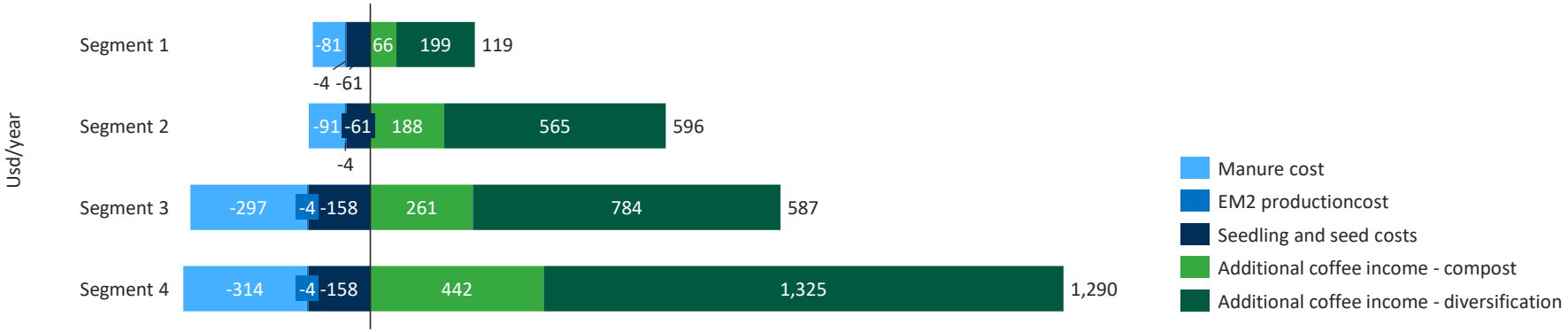
Select a diverse portfolio of crops that can sustain a regenerative agriculture system and a feasible transition plan for farmers.

Go to RA strategy →
Go to RA assumptions →

Investments in regenerative agriculture practices are outweighed by the additional benefits for all farmer segments

Farm-level additionality of Regenerative Agriculture approach

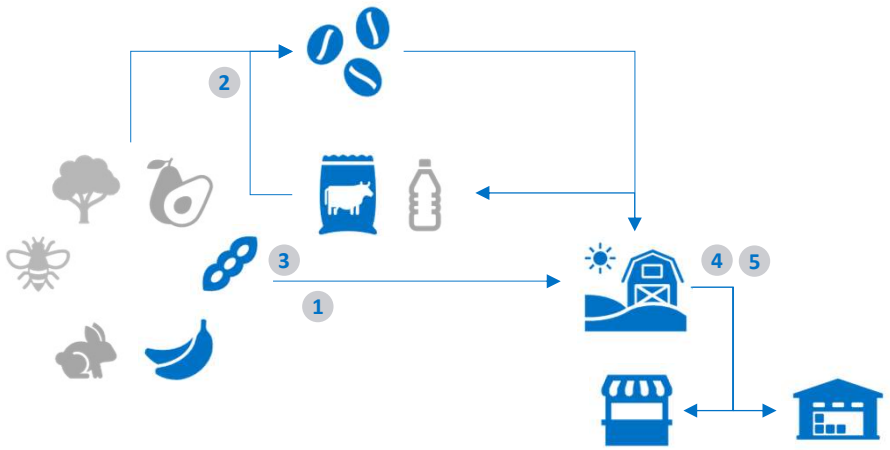
Additional costs and revenues in USD/year per Segment in year 5

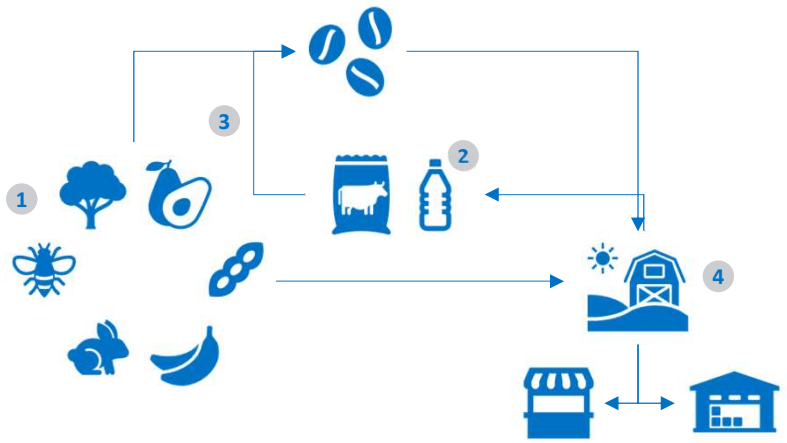


- Farmers use **manure as organic fertilizer** for cultivating coffee, beans, banana, macadamia and avocado as opposed to baseline farmers due to the regenerative agriculture approach practiced by MH. The **costs differ between the segments based on their coffee land size, coffee tree density and coffee yield.** The difference between **costs for seedlings and seeds is based on total farm size**.
- All farmers **produce and apply EM2 at similar dosages, resulting into similar costs.**
- With a regenerative agriculture approach the **farmers are able to increase farm yield per tree with 10% due to compost use and 30% due to diversification** which protects and restores soil health.
- **The overall financial situation for all farmer segments is positive**, however it is important to note that the first year when practices are implemented results in a net loss of 30$, 60$ and 30$ for a Segment 1, Segment 3 and Segment 4 farmer respectively.

2. Recommendations | Recommendation 2.B (1/4): Diversification should achieve farm income growth and resilience

By adding shade trees and micro-organisms the soil can fully regenerate, while by adding bees and rabbits and cash crops, coffee income can be complemented.





Legend
- (Un) performed
- Coffee
- Banana
- Beans
- Bees (honey)
- Avocado / Macadamia
- EM2 micro-organisms
- Fertilizer / Compost
- Rabbits (meat)
- Farm
- (Local) market
- Off taker

Estimated +1,500-8,000 $/year

Current farmer practices [1),2)]

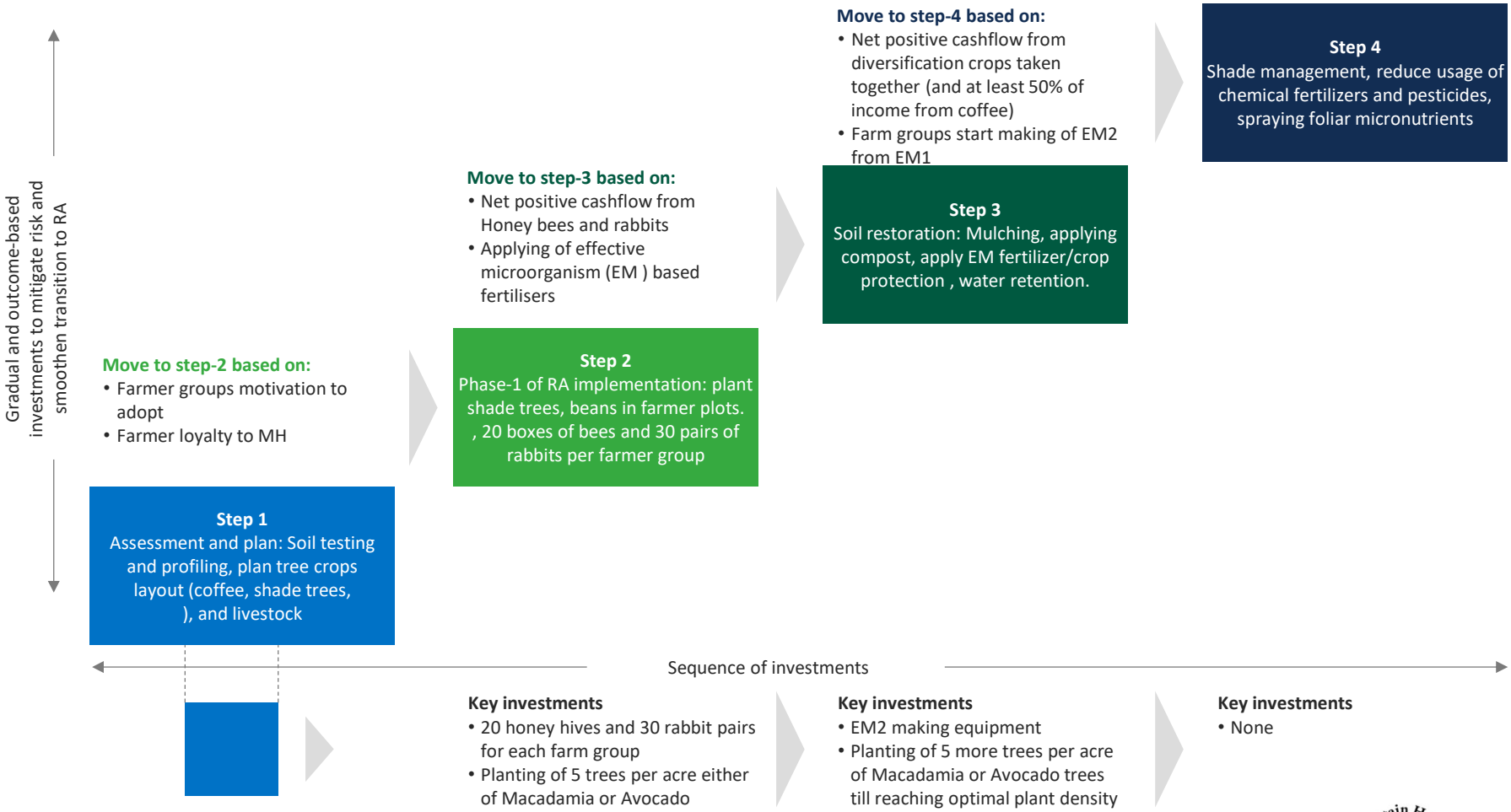
1. Diversified produce from beans and banana are mainly used for household consumption;
2. Residual of the diversified crops is used as mulch, is mixed with manure to produce organic compost to stimulate coffee trees' production;
3. No crop protection is used, instead Beans are used as cover crops to reduce the growth of weeds;
4. Most of coffee and diversified produce is sold at local markets and to aggregators or used for household consumption;
5. Limited to no return of energy to the soil or to protect, feed, and fertilize farmer activities (coffee and diversified crop).

Regenerative farmer practices

1. Farmers diversify their activities with the cultivation of avocado or macadamia trees, banana and beans. Bees and rabbits are kept at the farmer group level. Macadamia, avocado, rabbits and bees have the highest potential to drive farmer income in that order
2. On top of using manure and plant rests as mulch, farmers buy or produce micro-organisms to activate soil life and improve fertilizer response;
3. Avocado/Macadamia trees are used as shade trees, cultivated in boundaries between acres or amongst the coffee trees to reduce the spread of diseases.
4. Produce from diversified activities is used for household consumption, to diversify income, to dampen cash flow volatility, and to increase income resilience against e.g. climate extremes.

Sources: 1) Kilimo Trust (2020) Farmer Research & Market Systems Analysis Research; 2) Mountain Harvest interviews

A clear phase-wise implementation road map for farmers, which is linked to expected outcomes from previous phases helps mitigate risk for farmers

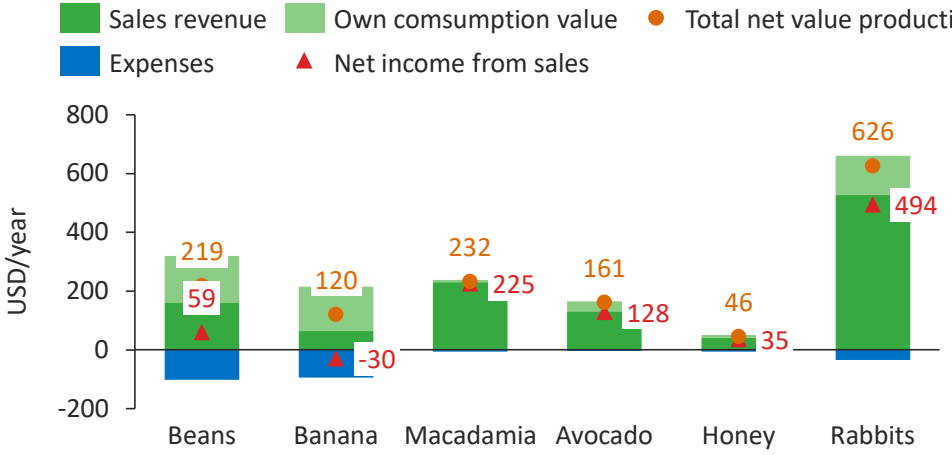


Go to Farmer assumptions →
Go to tree assumptions →

Diversification is likely to generate a significant increase in farmer income. Therefore the combination of crops, which is based on agronomic conditions, input and market access, needs to be considered carefully.

Comparing additional net income from diversification activities

Year 10 net income from sales, own consumption value and total net value production in USD/year



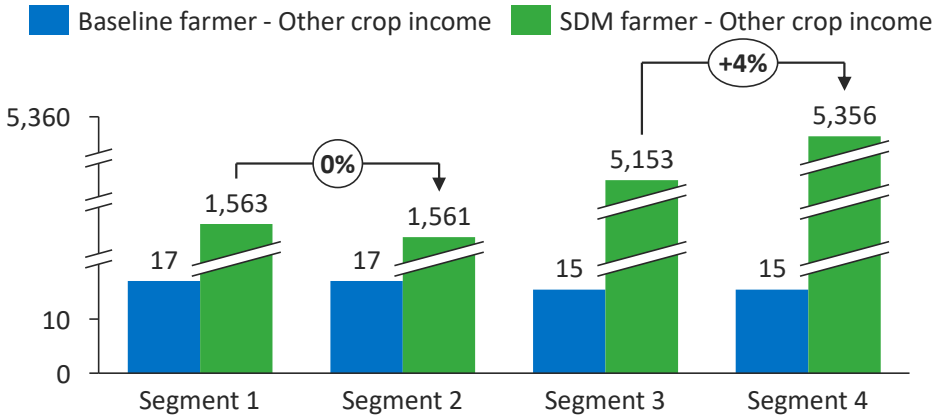
Unit of analysis	1 acre	1 acre	1 tree	1 tree	1 beehive	1 pair of rabbits[1]

- Beans are a better investment compared to banana, as it generates a higher income from sales and produces a higher own consumption value.
- Of the shade trees macadamia and avocado, the former appears to be most profitable for the farmer as diversified income stream. Rearing rabbits appears to be more lucrative than maintaining a beehive.

1) For each pair of parent rabbits initially provided to a farm group and not for a pair of rabbits sold

Diversification of farming activities outweighs initial other crop income

Average 10-year net-income from non-coffee farm related activities in USD/year

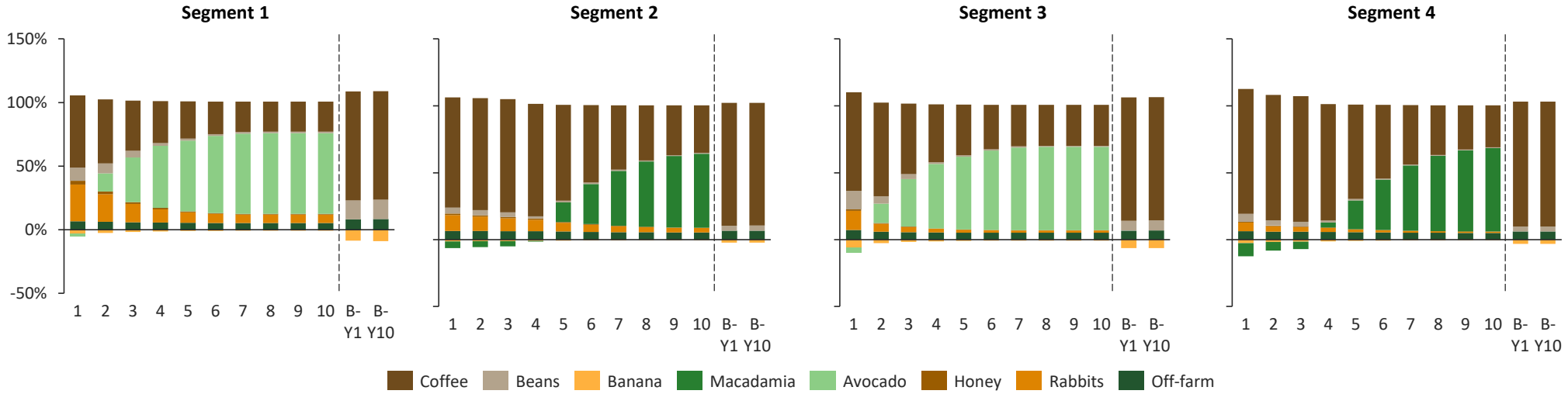


- The diversification approach by MH generates a very significant increase in income from non-coffee farm related activities for all segment farmers.
- Segment 4, who plants macadamia as shade trees instead of avocado trees, can generate 4% more income than Segment 3. While for the farmers with smaller land sizes (and thus fewer additional shade trees) the differences between planting avocado or macadamia appears insignificant on a 10-year average as macadamia trees only become productive at year 4.

By performing RA, farmers will become more financial resilient to shocks, due to a more diversified income portfolio.

Income distribution from farming activities

Distribution of net income in 1st, 5th and 10th year of Segment in %/year compared to Baseline year 1 and 10



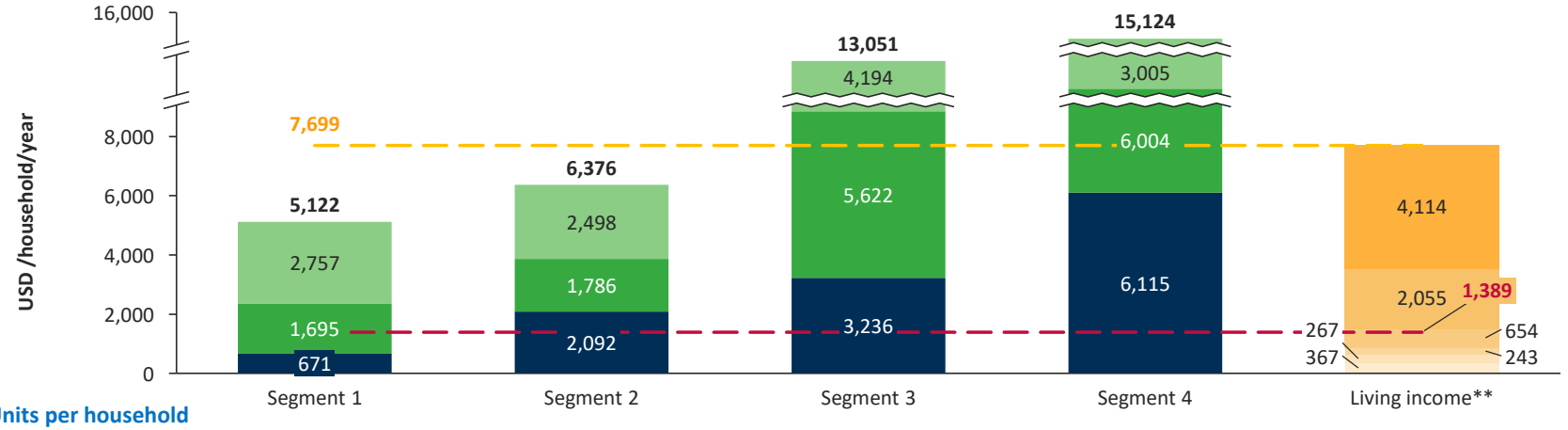
- Compared to the Baseline, who are currently already growing beans and banana, all SDM segments are able to diversify their income even more with other activities.
- SDM farmers decreased reliance on a single crop as a source of income, makes them more resilient to climate change and climate shock that can lead to unforeseen crop losses.
- Segment 1 and 3 have a larger relative income from diversified activities than from coffee, compared to Segment 2 and 4 as 1) avocado production starts earlier in time compared to macadamia and 2) their absolute coffee net income is lower due to differences in coffee yield and tree density.

Go to Living income expl.→

All farmers who enter the SDM can earn more than the poverty line, although Segment 1 farmers remain reliant on diversified income. Farmers with larger farms are able to close the gap to a living income.

Comparing household income, living income benchmark and poverty line

Shown for each farmer segment, in USD/household/year based on 10-year average



Units per household	Segment 1	Segment 2	Segment 3	Segment 4
Coffee	0.8 acre	0.8 acre	3 acres	3 acres
Coffee tree density	650 trees/acre	1,240 trees/acre	650 trees/acre	818 trees/acre
Beans (intercropped)	0.7 acre	0.7 acre	1.8 acre	1.8 acre
Banana (intercropped)	0.8 acre	0.8 acre	3 acres	3 acres
Macadamia (shade tree)	n/a	4 -> 16 trees	n/a	15 -> 60 trees
Avocado (shade tree	4 -> 16 trees	n/a	15 -> 60 trees	n/a
Honey	20 beehives per farmer group	20 beehives per farmer group	20 beehives per farmer group	20 beehives per farmer group
Rabbits	30 rabbits per farmer group	30 rabbits per farmer group	30 rabbits per farmer group	30 rabbits per farmer group

Own consumption value
Other income
Coffee income
Poverty line*
Living Income**
Food
Housing
Transport
Healthcare
Education
Other

Impact on farmer incomes

- All SDM farmer segments accessing this service offering will be able to earn more than the poverty line of $1,389, and segments 2, 3 and 4 are able to earn more than the poverty line from coffee alone.
- SDM farmers in segments 3 and 4 are able to earn more than a living income of $7,699 with the diversification of their household income.
- Differences in coffee density and diversification approach impact the profitability of the farmers as can be observed between segments 1 and 2 and between 3 and 4. The final combination of the diversification portfolio lies with MH as agronomic and access to market play a key role.

**The Worldbank poverty line was adjusted to a household of 7 members and a PPP conversion factor of 947UGX per $.*
***The living income benchmark is based on the family composition of 2 adults and 5.7 children with 1.7 FTE. The data was based on the living wage for a standard family from Wage indicator (2019) and corrected for inflation.*

The gap to a living income for the Segment 1 farmers could be closed further if farmers would transition all their land to coffee cultivation and simultaneously achieve the max yield of 2kg of parchment per tree

The **net income of a SDM farmer including own consumption value** amounts to **$3,148** in the **first year of the SDM**. The table below shows the feasible improvements for each of the income drivers* to increase this income towards the level of the living income benchmark. This benchmark is **$7,699**, so **an income increase of 59% is required.**

	Baseline assumption	Max obtainable assumption	Corresponding income	Remaining LI gap	Effectiveness	Feasibility	Comment / explanation
Farm size (Acre)	0.8	**1.4** (*+75%*)	$ 719 (*-1%*)	59%	High	Low	SDM farmers own on average 1.4 acre of farmland, so they could convert this into coffee cultivation. However, this means they would not have the additional income of diversification and would be worse off.
Yield (kg dry/tree)	1.26	**2** (*+59%*)	$ 974 (*+33%*)	56%	High	High	Through GAP training and adoption of Regenerative agriculture practices, the farmers can significantly increase their yield per tree (see slide 18).
Price ($/kg dry)	2.08	2.08 (-)	$ 730 (-)	59%	Low	Low	Farmers are already assumed to be applying GAP and achieving high cupping scores linked with high prices.
CoP ($/kg dry)	1.22	1.22 (-)	$ 730 (-)	59%	Low	Low	Coffee farming is a labor-intensive crop and there are currently no practical implementations to further reduce labor cost without impacting yield and quality.
Other income ($/year)	319	319 (-)	$ 730 (-)	59%	Low	Low	SDM farmers already implement a wide range of additional activities, there are no plans to extend this further currently

When the feasible improved values for Farm size and Yield, can be obtained simultaneously, and therefore other income from diversification reduces to 0$, the farmers could reach an income of $1,146. Generating an income increase of 57% and resulting in a remaining living income gap of 54%. It is important to note however, this does not take in account the necessary upfront investment cost for farmers to expand their coffee farm.

** The different income drivers influence the family income through the following simplified formula:* $Total\ household\ income = Farm\ size \times Yield \times Price - Cost\ of\ production + Other\ income$

Segment 2 farmers could earn a living income if coffee prices would increase with 35% and yield increases with 45%, while Segment 1 farmers would remain well below the living income benchmark

Sensitivity analysis on net income from Segment 1 and 2 in Year 10

Current net income and living income benchmark in USD/year

Segment 1

Farm-gate price (USD/kg dry)

Productivity (kg/tree)	1.82	**2.14**	2.46	2.78	3.10	3.42	3.74
1.4	2,775	2,919	3,063	3,206	3,350	3,494	**3,638**
1.6	2,859	3,024	3,188	3,352	3,516	3,681	**3,845**
1.8	2,943	3,128	3,313	3,498	3,683	3,868	**4,052**
2.0	3,028	**3,233**	3,438	3,644	3,849	4,054	**4,260**
2.2	3,112	3,338	3,564	3,789	4,015	4,241	**4,467**
2.4	3,196	3,442	3,689	3,935	4,182	4,428	**4,674**
2.6	3,297	3,568	3,839	4,110	4,381	4,652	**4,923**

Segment 2

Farm-gate price (USD/kg dry)

Productivity (kg/tree)	1.82	**2.14**	2.46	2.78	3.10	3.42	3.74
1.4	5,326	5,700	6,073	6,447	6,821	7,194	**7,568**
1.6	5,545	5,972	6,399	6,826	7,253	7,680	**8,107**
1.8	5,763	6,244	6,724	7,205	7,685	8,166	**8,646**
2.0	5,982	**6,516**	7,050	7,584	8,117	8,651	**9,185**
2.2	6,201	6,788	7,375	7,963	8,550	9,137	**9,724**
2.4	6,420	7,060	7,701	8,341	8,982	9,623	10,263
2.6	6,638	7,332	8,026	8,720	9,414	10,108	10,802

Legend

Current net income | Living income benchmark

- Shown in the figures above, the Segment 1 farmer would even with a further price increase of 75% (potentially due to global price increases or obtaining higher cupping scores) not be able to earn a living income of $7,699 with a yield between 1.4 and 2.6 kg/tree.
- In situation of negative weather events, the prevalence of pests or diseases , causing major coffee crop loss, it is shown that the Segment 1 farmer would continue to earn above the poverty line of $1,389 but remains very vulnerable.
- If Segment 2 farmers are able to capture higher farm-gate prices due to improved quality (for example 2.07USD per kg dry) and to further improve their yield to even above the goal of 2kg/tree (for example to 2.2), then they would be able to earn a living income higher than the living income benchmark of $7,699 per household.

Improve the infrastructure by increasing access to finance, diversified markets, and data sharing

Recommendation 3:
Provide blended services including access to finance and market linkages for diverse crops in farmers portfolio.

Pillar 3

3.A

Provide set of services for soil restoration towards supporting the regenerative agriculture system

3.B

Enable farmers to invest in crop diversification during transition to Regen Agri

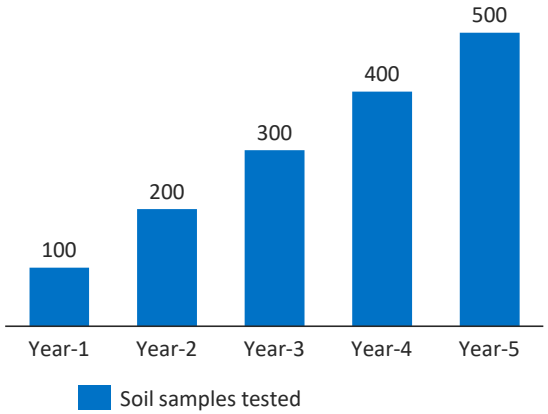
3.C

Facilitate market access or linkages for diverse crops in farm portfolio

Provide a set of services for soil restoration during transition to the regenerative agriculture system will enable farmers to fully adhere to regen agri practices

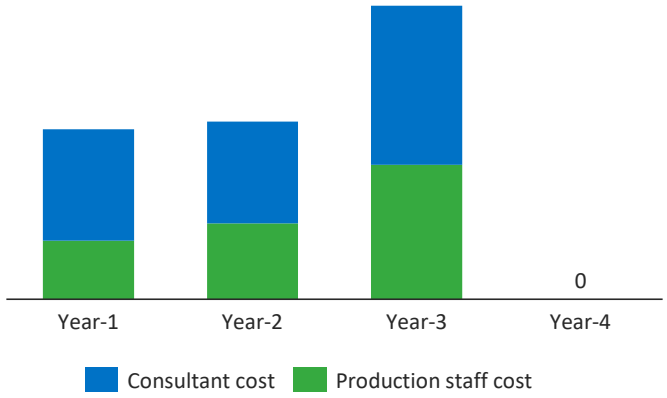
MH will continue to increase the number of soil samples tested per year

Number of soil samples tested per year



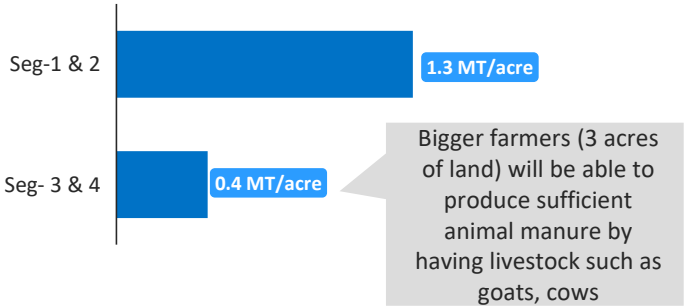
MH intends to supply EM2 fertilizer of targeted variety to farmers by investing sufficient resources in its production

USD/year



Livestock manure (Rabbit) available per farmer for different farm segments

Produced and applied organic manure in Mt/year per Segment



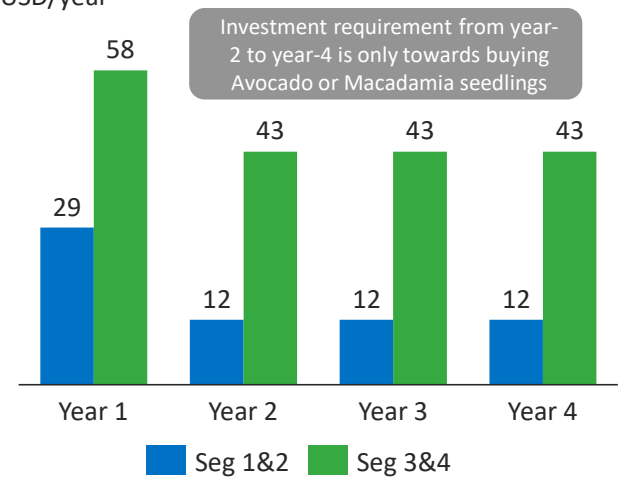
- Restoring soil health is a critical need in a regenerative agriculture system. MH plans to implement a comprehensive set of services towards restoring soil health starting from testing of soil samples, providing effective microorganism (EM2) based fertilizers for 3 years (after which farmers will be trained to make EM2 by themselves) and training farmers in organic compost manure making process
- MH will hire expert consultant and full time staff for production of EM2 fertilizer and training the farmers in EM2 production

- Rabbit manure is rich in nitrogen, phosphorus and other nutrients. The **NPK nutrient density in rabbit manure is much higher** compared to any other animal based manure. Once applied on the soil, rabbit manure is available for ready absorption and great helps in increasing soil organic matter and balancing the soil ph levels.
- Each farmer group of 35 farmers having 250 rabbits in total can produce a total of 37MT of manure i.e. about 1.1 per farmer. For seg-1&2 farmers with 0.8 acre of coffee farm, the applied manure works out to be 1.3MT/acre
- However, for seg-3&4 farmers due to their large farm size (3 acres) the availability of rabbit manure is only 0.4MT/acre in the current plan. To increase the manure application quantity per acre of land, we recommend large farmers to complement rabbit manure with other livestock manure such as goats, cows in their farms

Investments required for crop diversification are not high, therefore farmers with MH help can invest in crop diversification by accessing microloans

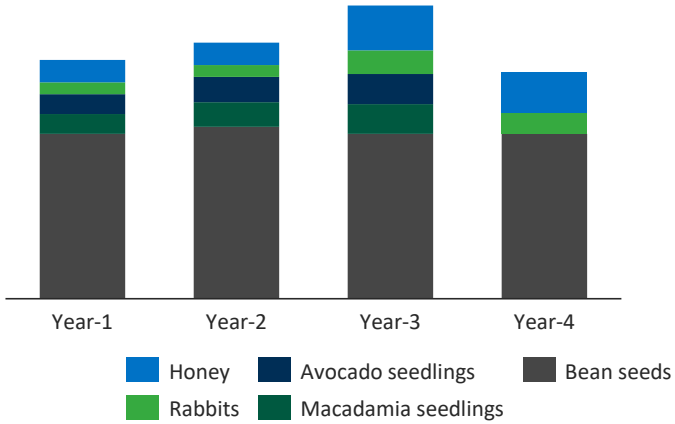
Investment required by farmers towards diversification

USD/year



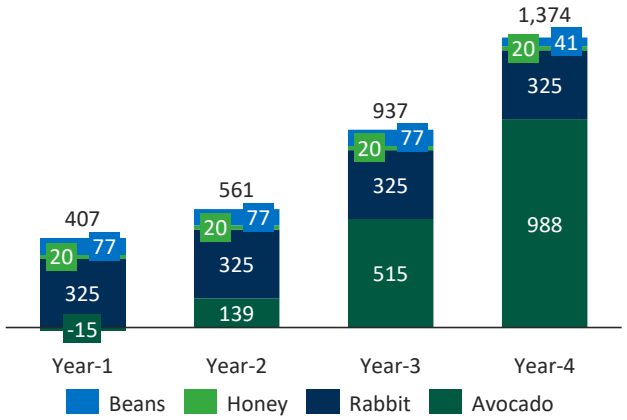
MH spend for supporting crop diversification

Spend for diversification in USD/year.



Segment-1 farmer income from diverse crops

Farmers will be net cashflow positive from year-1 (USD)



- Farmers incur expenses on purchasing of equipment for honey hives and rabbit sheds during 1st year and purchase of 5 seedlings per year of avocado or macadamia over a period of 4 years
- The cumulative spend for 4 years (other than for labor) for seg1&2 and seg-3&4 farmers is $65 and $187, respectively. In the current crop diversification plan there is no requirement for capital intensive investments by both farmers and MH

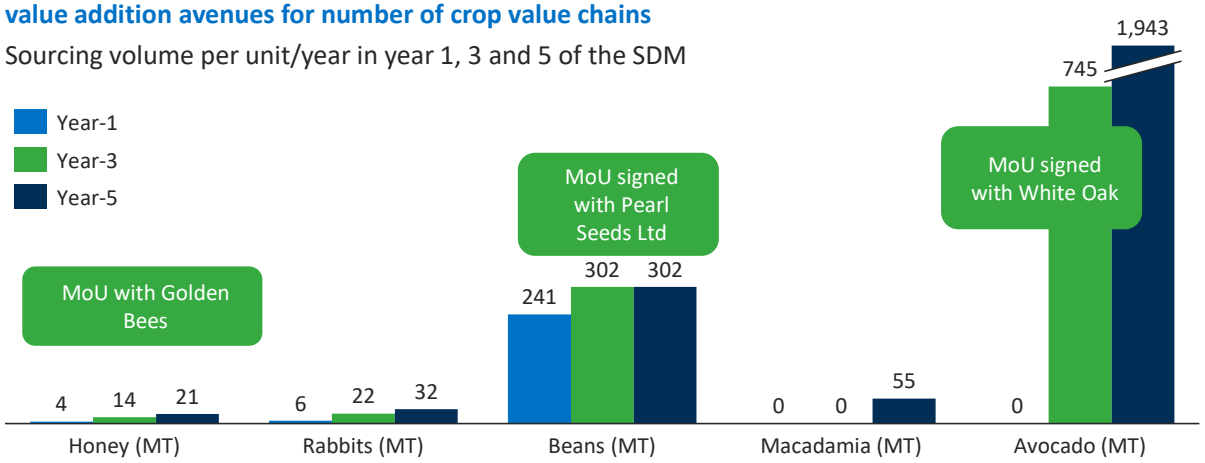
- Unless MH providing subsidy on beans seeds is critical for farmer loyalty, MH can considering doing away or reducing the subsidy on beans seeds
- From the diversified crop portfolio of farmers 3 out 4 crops viz beans, honey and rabbit rearing are profitable/cash-flow positive from year-1 itself. Only tree crops of Avocado and Macadamia will start producing from year 2 or 3 onwards
- For a seg-1 farmer with a total land holding of 1.4 acres, the income from diversified crops is estimated at $13,74 in year-4. The majority of the income if expected to come from tree crop of Avocado (Macadamia for seg-2 and seg-4)
- In the long run, to sustain and increase the farm income from diversified crops, it is critical for tree crops to yield according to expectation with reliable access to market

Go to SDM assumptions →

Mountain harvest can facilitate access to markets for diversified crops

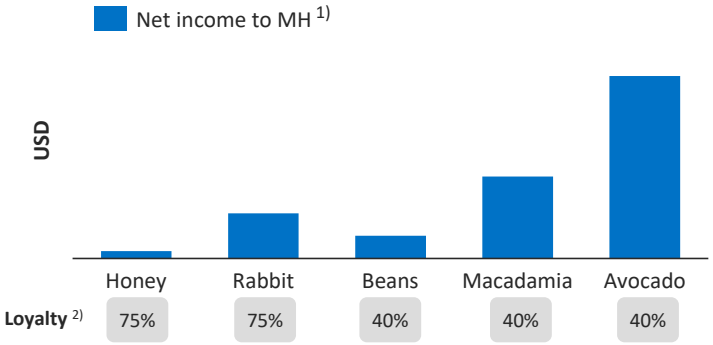
A diversified crop portfolio of a RA adopted farmer enables MH and other VCPs to collaborate on value addition avenues for number of crop value chains

Sourcing volume per unit/year in year 1, 3 and 5 of the SDM



Macadamia value chain has the highest income potential to MH among the diverse farm crop portfolio

Sourcing volume per unit/year in year 5 of the SDM



- **Honey and Rabbits**: Mountain Harvest has signed MoU with Golden Bees for developing the honey value chains. In addition to the direct income potential of beekeeping, bees in the farm increase pollination of crops on the farm and hence the yield**.** The rabbit meat market in Uganda although in its infancy, is growing at a fast pace due to developing of the market by various start ups. However, there is a risk on rabbit market not sustaining the growth. Honey and rabbits are undertaken at farm group level and without much investment from farmers.
- **Beans**: Beans has been grown traditionally by farmers as a diverse food crop for their own consumption and for nitrogen fixing in the soil. MH has signed an MoU with Pearl Seeds Ltd for beans value chain. MH provides improved seed variety to farmers at a subsidised rate.
- **Macadamia**: Among all the diverse crops in farm portfolio, macadamia is the most high value commodity pound for pound. In one of the research studies conducted in Brazil[3], it was found that coffee and macadamia trees are a perfect combination in a farm, resulting in increasing coffee yield and a survival strategy for climate change.
- **Avocado**: MH has signed an MoU with White Oak Holding Ltd for developing Avocado value chain. MH intends to develop Hass avocado variety that is known to have high demand in export markets. UCDA recommends avocado trees to be planted along the boundaries of the coffee farm and not as primary shade tree in midst of coffee trees.

1) At a net income margin of 10% of farm-gate price. Margins can vary and depends on number of factors 2) % of marketable surplus sold or traded through Mountain Harvest or VCP
3) Coffee and Macadamia

4. Annex

This section includes the following subchapters:

- *4.1 About Arabica Coffee in Uganda*
- *4.2 About Mountain Harvest*
- *4.3 About the farmers*

Back to Chapter overview →

4.1 About the context

Understanding the context of the SDM

This section:

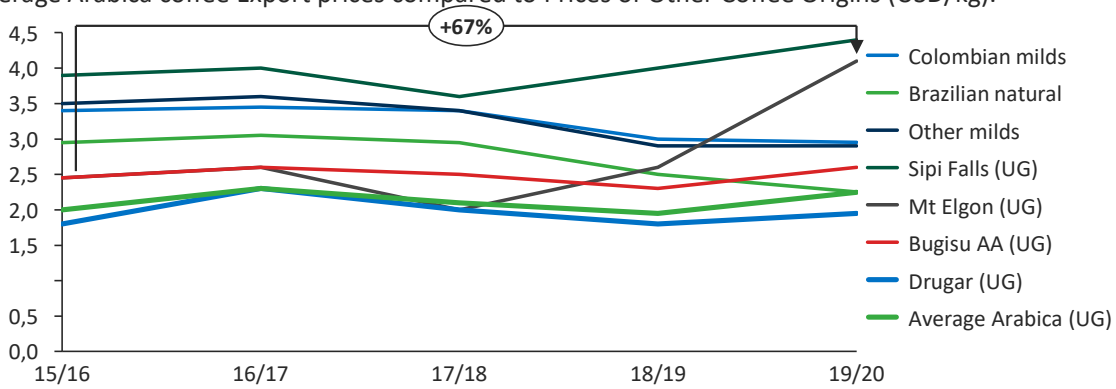
- *Describes the Arabica Coffee market and value chain in Uganda*
- *Analyses the enabling environment and key sustainability risks*

Back to Chapter overview →

Global Arabica prices are rising due to weather concerns in Brazil, but the increasing demand for sustainable coffee generates a clear push in Mt Elgon coffee prices.

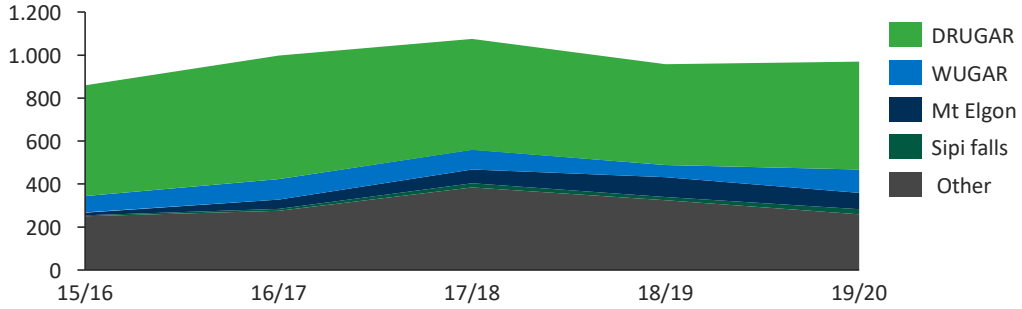
In five years time, Mt Elgon Arabica export prices have increased significantly reflecting an increasing demand for sustainable coffees

Average Arabica coffee Export prices compared to Prices of Other Coffee Origins (USD/kg).[6)]



The growing export volume of Arabica exists predominantly of DRUGAR coffee beans, but the share of sustainable coffee is growing

Arabica coffee export in 60kg-bags by type between 2015/16 and 2019/20 (1,000 60-kg bags).[6)]



Discussion

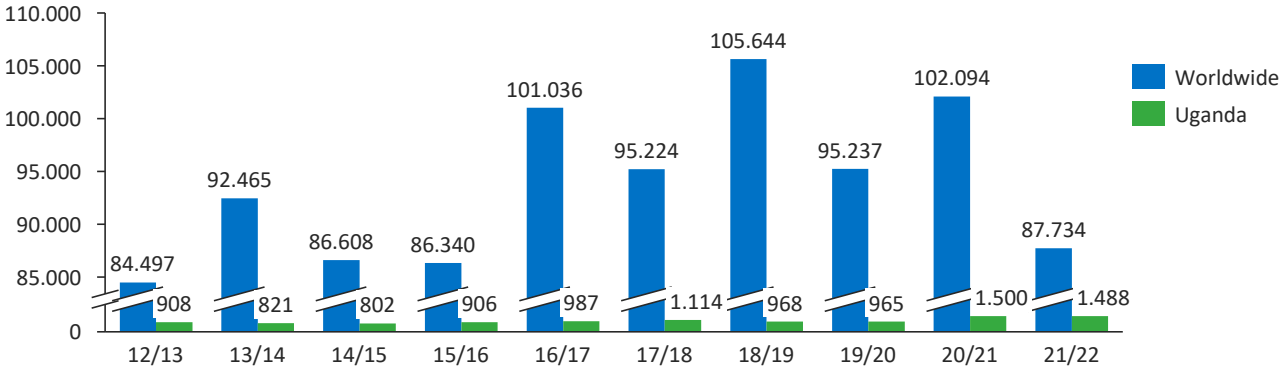
- The share of EU imports of Ugandan coffee has declined from 75% to 60% in recent years as **importance of less traditional importers in non-mature markets in Eastern Europe, North Africa and Asia has grown**.[2) & 3)]
- The global market is becoming **increasingly competitive and has experienced over-supply from major producers such as Brazil**.
- Since 95% of Ugandan coffee is exported, any trends and changes in the international market will have a direct impact on the prices and conditions of farmers and enterprises back home.[3)] Global Arabica coffee prices have been **increasing due to weather related concerns in Brazil this season**.[5)]
- In general, **Arabica farmers are able to consistently retain 65-80% of the export price**, showing that these farmers utilize the price and market information disseminated by UCDA and are able to negotiate for higher prices. [6)]
- **Sustainable coffee prices have increased significantly** over the past 5 years (average of 67% for Mt Elgon coffee). [7)] Due to increasing demand for organic coffee, larger producers have been providing necessary training for farmers to grow more organic **products with organic fertilizer**.[5)]

Sources: 1) ATAI (2020); 2) CGIAR (2019); 3) FAO (2020); 4) The Independent (2021); 5) Tridge (2021); 6) UCDA (2020);

Uganda faces an increased risk of coffee oversupply in coming years, due to the implementation of their coffee expansion plan to quadruple their coffee production by 2025.

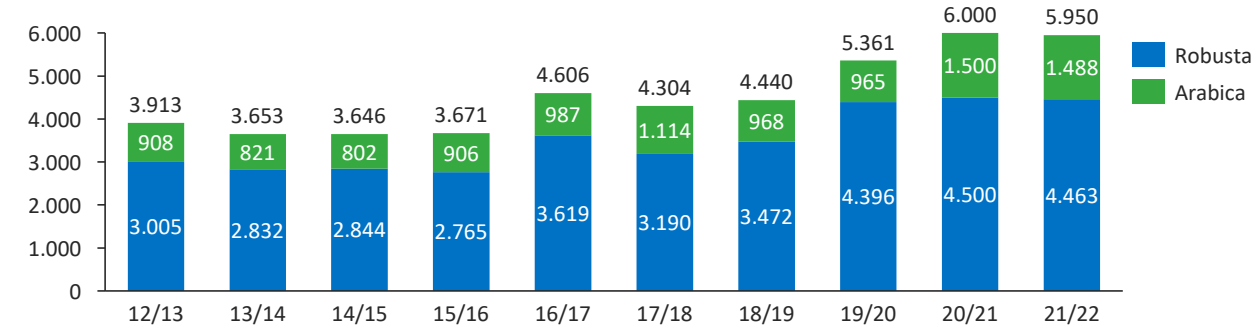
Uganda's market share in Arabica coffee slowly increased from 1.1% to 1.7%

Arabica coffee production world wide and Uganda 2012/13 to 2021/22 (1,000 60-kg bags).[1,7)]



Uganda produces Robusta and Arabica in a stable ratio of 4:1

Robusta and Arabica production in Uganda 2012/13 to 2019/20 (1,000 60-kg bags).[3,7)]

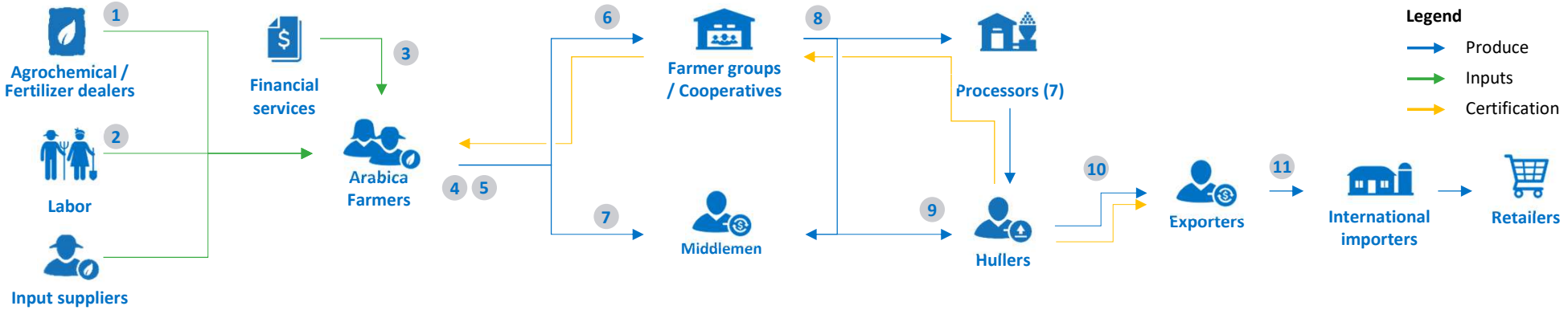


- Coffee is the **major cash crop of Uganda**, both in terms of foreign exchange earnings and employment creation.[2)]
- Uganda is **producing 5-6 million 60-kg bags**, which represents 47% of African Robusta supply and 9% of African Arabica supply. The Ugandan Coffee Development Authority aims to **increase production to 20 million bags by 2025**.[2)]
- **95% of the total coffee production in Uganda** is exported annually, for earnings between **350-400 million USD**.[5)]
- **25% of the export is Arabica coffee,** representing **30% of the value** of exported coffee as the value is higher than for Robusta coffee. [7)]
- **Arabica coffee** is grown in the high altitude areas of Uganda (Mount Elgon and Mount Rwenzori), and is **more susceptible to pests and disease**, thus, needs **more fungicides and pesticides than Robusta**, and have a **lower crop yield than Robusta**.[2)]
- With **certified volumes for Arabica (~9%)** and Robusta (~1%), Uganda is lagging behind the **world average of 25% of the total volume**.[4)]

Sources: 1) Statista (2020); 2) UCDA (2019a); 3) UCDA (div.); 4) Coffee Barometer (2019); 5) CGIAR (2019); 6) FAO (2020); 7) Uganda coffee increases 21/22

4.1 About the context | Value Chain

Mt Elgon Arabica farmers want to semi-process cherry at farm-level to control cash flows and capture higher values, however this often results into lower quality and lower prices affecting their livelihoods and companies' leverage to invest in inputs, infrastructure and certification.



Inputs	Cultivation	Aggregation	Processing	Manufacturing / Retail

1. Coffee production is operated on small plots, with limited use of inputs.[2)]
2. Women provide most of the coffee labor, but they are often excluded from farmer groups, training, and marketing decisions. Man take most management, input and marketing decisions.[1)]
3. Farmers use informal finance to buy inputs. Due to a lack of collateral, farmers are not able to access formal finance.[1)]
4. ~300k farmers cultivate Arabica out of total of 1.8M coffee farmers in Uganda.[3)]
5. Farmers prefer to produce and sell parchment to control timing for liquidity though it results in higher costs and lower income. [6)]
6. Typically few farmers are members of cooperatives ,but about 50% of the harvested dried cherries is sold through farmer groups.[1)]
7. Immediate cash needs lead to side selling to middleman, even before harvest. Middleman are often from the community, provide credit for coffee on trees, and pay immediately, but don't offer quality premiums.[1)]
8. Farmer groups sell to exporters or middleman. Payments may be lagged, quality is bulked but some groups can be certified.[1)]
9. Agents pay for hulling services but some may own or lease small-scale hulling facilities (~537 active outside Kampala).[3)]
10. Although ~20% of coffee is cultivated according to certified requirements (e.g. Fairtrade, Rainforest, 4C Certification),[1)] only ~5% of Arabica coffee is exported as such,[4)] and increased cost of compliance to certification requirements dampen the aimed increase in income.[5)]
11. Due to the liberalization of Uganda's coffee industry, the market consists of >75 exporters, although top 10 exporters control >70% of the market.[4)]

Sources: 1) CGIAR (2019); 2) FAO (2020); 3) Morjaria and Sprott (2018) Ugandan Arabica coffee value chain opportunities; 4) UCDA (2019); 5) Coffee Barometer (2019); 6) Mountain Harvest interviews

By promoting research, production, quality, and marketing of coffee, the UCDA stimulates the improvement of the enabling environment of coffee farming and the sustainability of coffee farmers' farms.

Uganda Coffee Development Authority (UCDA)

UCDA is established as a public Authority and its mandate is **to promote and oversee the coffee industry** by supporting research, promoting production, controlling the quality and improving the marketing of coffee in order to optimize foreign exchange earnings for the country and payments to the farmers. [1)]

To guide UCDA's aimed transformation of the coffee industry has formulated the following Roadmap: [3)]

Demand & Value addition

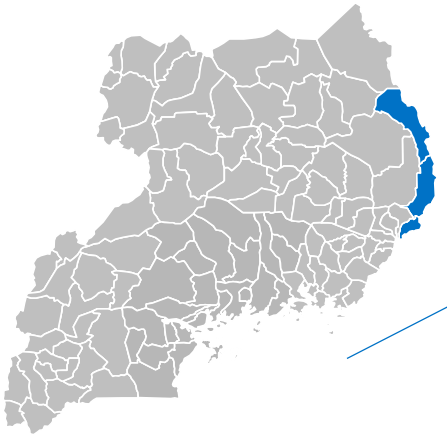
- Build structured demand through country-to-country deals (focussed on China)
- Brand Uganda coffee to drive demand and improve value by up to 15%
- Support local coffee business for value addition, including primary processing and a soluble coffee plant

Production

- Strengthen farmer organisation and producer co-operatives to enhance commercialization for smallholder farmers and ensure broad access to extension, inputs, finance, and aggregation
- Support joint ventures between middle-class owner of underutilized land an investors to develop coffee production
- Provide and promote concessions for coffee production on large underutilized tracts of land

UCDA advices to cultivate Cordia and Ficus trees to facilitate shade to coffee trees

Recommended shade trees for Mt Elgon regions [1)]



Shade trees (Mt Elgon region Uganda) [2)]

- Cordia Africana
- Albizia coriaria
- Ficus natelensis

Enablers

- Improve quality of planting material (seeds and seedlings) through strengthened research and multiplication of improved varieties
- Improve access to quality inputs by reducing counterfeiting (fertilizer, pesticides, herbicides) from current 40-60%
- Develop coffee finance programme to provide financing to farmer organizations (including on-lending to smallholders), coffee business, and investors

Sources: 1) UCDA (2021); 2) UCDA Robusta Handbook (2019); 3) UCDA Roadmap (2017)

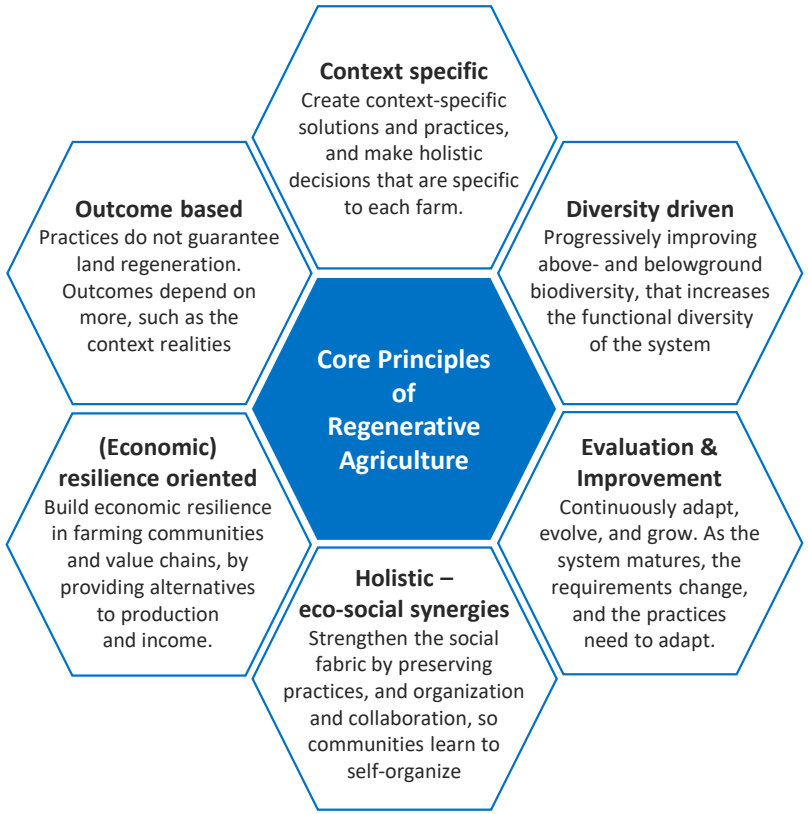
As an holistic agricultural approach that retains or if needed restores ecosystems, Regenerative Agriculture provides a theoretical and practical implementation pathway towards Climate Smart Coffee

Climate Smart Coffee [1)]

Climate smart coffee (CSC) production sustainably increases productivity, enhances resilience to climate risk, and reduces or removes greenhouse gas emissions (GHGs). Many of the interventions that make up CSC already exist worldwide and are used by farmers to cope with various production risks, and can take place at different technological, organizational, institutional and political levels.

Regenerative Agriculture [2)]

RA is an approach to farming that uses soil conservation as the entry point to regenerate and contribute to multiple provisioning, regulating and supporting ecosystem services, with the objective that this will enhance not only the environment, but also the social and economic dimensions of sustainable food production. A healthy soil is the basis for RA and therefore degraded agricultural soils should be restored to healthy soils.



Sources: 1) CGIAR (2019); 2) Schreefel et al. (2020); IDH (2020) – Deep dive: Regenerative Systems in Kenya and Uganda

Governmental practices stimulating sustainable agricultural practises do not outweigh limiting factors such as lack of owned land, limited access to finance, and an unorganized value chain.

Risk *Neutral* *Opportunity*

Definition	Situation	Impact on SDM
Technology	• Farmers who use mobile money sell a larger proportion of their coffee to buyers in high-value markets.[9)] • 10% of smallholders in Uganda own a bank account, and 21% has access to mobile money.[14)] • In 2019, 46% of farmers is connected to 3G networks.[18)]	• Access to mobile money and 3G will enable to increase financial access.
Environment	• Index-based weather insurance lacks adoption due to weak regulations, weather data quality and a lack of local adaptation and capacity building.[10)] • Uganda is the 14th most vulnerable country and the 48th least ready country – meaning that it is very vulnerable to, yet unready to address climate change effects.[16)]	• Worsening and less predictable environment increase the risk of harvest losses and instable sourcing volumes.
Infrastructure	• The main roads that connect Kampala to some of the main Robusta growing districts are in good condition, making it easy to transport coffee to factories in Kampala.[11)] • Uganda scores 3.3 (Sub Saharan Africa: 2.9) on the Infrastructure Index.[13)]	• Poor infrastructure puts pressure on profitability of SHF and lowers quality of the coffee bean.
Labor	• Coffee farming is labor intensive around harvest season, particularly in intercropping systems. Farmers rely on family and seasonal labor from their communities, but labor availability is low, leading to difficulties of getting sufficient (decently priced) labor.[15)]	• Limited access labor hampers the possibilities of farmers to expand their operations.
Inputs & Financing	• The majority of smallholders save informally by VSLAs or keep it at home,[11)] and access finance trough SACCOs.[8)] • Coffee production is operated on small plots, with limited use of yield-enhancing inputs.[11)]	• Limited access to finance causes farmers not to reach full potential.

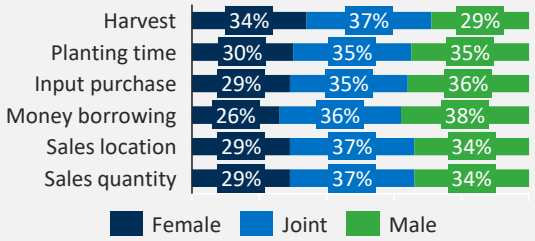
Definition	Situation	Impact on SDM
Trading System	• The majority of coffee farmers sell their dry coffee parchment to Agents, who process the parchment to green beans, which are sold to exporters.[17)] • <10% of farmers are members of a cooperation.[1)]	• Unorganized coffee value chain exposes farmer to the risk of selling at to low prices.
Pricing & Competition	• Price is set the global coffee market and is depended on the world coffee supply.[11)] • The high competition of agents results in a high price transmission to farmers and timely payments at sale.[7)]	• Although prices are dropping, farmers do receive fair portion of the price.
Institutional Stability	• Institutional capacity to respond to challenges is low and regulations are often not enforced despite the political importance of coffee.[1)] • Mobile Money solutions in Uganda suffer from unclear and changing regulation.[2)]	• Governmental focus on sustainability enhances access of farmers to high quality seedlings and increase of yield.
Land Tenure	• 80% of agricultural land is under customary tenure that is undocumented,[2)] facilitating the rise in land-grabbing.[3)] • Growing cities, oil and gold production, and expansion of estate crops increasing the risk of smallholder coffee producers being driven off their land without legal means or ways to benefit from increasing land prices.[3)]	• Informal land tenure, gender relationships, and poor market access are disincentives for CSC adoption.
Social Norms	• Coffee traditionally falls under the ownership of men, the cultural norms favour male inheritance, and females can often only access land through marriage.[12)] • Women in Uganda are more likely to be illiterate than men, leave school earlier [4)], receive a lower share of the coffee income and have less decision making power.[5) & 6)]	• Unequal distribution of value to labor limits farmer households to achieve full potential, and secure sourcing volume.

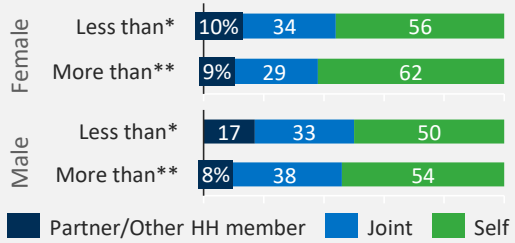
Sources: 1) CGIAR (2019); 2) World Bank (2018); 3) USAID (2016); 4) Uganda Bureau of Statistics (2016); 5) Ochago (2017); 6) Bolwig (2012); 7) Baffers (2006); 8) Schmidt (2017); 9) Sekabira (2017); 10) Ntukamazina (2017); 11) FAO (2020); 12) UNDP (2015); 13) World Bank (2017); 14) CGAP (2016); 15) FAO (2012); 16) Dutch Ministry of Foreign Affairs (2019); 17) Enveritas (2020); 18) GSMA (2020)

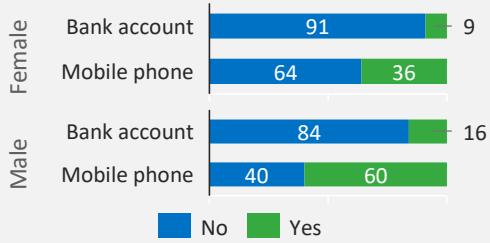
Gender inequality sustains in Uganda's coffee sector, as women's involvement in sales decision-making remain low and farm-activities remain focussed on (diversified) crop cultivation.

Gender Dynamics

Category	Decision making	Earnings control	Connection though bank / phone
Data	**Women's involvement in decisions** [5]	**Control of income earned by wife or husband in rural areas** [1]	**Ownership and use of bank accounts and mobile phones in rural areas** [1]







Category	Description of involvement	Detailed description of risk	Expected Impact
Involvement in household activity	**Activities undertaken:** • Of the female population in rural areas 11% had no education, whereas 51% had only some primary education. [1] • Of the 75% females who are working, 60% is performing rural labor and 12% is performing elementary work. [1]	• Disproportionate load of unpaid care work • Limited time to engage in productive and/or economic activities (time poverty).	• Women's exclusion of effective participation in agricultural value chains. • Lower Farm yields • Unsustainable agricultural value chains
Involvement in farm activity	**Activities undertaken:** [2] & [4] • Women provide 58% of the fieldwork and harvesting (e.g. planning and seed sourcing; land preparation; nursery management; planting, weed and pest management; fertiliser application and pruning). • 72% of post harvest handling is provided by women (e.g. harvesting, sorting, fermentation, washing, drying and bagging). • Processing and marketing (e.g. transportation, collection, milling and selling) is predominately performed by men.	• Role of women invisible in agricultural value chains, increasing the risk of mis-alignment of service provision to intended target audience. • Although the majority of value is created during the field and harvest and harvest handling stage, because men sell the crop, men exercise control over these funds.	• Increasing need to empower women on decision making on their income, as this will improvement their social and economic status and the level of resources allocated to their children. • Focus on economic empowerment of women to benefit no only individual women but also their children, household and communities.

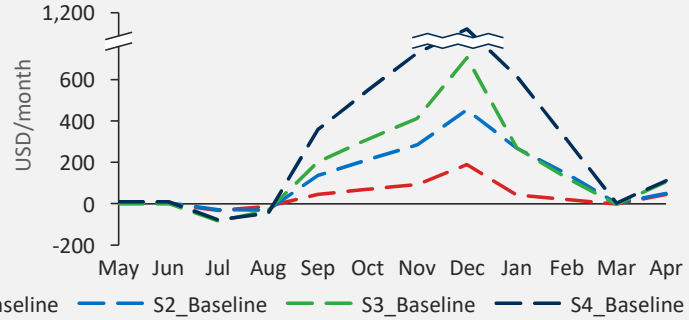
Sources: 1) DHS Program (2016); 2) Farm Africa (2021); 3) Specialty Coffee Association (2018); 4) Coffee Quality Institute (2020); 5) CGAP (2016);

*Person who decides how cash earnings are used if person's earns are less than other HH-member.

**Person who decides how cash earnings are used if person's earns are more than other HH-member.

Scale and income of diversified activities are not sufficient to increase smallholders' financial resilience to secure food, as cash flows remain unstable during the year.

Farmer's overall Food Security status

Category	Cash-flow (Stability & Access)	Food Security (Access & Availability)
Data	**Cash flow** [7] • In Uganda, most farmers (93%) face months of insufficient cash to cover basic household needs (except food). • For farmers in the Mt Elgon region, January, April and July are the most common months for cash shortages due to high expenditures (January, June and September are when school fees need to be paid). 	**Food Security** • **Prevalence of severe food insecurity in the total population** (2017-2019): 20.6% [2), 9)] • **Prevalence of moderate or severe food insecurity in the total population** (2017-2019): 66.3% [2), 9)] • Farmers in the Mt Elgon region have on average 3 months during which they face hunger, which is more than in central Uganda or Rwenzori. [7)] • Food insecurity is most likely faced in July and June. [7)]

Category	Assets (Stability)	Market (Availability)	Health & Sanitation (Utilization)
Data	• **Ownership**: Most farmers own their farm land (96%). [7)] • **Farm size:** 3.8 acres • **Crop farm size**: 2.1 acres (~55%) [7)] • **Other crops:** Most farmers in Mt Elgon region grow banana and beans (+95%) and avocado and maize (50%). [7)] • **Animals**: Most smallholders own cattle (80%) and chicken (85%).[7)]	• **Per capita food production variability**: 3.4 [1)] • **Global production**: Uganda was ranked 8th worldwide in 2020 based on coffee production estimated at 5.62 million 60kg bags. Brazil is leading with 69 million 60kg bags. [5)] • **Export vs Import**: Uganda is a net exporter of coffee. The country exported ~90% of its produced coffee in 2018.[6)]	• **National average dietary energy supply adequacy**: 90% [2)] • **Access to clean water**: Yes. At least 49.1% of Ugandan have access to basic drinking water services.[3)] • **Access to sanitation**: 18.47% of the population has access to at least basic sanitation services.[4)]

Sources: 1) FAOstat (2015); 2) FAOstat (2017-2019); 3) IndexMundi (2019a); 4) IndexMundi (2019b); 5) Statista (2020); 6) FAOstat (2018); 7) Baseline study CFIRP IDH (2021); 8) Kilimo Trust (2020) - Farmer Research & Market Systems Analysis Research; 9) FAO (2020); 10) CGIAR (2019;

Intensified and prolonged rainfall and increased temperatures will put some pressure on the Arabica producing regions on Mt Elgon, however incremental changes in practices towards climate smart agriculture can contribute to safeguarding high quality and quantities

Climate risks exposure and impact

Risk exposure

Temperatures (change in) short- and long-term averages

Medium risk

Significant increase at a rate of 0.52°C per decade over de past 30 years, and an expected increase of 1.7°C (Mt Elgon region) by 2050.[1)]

Precipitation (change in) timeliness and availability

Medium risk

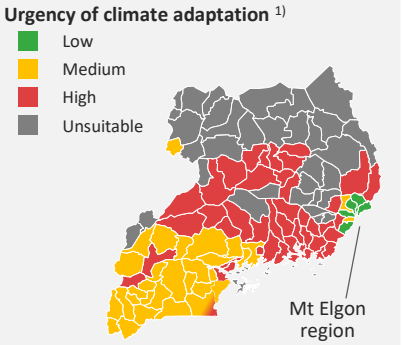
Projected increases in total annual precipitation by 2050 to +12-15% (Mt Elgon region).[1)] Increase in precipitation during the dry season may be slightly higher than currently.[1)]

Climate extremes (change in) likelihood and severity of hail, floods, locusts, etc.

Low risk

Limited increase in the frequency and intensity of droughts and floods in the Mt Elgon region.[2)]

Farmer resilience and impact



Although altered pest and disease patterns, uncertain rainfall, drought and heat may affect the crop, the climate in the Mt Elgon region will most likely remain suitable for Arabica coffee production. An incremental effort in climate adaption to achieve a change in practices such as more shading or improved soil management is required.[1)]

Measures taken by Mountain Harvest

Current measures and policies in place

Strategy, measures and policies

- Severe weather events can lead to destruction of crop production and pose a business risk to MH, making it hard to reach their volume and quality targets.
- MH aims to boost production and farmer profitability through soil regeneration and enhancement, support to biodiversity and protection of crops through agroforestry and organic inputs.

Intelligence

- Collect soil data;
- Collect historical data on climate to plan ahead;
- Track temperature throughout supply chain to ensure quality;
- Produce and distribute own organic inputs;

Challenges and room for improvement

- Limited data available on farm-level soil fertility and responsiveness to inputs.
- Safeguard use by farmers of organic inputs instead of chemical inputs distributed freely by government.

Sources: 1) CGIAR (2019); 2) Ministry of Water and Environment (2015); 3) CGAP (2016);

4.2 About the SDM

Understanding the SDM's strategy, business model and financial performance

This section:

- *Describes the current strategy of MH Ltd.*
- *Details proposed improvements as included in the main recommendations*
- *Assessing the SDM's financial performance and opportunities for improvement*

Back to Chapter overview →

← Back to Recommendations

Mountain Harvest invests in providing various services to adequately support smallholders in their transition towards regenerative agricultural cultivation of Arabica coffee

Overhead (management, HR, legal, utilities, office, transport etc.)

Core-business

Quality control & Processing

- Extension officers will oversee operations of both central and community wet mills to ensure strict adherence to processing practices.
- After transporting the dry parchment to MH's central warehouse in Mbale, the coffee is hulled, processed and transported to the harbour for export.

Sourcing

- MH sources Arabica coffee from 800 farmers in Mt Elgon with their extension officers managing the buying operations from farmers.
- Extension officers are trained on commerce, coffee quality, alternative crops, financial literacy, and regenerative agriculture in the future.

Production activities

Services

Inputs and fertilizers (credit)

- MH will supply fertilizers and subsidized EM2 fertilizers for 3 years to farmers. Farmers will be trained to produce EM2 fertiliser on their own

Seeds/Seedlings

- MH provides **bean seeds** at a subsidized price, with credit repayment by coffee.
- MH will supply 5 seedlings (free) to each farmer of macadamia and avocado totalling 3000 seedlings/year for 3 years,

Gender awareness and equality

- Provision of gender sensitization training on e.g. household decision-making
- Proactive engagement of women and youth in diversified crops such as beekeeping, rabbits etc

Training

- Extension officers and lead farmers provide training to farmers with GAP, regenerative agriculture, climate smart practices and other training (e.g. diversified crops, gender sensitization, etc.).

Demo garden

- MH has 42 demo-plots at selected farms, one for each farmer group.
- Plots are research and training ground on GAP, cover crops, food security, etc.

Market access

- MH provides market access to farmers for coffee by direct offtake;
- MH has signed MoUs with other VCPs for beans, honey, avocado and other diverse crops.

Finance / Digitization

Microloans

- MH has signed an MoU with 'Opportunity Bank' to provide cash microloans to eligible farmers
- Providing loans, other financial services to farmers from a tier-1 financial institution will enable farmers to avail cost effective credit, improve their financial literacy and invest in their farms.

Digitalization and data capture

- MH captures data on farm-level through an app. This information is used to analyse the impact of services and improve the efficiency of service delivery.
- The information are also used to tailor and provide information to the farmers on agronomic reminders, availing of micro-loans and disbursal of coffee payments by mobile or bank payments.

Soil testing

- MH conducts soil test of farms, eventually covering all the farms and conducting soil test of every farm once in 2 years
- Tests show soil fertility, nutrient profile and organic matte, ph level that guide corrective actions

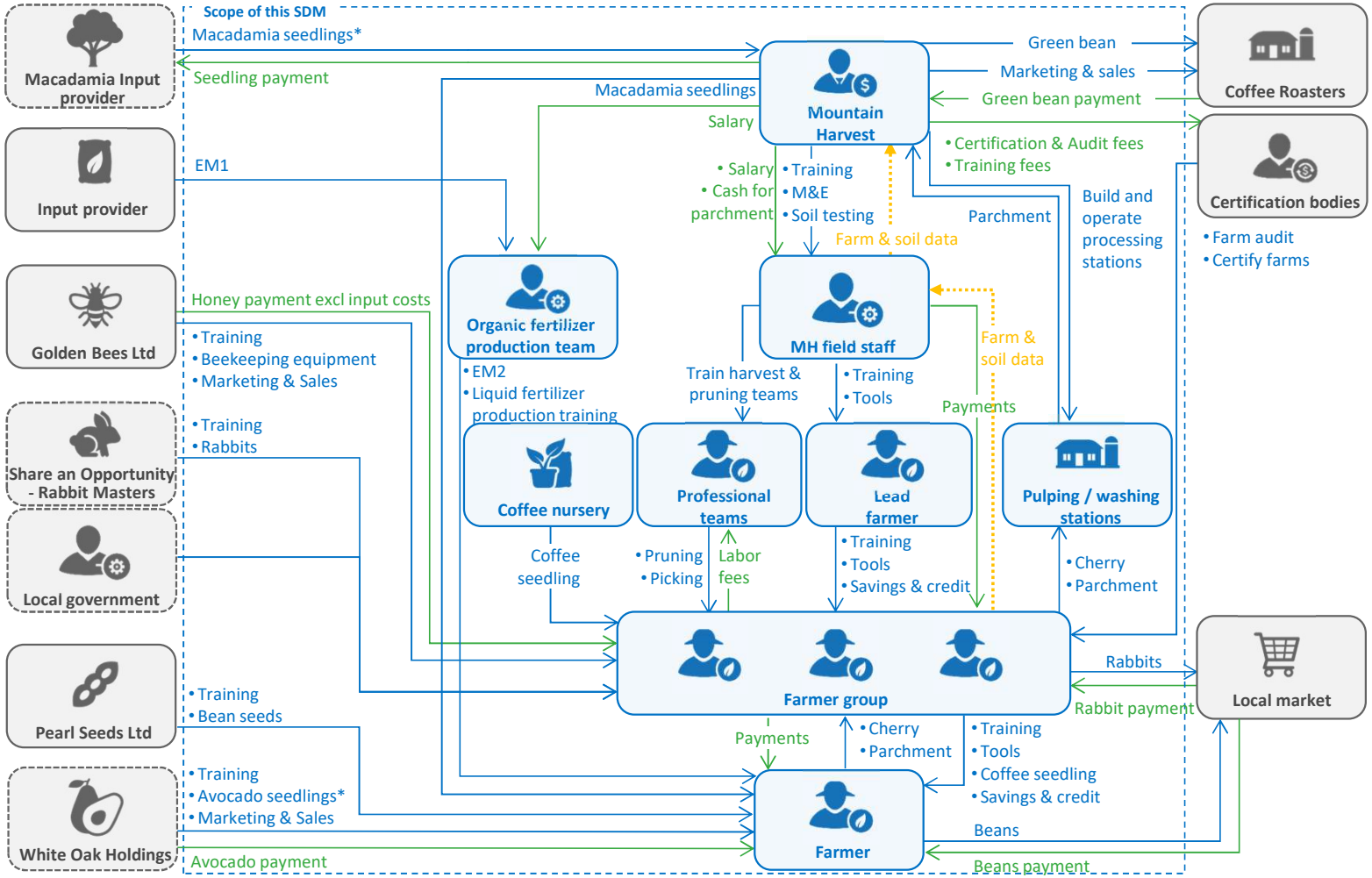
Certifications

- MH supports farmers to become Rainforest Alliance, Organic and Fairtrade certified.
- Premiums are paid out by the end of coffee season or converted into services taken by the farmer (e.g. inputs)

Supporting activities

Margin

The SDM is structured in the following way



Service description

- This overview shows the main stakeholders and respective SDM service, payment and information flows between those.
- Mountain Harvest's main business if improving quality and quantity of coffee. Therefore they operate professional pruning and picking teams, provide GAP training and operate washing stations.
- To strengthen the understanding of the soil quality, and tailor services around it, MH pays for annual soil testing and is developing capacity internally and at farm level for organic fertilizer and manure production.
- Coffee payments to farmers are made in cash or via bank transfer, deducting any costs for input provision.
- MH has signed MoUs with different stakeholders to support the farmers in their diversification efforts. Agreements are maid for training, inputs and marketing of avocado, macadamia, beans, beekeeping and rabbits.

Legend

- Produce / Services
- Payments
- Information / data
- MoU signed
- MoU to be signed

Mountain Harvest engages with multiple stakeholders both vertically and horizontally in the coffee value-chain

Actor	Organizations	Function (within this SDM)	Revenue model (within this SDM)	Incentive to participate (within this SDM)
Operator	• Mountain Harvest Ltd.	• Value chain investor • Provide services to farmers • Sources and processes coffee beans and exports coffee green beans of Robusta and Arabica.	• Margin on coffee sales	• Increase and secure sustainable coffee supply, by achieving sustainability goals, transform the sector, accelerate progress, and contribute to alleviation of poverty in rural communities.
Processor	• Exporters • Roasters	• Buys coffee from MH and processes it to consumer products.	• Margin on coffee sales	• Increased access to high quality single origin coffee • Increase experience on business with smallholders.
Financial Service Providers	• Lutheran World Relief • Ground up • Finance Inst (FI)	• Shareholder and promoter of MH • Finance, de-risk, and create access to finance for smallholders and MH.	• None • Dividends • FIs- Payment of interest by MH and farmers.	• Financial returns • Develop fair and principled markets, and advance communities from poverty to plenty • Capture savings made by smallholder farmers and increase farmers access to financial services/products.
Impact Leads	• IDH • IKEA Foundation • Government • Research Institutes	• Co-investor and capacity builder for Regenerative Agriculture projects in Uganda;	• None • Consulting Fee	• Increase experience on business with smallholders and cooperatives. • Bring into practice the results of research
Input providers	• Value Chain Players	• Manufacture, sell and source agro-inputs, equipment and produce in order to improve farmer productivity and income.	• Margin on product sales	• Increased sales volumes • Increase experience on business with smallholders.
Off takers	• Value Chain Players	• Buys diversified products from MH and processes it to consumer products and/or export products.	• Margin on product sales	• Increased sales volumes • Increase experience on business with smallholders.

Opportunities to support the transformation towards regenerative agriculture, leverage MH's strengths and solve weaknesses and mitigate threats.

	Helpful	Harmful
Internal	**Strength** • Mountain Harvest (MH) is deeply committed to bring in and experiment innovative solutions that create more value for the company's supply chain (including farmers) with aim of decommoditizing coffee and building a long-standing relationship with farmers. • MH has a data-driven segmentation methodology, which indicates the loyalty of famers, and which is used to determine access to services. • MH is intensifying its engagement with farmers by providing services for diversify farm crops and facilitating market access for the same • MH pays quality premium to farmers over the farm-gate-price.	**Weakness** • Farmers MH sources from have lower loyalty to MH due to competition from middlemen, which leads to side selling by farmers. • MH has a limited track-record in produce other than coffee in Uganda, which leads to large start-up costs and reliance on existing VCPs. •
External	**Opportunities** • Coffee farmers' over reliance on coffee income should be diversified with transitioning to regenerative agriculture system. • Providing services and market linkages to diverse farm crops will lead to higher trust between MH and farmers, this in turn will increase farmers loyalty to MH. • With the implementation of regenerative agriculture, farmers might be able to tap into the maturing carbon market as an additional revenue stream • Stimulating women empowerment will increase farmer resilience as productivity of women associated activities will increase.	**Threat** • Decrease in coffee volume due to migration to other (food) crops because of food insecurity and low coffee prices; • Decreasing coffee volume, due to both soil degradation and risk of climate change causing favored coffee cultivation areas to shift to regions on higher altitudes, which are mostly protected nature reservoirs. • Fragmentation of farms and subsequent reduction in average size of coffee farms might increase the cost to serve per farmer • Average age of coffee farmers is increasing, and younger generation are less keen to take up farming activities

SWOT

Legend: Economic | Social | Environmental

4.3 About the farmers

Assessing farmer impact and opportunities for improvement

This section:

- *Assessing the farmer's financial performance and opportunities for improvement*

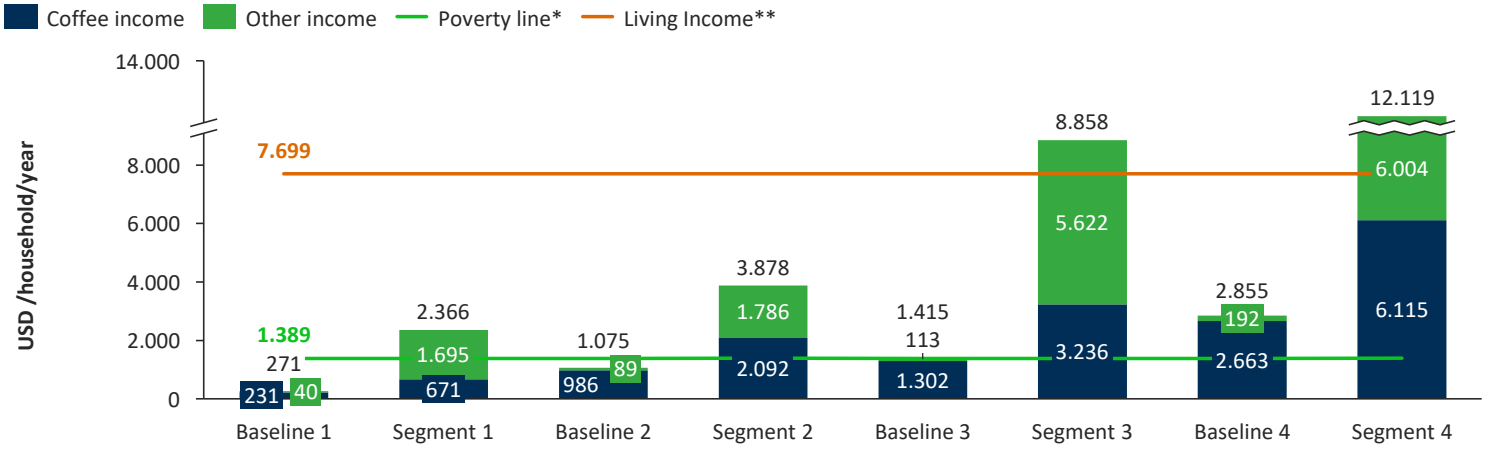
Back to Chapter overview →

Go to Living income expl.→

All farmers who enter the SDM can earn more than the poverty line, although Segment 1 farmers remain reliant on diversified income. Farmers with larger farms are able to close the gap to a living income.

Comparing household income, living income benchmark and poverty line

Shown for each farmer segment, in USD/household/year based on 10-year average



Units per household

	Baseline 1	Segment 1	Baseline 2	Segment 2	Baseline 3	Segment 3	Baseline 4	Segment 4
Coffee	0.8 acre	0.8 acre	0.8 acre	0.8 acre	3 acres	3 acres	3 acres	3 acres
Coffee tree density	650 trees/acre	650 trees/acre	1,240 trees/acre	1,240 trees/acre	650 trees/acre	650 trees/acre	818 trees/acre	818 trees/acre
Beans (intercropped)	0.7 acre	0.7 acre	0.7 acre	0.7 acre	1.8 acre	1.8 acre	1.8 acre	1.8 acre
Banana (intercropped)	0.8 acre	0.8 acre	0.8 acre	0.8 acre	3 acres	3 acres	3 acres	3 acres
Macadamia (shade tree)	0 trees	0 trees	4 -> 16 trees	4 -> 16 trees	0 trees	0 trees	15 -> 60 trees	15 -> 60 trees
Avocado (shade tree	4 -> 16 trees	4 -> 16 trees	0 trees	0 trees	15 -> 60 trees	15 -> 60 trees	0 trees	0 trees
Beekeeping	20 beehives per farmer group	20 beehives per farmer group	20 beehives per farmer group	20 beehives per farmer group	20 beehives per farmer group	20 beehives per farmer group	20 beehives per farmer group	20 beehives per farmer group
Rabbits	30 rabbits per farmer group	30 rabbits per farmer group	30 rabbits per farmer group	30 rabbits per farmer group	30 rabbits per farmer group	30 rabbits per farmer group	30 rabbits per farmer group	30 rabbits per farmer group

Impact on farmer incomes

- Given that envisioned service impacts will materialize, the SDM significantly boosts farmer incomes from coffee and other crops for all segments from between $271 and $2,855 to between $2,366 and $12,119 per household per year.
- In contrast to baseline farmers, all SDM farmer segments accessing this service offering will be able to earn more than the Worldbank poverty line of $1,389, and segments 2, 3 and 4 are able to earn more than the poverty line from coffee alone.
- SDM farmers in segments 3 and 4 are able to earn more than a living income of $7,699 with the diversification of their household income.
- Differences in coffee density and diversification approach between segments 1 and 2 and 3 and 4 are explained in more detail in farmer the segmentation slide.

**The Worldbank poverty line was adjusted to a household of 7 members and a PPP conversion factor of 947UGX per $.*
***The living income benchmark is based on the family composition of 2 adults and 5.7 children with 1.7 FTE. The data was based on the living wage for a standard family from Wageindicator (2019) and corrected for inflation.*

4.3 About the farmers | Farmer profit & loss over time

By continuously investing in improved GAP, professional support in coffee farming and access to new income streams, the SDM farmer can generate a 300-500% higher profit in 8-9 years.

Comparing total farm net incomes of baseline and SDM farmers of Segment 1 and Segment 2 (0.8 acre coffee farm)

Split by revenue and expenses drivers, in USD/year

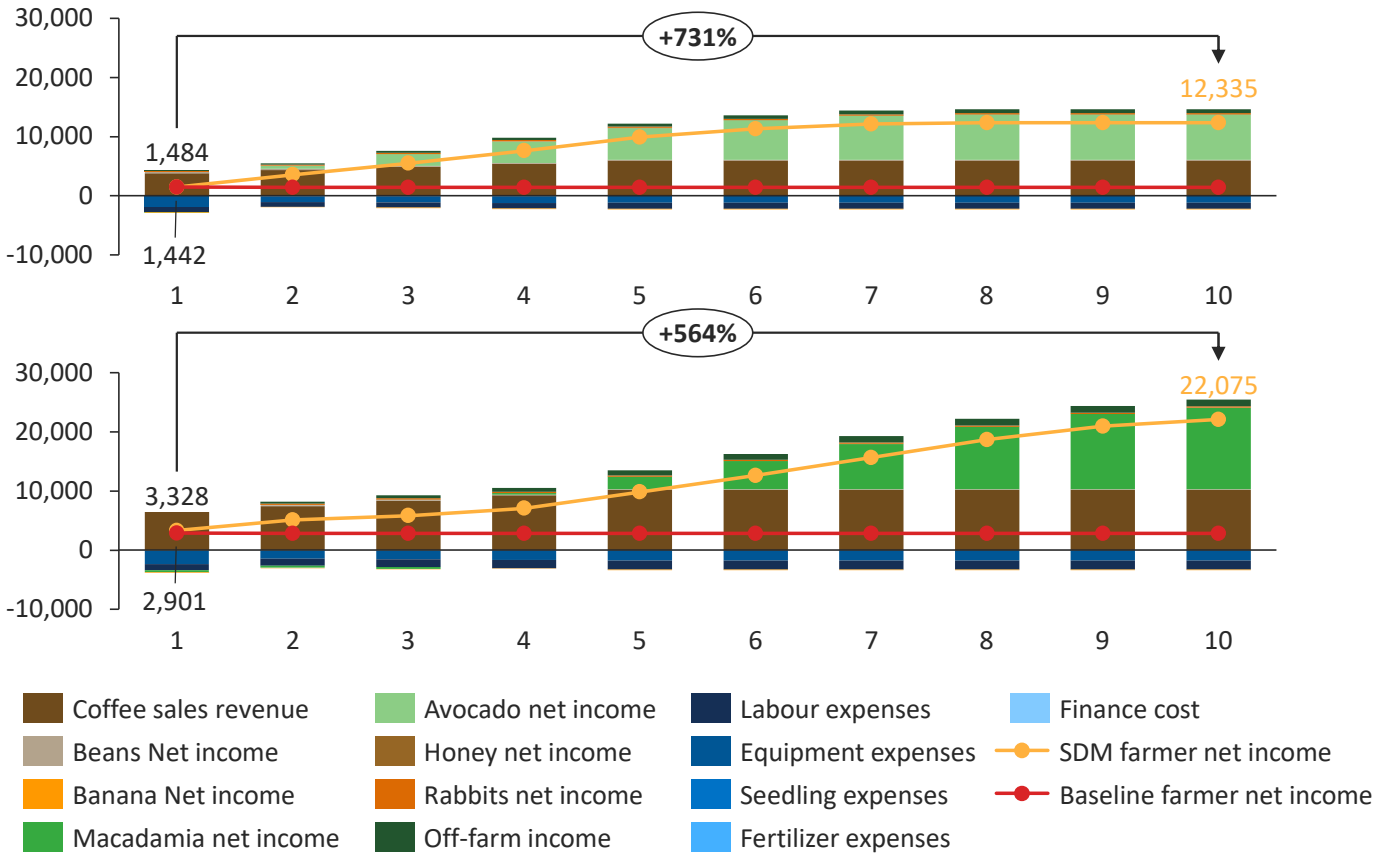
- **SDM farmers of Segment 1 could increase their annual net income with 343% over 10 years time** from USD 278 to USD 3,233.
- **SDM farmers belonging to Segment 2 could increase their annual income five times over 10 years time** from $ 1,095 to $6,515.
- These large increases can be attributed to the support from **Mountain Harvest on GAP training, professional teams for pruning and plucking** which increases farmers' yields, marketable surplus and quality. Allowing the farmers to produce higher volumes and capture higher prices (related to the cupping score) over time.
- Simultaneously, Mountain Harvest supports the farmers in **applying regenerative agriculture practices which improves soil health** and gives them **access to new revenues streams**.
- Although both **Segment 1 and 2 farmers have the same coffee farm size, their coffee density is different** (477 trees per acre vs 1240 trees per acre respectively), resulting into a **higher income from coffee for Segment 2 farmers**.
- Additionally, **Segment 2 farmers are modelled to plant macadamia as shade trees while Segment 1 farmers plant avocado**. The **higher profitability of macadamia per tree results in a higher annual income but only later in time**.

4.3 About the farmers | Farmer profit & loss over time

Segment 3 and 4 farmers invest in drying and pulping facilities due to the profitability of their farm and can generate more revenues from macadamia and avocado compared to Segment 1 and 2 farmers

Comparing total farm net incomes of baseline and SDM farmers of Segment 3 and Segment 4 (3acres coffee farm)

Split by revenue and expenses drivers, in USD/year



- **Also Segment 3 and segment 4 SDM farmers can increase their annual net income significantly over time compared to Baseline farmers** (respectively 731% and 564%).
- Equipment expenses for both segment farmers are double as high in year 1 as **large farmers invest in their own pulping and drying facilities**.
- **Labor expenses such** as harvesting, pulping, washing and transport **increase slightly over time due to the higher volumes of coffee.** These increase are offset by the higher sales.
- The **benefit of avocado and macadamia shade trees are much higher for Segment 3 and 4 farmers compared to Segment 1 and 2 farmers** as they have much larger coffee farms (0.8 vs 3 acres) to which the farmers can further expand the shade trees – at their own expense.
- **Alternative income from honey and rabbits is the same for all SDM farmers** as the activities take place at farmer group level (35 members) and is spread evenly amongst the farmers.

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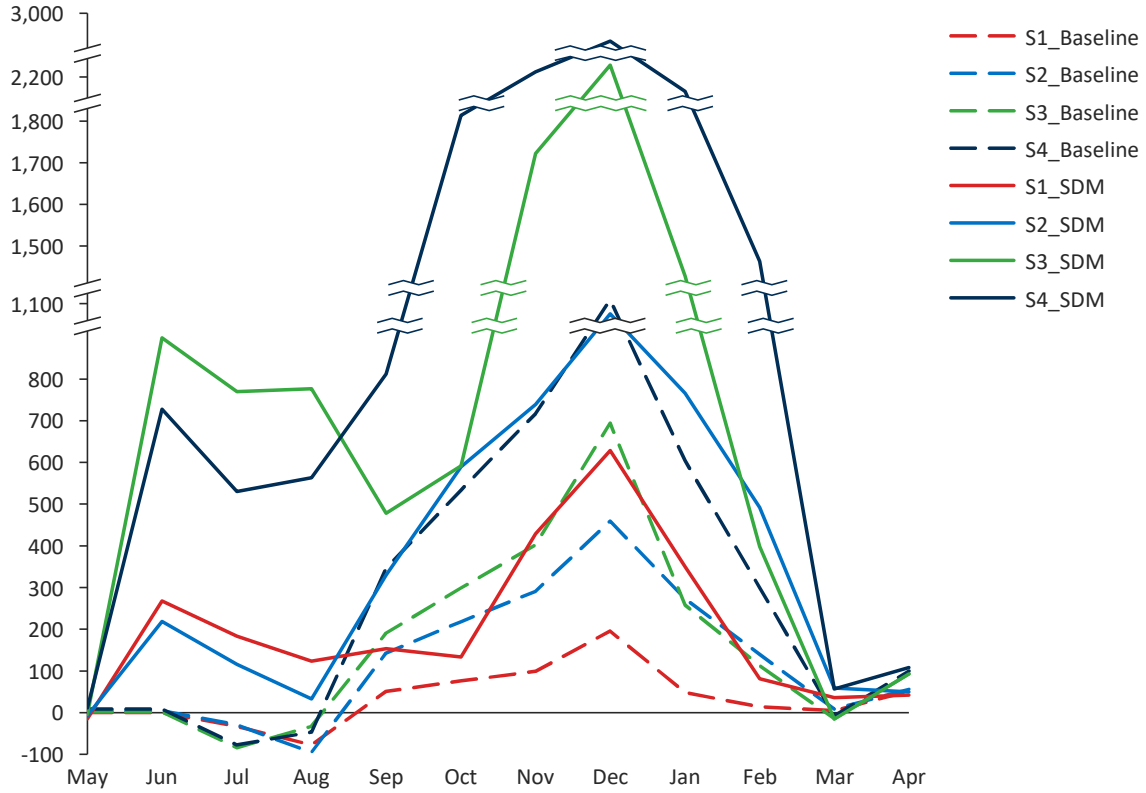
A careful selection and timing of diversified income-generating activities complements coffee income and dampens cash shortages between Feb through March and May through August

Performance of diversified activities dampens cash shortage between May and August, and February and March

Average 10-year net cashflow from farming activities in USD/month

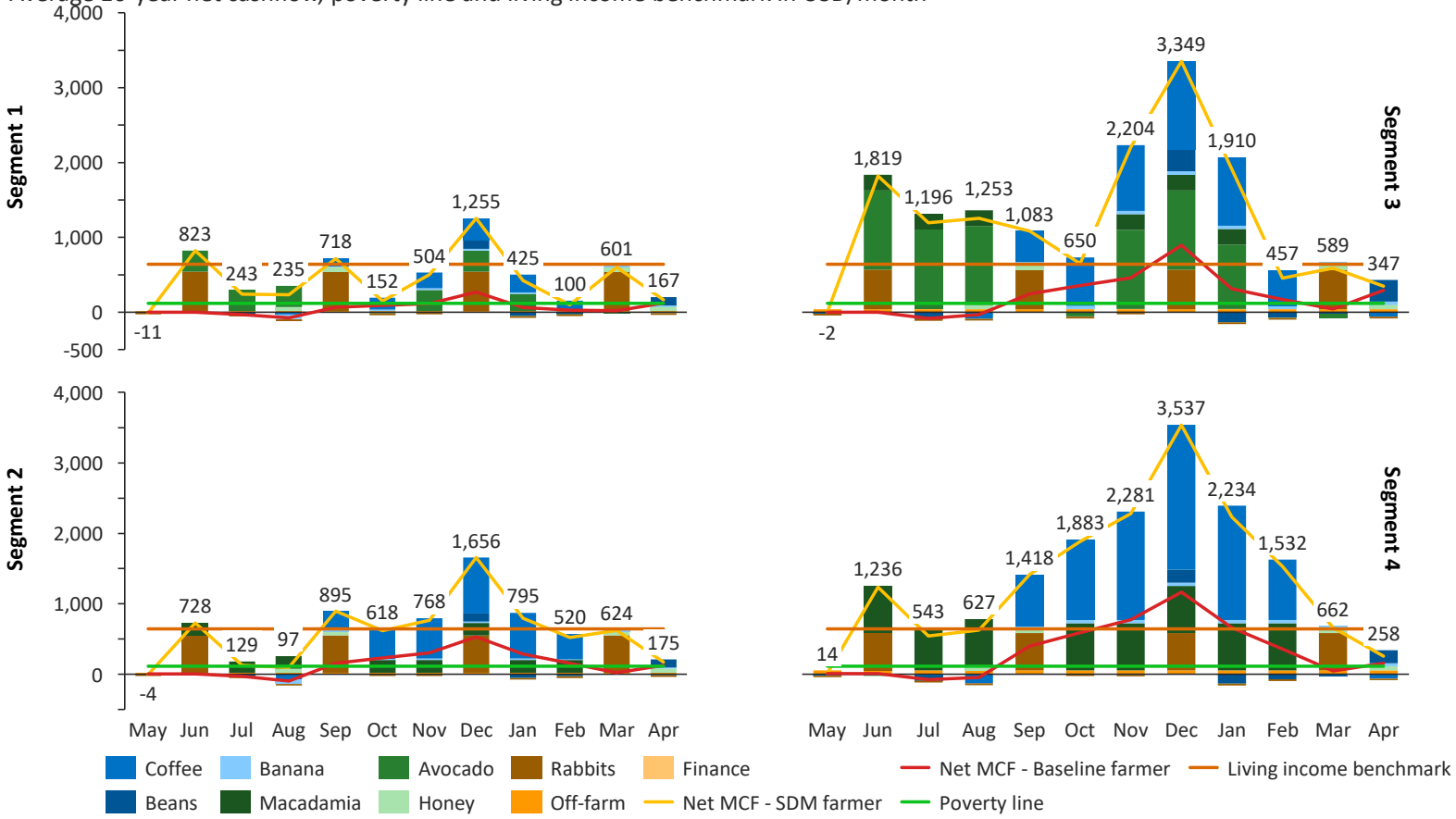


- Following the crop calendar, all segments for both baseline and SDM farmers have cash surplus during the harvest seasons.
- However, the baseline farmers experience cash shortage during the cultivation periods, while the SDM farmers who focus on a wide range of diversification activities can generate additional income during May and August, and February and March.
- Segment 1 and 3 farmers, who cultivate avocado do have a more precarious situation in March as they need to invest in avocado agro-inputs on top of expenses for rabbit production without any projected revenues in this month. Segment 2 and 4 farmers, who cultivate macadamia do not experience this additional burden and remain a positive cash flow. Farmers can however use their buffer from sales in November and December to smoothen this deficit.
- It is also important to note that revenues and expenses from beekeeping and rabbit farming are cyclical and should be planned to accommodate the smoothest cashflow patterns for the farmers (as demonstrated in the graphs here).

Diversification activities allow Segment 1 and 2 SDM farmers to earn above the monthly poverty line threshold and Segment 3 and 4 SDM farmers above the monthly living income benchmark

Segment 1, 2, 3 and 4 SDM farmers' monthly cash flows compared against baseline, poverty line and living income benchmark

Average 10-year net cashflow, poverty line and living income benchmark in USD/month

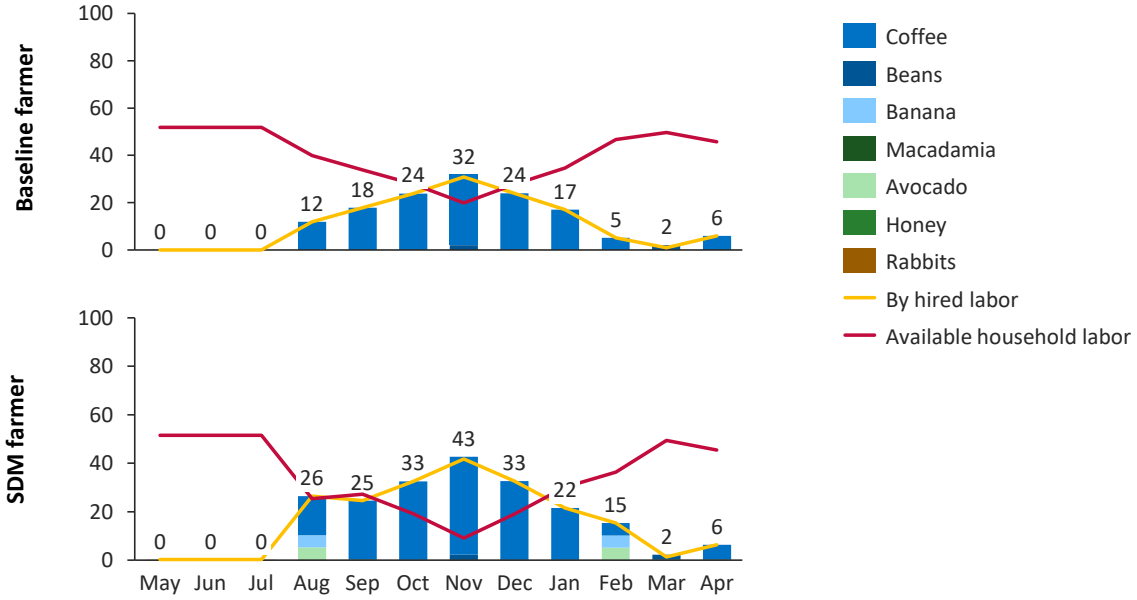


- The graphs on the left clearly show the importance of the cyclical returns of rabbit farming and the complimentary harvests of avocado and macadamia to provide an income throughout the year and to keep the household above the monthly poverty line threshold of $115.
- SDM segment 3 and 4 farmers can earn above the monthly living income benchmark of $641 nearly all year round, except in April and May.

While farmers appear to have enough available household labor to perform both coffee and diversification activities, most labor is currently hired. The surplus available labor could be used to reduce hired labor costs or generate additional off-farm income.

Segment 1 Baseline and SDM farmer monthly labor requirements

Average 10-year labor requirement in days/month



- The baseline farmer requires the most labor during the main coffee harvesting seasons, while SDM farmers mainly require additional labor in August and February for cultivation of avocado and banana.
- The household has 1.7FTE available per day, leading to +/- 52 days per month of available household labor.
- Although baseline and SDM farmer households appear to have enough household labor to cover the labor needs of both coffee and crop diversification, most of the labor for coffee and diversification activities is hired.
- The surplus of available labor could be used for either the reduction of hired labor costs or for the pursuit of off-farm activities to generate an additional income source.

4.4 Assumptions and methodology

Key assumptions and background information

This section:

- *Shows all assumptions used for the SDM operator*
- *Shows all assumptions used for the different farmer segments*
- *Explains the methodology of the Primary Data collection*
- *Explains the methodology of the Digital Transformation Assessment*

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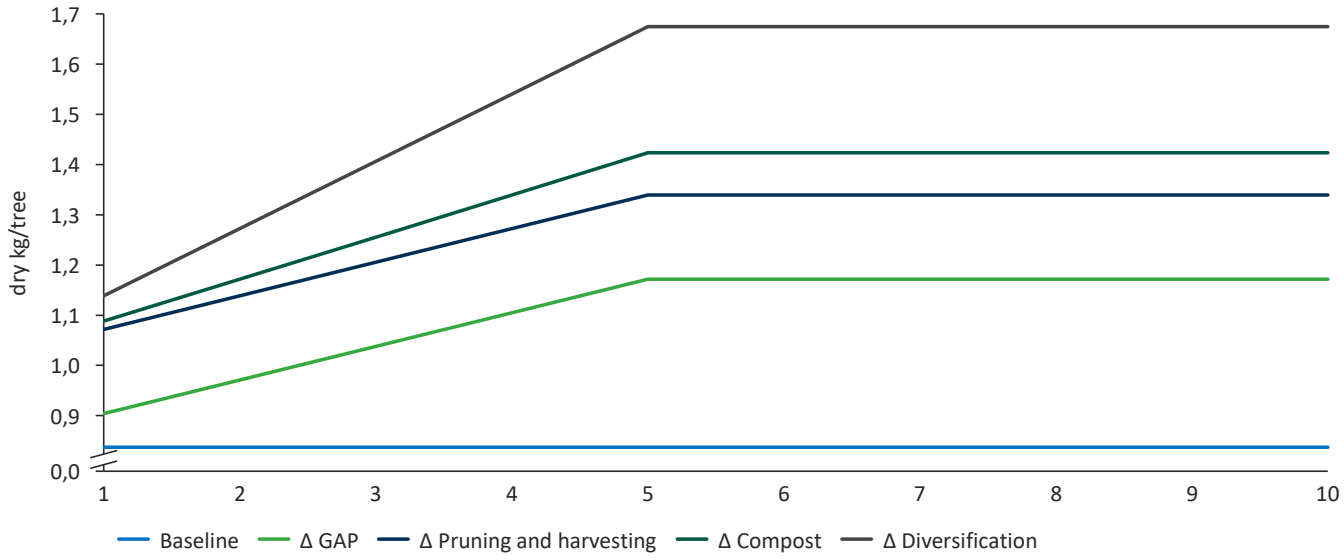
Coffee cherry yield-curve from GAP, professional pruning and harvesting teams, and regenerative agriculture practices

Segment 1 farmer yield curve of coffee dry kg/tree

10-year projection of dry kg/tree due to GAP, pruning and harvesting teams, compost and diversification



Δ GAP	20%	40%	60%	80%	100%	100%	100%	100%	100%	100%
Δ Pruning and harvesting	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Δ Compost	20%	40%	60%	80%	100%	100%	100%	100%	100%	100%
Δ Diversification	20%	40%	60%	80%	100%	100%	100%	100%	100%	100%

- SDM farmers receive training on GAP and have access to professional pruning an harvesting teams which allow the farmers to increase their yield with 40% and 20% respectively.
- Additionally, the regenerative agriculture practices which MH supports its farmers to implement would allow them to increase their coffee yield with 10% due to applying compost, manure, and micronutrients and 30% due to the planting of shade trees and covering the soil with beans.

Note: the starting yield of Segment 2, 3, and 4 is respectively 0.91,0.88 and 0.86 kg dry per tree.

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Effects from regen agri on farm performance

Shade/temperature

Macadamia trees are planted between the coffee rows whereas avocado trees are planted at the boundaries of coffee farm. The shade from macadamia trees will reduce and mitigate temperature increase, leading to a potential yield increase. Further, diversification with trees enriches the soil due to roots penetration of the soil, and water collection to keep the moisture levels sufficient.

Chemical -> Organic

*Keeping of rabbits, and collecting of droppings of them and other crop residues, farmers are able to make organic compost on their farm. The organic compost, in combination of applying EM2 fertilizers/crop protection, will reduce usage of chemical fertilizer and chemical crop protection from **year 4 onwards**.*

Beans and Bees

Beans are cultivated in midst of coffee plants. Beans function as a nitrogen fixator, enriching the soil to become more fertile and responsive to other inputs such as organic fertilizer.
Keeping of bees will increase the pollination of avocado/macadamia and crops in the farm

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Farmer P&L Assumptions

Variable	Segment_1	Segment_2	Segment_3	Segment_4
Coffee Farm size (acre)	0.80	0.80	3.00	3.00
Total farm size (acre)	1.4	1.4	3.6	3.6
Farm size for other crops (acre)	0.6	0.6	0.6	0.6
Coffee yield (parchment) – current (kg dry/tree)	0.84	0.91	0.88	0.86
Coffee yield (parchment) – optimal (kg dry/tree)	2.0			
Farm-gate price (UGX/kg dry parchment)	7,540			
Tree-density (trees/acre)	477	1,240	477	818
Coffee tree intensification	No			
Sales channel (%)				
Mountain Harvest	80%			
Middleman	20%			
Investment in drying facility	No	No	Yes	Yes
Investment in pulping facility	No	No	Yes	Yes
Maximum amount pre-financed by MH	30%			
EM2 on-farm production	Yes	Yes	Yes	Yes
Off-farm income	5% of total income			
Household size	7			

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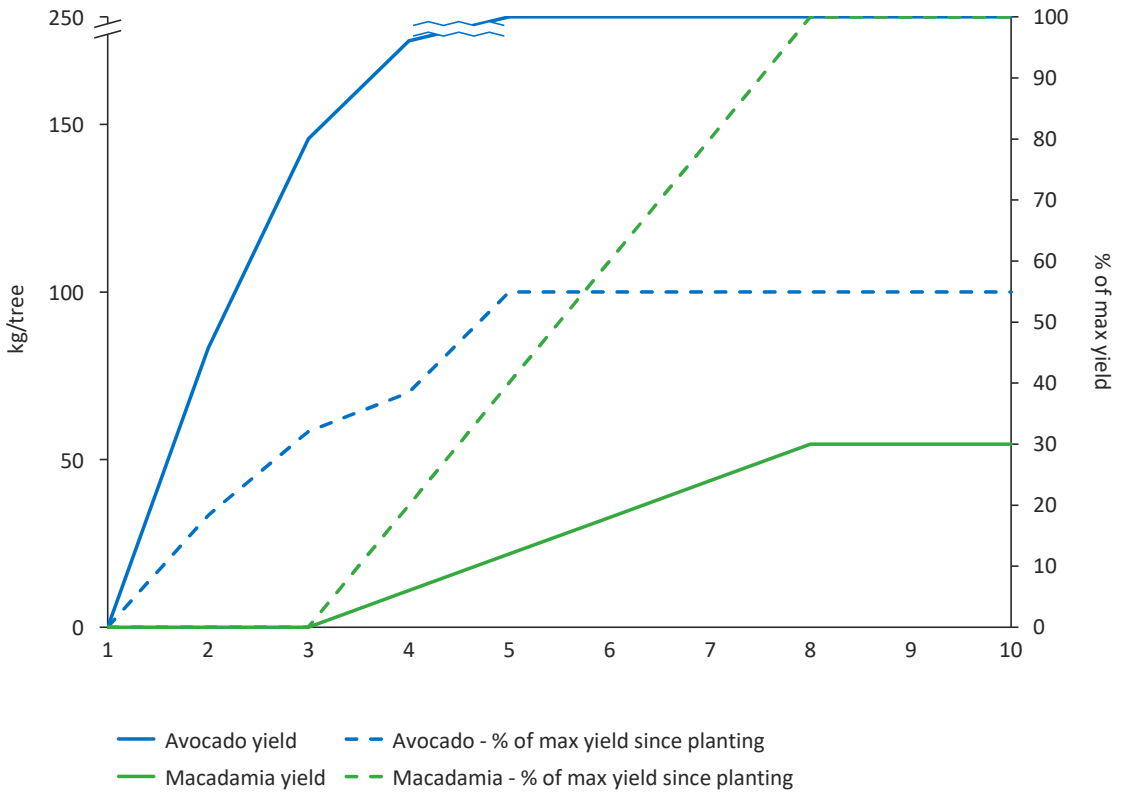
Farmer P&L Assumptions

Yield curve of avocado and macadamia

10-year projection of yield per tree in kg/tree and in % of max yield since year of planting



Variable	Value
Beans	**2021 →**
Farm-gate price	4,500 UGX/kg
Own consumption	50%
Banana	**2021 →**
Farm-gate price	5,000 UGX/kg
Own consumption	70%
Macadamia	**2021 →**
Farm-gate price	40000 UGX/kg
Own consumption	10kg
Avocado	**2021 →**
Farm-gate price	2500 UGX/kg
Own consumption	20%
Honey	**2021 →**
Farm-gate price	5,500 UGX/kg
Own consumption	20%
Rabbits	**2021 →**
Farm-gate price	20,000 UGX/kg
Own consumption	20%

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Farmer P&L Assumptions

RA implementation	1	2	3	4	5	6	7	8	9	10
Coffee	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Beans	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Banana	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Macadamia	25%	50%	75%	100%	100%	100%	100%	100%	100%	100%
Avocado	25%	50%	75%	100%	100%	100%	100%	100%	100%	100%
Honey	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Rabbit	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

RA financing strategy	1	2	3	4	5	6	7	8	9	10
Coffee	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer
Beans	MH	MH	MH	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer
Banana	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer
Macadamia	MH	MH	MH	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer
Avocado	MH	MH	MH	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer
Honey	MH	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer
Rabbit	MH	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer	Farmer

Living income benchmark methodology

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Living Income

Earning a living income means that all income sources from a farming household are sufficient to afford a basic but decent cost of living for a family

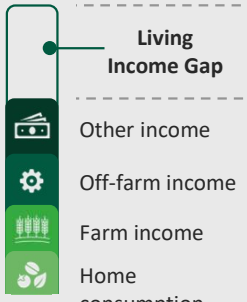
Living Income Benchmark

The Living Income Benchmark is equivalent to the cost of decent living for a family

Cost of a decent standard of living for a family

(specific to a time and place)

Living Income Gap



Actual income

To measure the Living Income Gap, **compare the living income benchmark with farmers' actual income** (earned by **all adult household members** from their own farming enterprise, as well as all other income sources).

Next steps

Once gaps are identified, you can take action through a smart-mix of solutions that include: delivering bundled services to farmers, adopting better procurement practices, collaborating with and beyond your trade partners, innovating through brand and consumer engagement, and embracing transparency

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