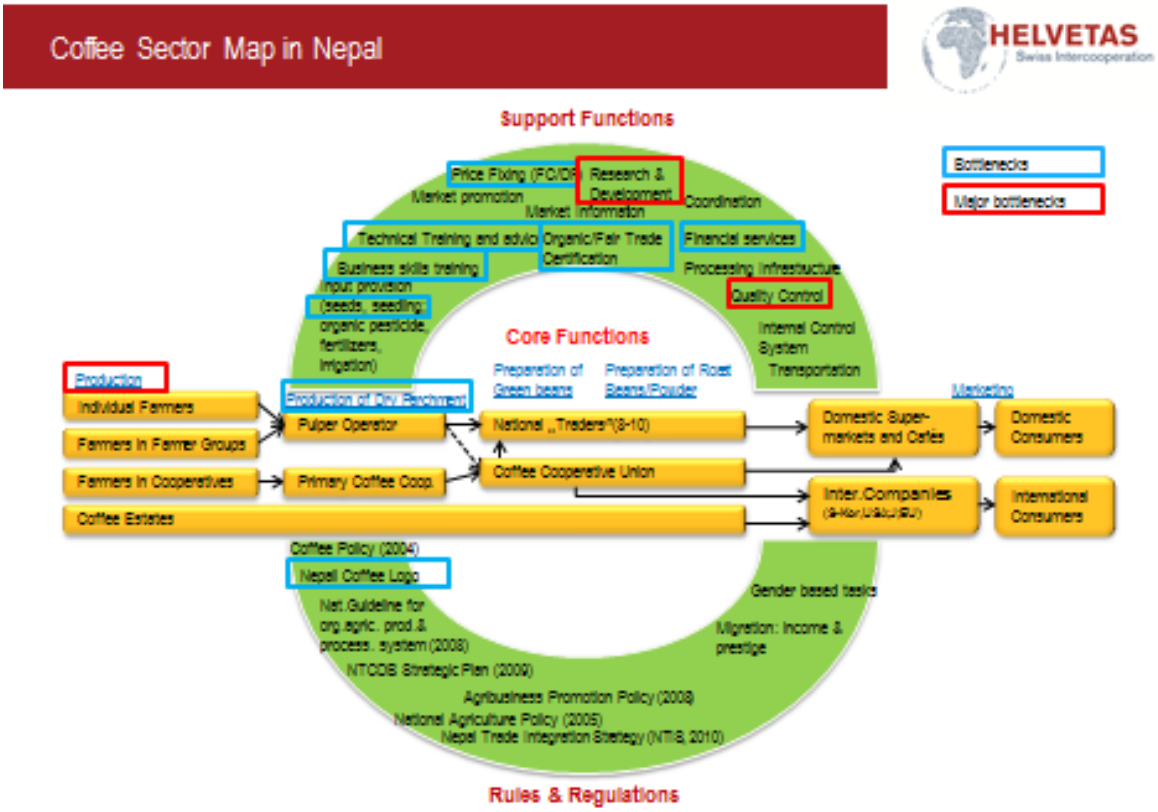
Coffee Sub Sector Assessment - Nepal

Source: HELVETAS Swiss Intercooperation Nepal 2016

Step 1: Map core functions, support functions and rules/regulations in the selected market system



Process: The coffee sector map in Nepal was developed by the Coffee Promotion Programme team in collaboration with a market systems development expert in the process of a coffee sub-sector analysis

Step 2: Identify current and future hazards, impacts and current coping strategies

Result Step 2a: Identification and prioritization of hazards (see below; in **red** prioritized hazards)

Hazard Group	Hazard Sub-Group	Hazard Type	Hazard Sub-Type		Prioritization			
					Author	Group 1	Group 2	Group 3
Natural	Meteorological	**Changing temperature**	**Increase**/Decrease			3	3	3
			Diurnal variation			1	3	2
			Seasonal variation			1	1	1
		Changing precipitation	Increase/**Decrease**			3	3	3
			Seasonal variation			1	1	1
			Timing			1	1	1
		Changing humidity	**Increase**/Decrease			3	3	3
		Storm	Tropical storm		0			
			Extra-tropical storm		0			
			Convective storm	Derecho	0			
				Hail		2	1	1
				Lightning/ thunderstorm		1	1	1
				Rain		1	1	1
				Tornado	0			
				Sand/ dust storm	0			
				Winter storm/blizzard	0			
				Storm/surge	0			
				Wind		1	1	1
		Extreme Temperature	**Cold wave**			1	1	1
			Heat Wave			1c/2p	1	1
			Severe winter conditions	Snow/ice	0			
				Frost/freeze		2	3	1
		Fog/dew				1	2	2
	Hydrological	Flood	Coastal flood		0			
			Riverine flood			1	1	1
			Flash flood			1	1	1
			Ice jam flood		0			

Hazard Group	Hazard Sub-Group	Hazard Type	Hazard Sub-Type	Prioritization			
				Author	Group 1	Group 2	Group 3
		Landslide	**Avalanche (snow, debris, mud, rock fall)**		**1c/2p**	**1**	**1**
		Wave action	Rogue wave	0			
			Seiche	0			
	Climatological	**Drought**			**3**	**2**	**3**
		Glacial Lake outburst		0			
		Wildfire	**Forest fires**		**1c/2p**	**1**	**1**
			Land fire: Brush, bush, pasture		**1c/2p**	**1**	**1**
	Biological	Epidemic	**Viral diseases**		**1**	**1**	**1**
			Bacterial diseases		**1c/2p**	**1**	**1**
			Parasitic diseases		**1**	**1**	**1**
			Fungal diseases		**3**	**2c/3p**	**1c/2p**
			Prion diseases	0			
		Insect infestation	**Locust/Grasshopper/Other insects**		**3**	**1c/3p**	**2**
		Animals			**1**	**1**	**1**

Source: Test results, HELVETAS Swiss Intercooperation Nepal 2016

Explanation:
Prioritization: 0= not relevant; 1= lowest priority; 2= medium priority; 3= highest priority;
C= current; P= potential

Description of Groups:

Group 1: Coffee Promotion Programme team of HELVETAS Swiss Intercooperation: all experts in the coffee field with long term experience in different aspects of the coffee sub-sector: production, processing, marketing, policy;

Group 2:,Members of the Phung Phung Jharna Primary Coffee Cooperative, Madanpur and Laxya Primary Coffee cooperative, Kumari and Representatives of the Coffee EstatesLekhali/Alpine/Prasiddha; in Madanpur

Group 3: Representatives of the District Coffee Cooperative Union Nuwakot, Members of the Binayek Primary Coffee Cooperative, Kabilas-4, Nuwakot.

Result Step 2b: Hazards, impacts and coping strategies

Hazards	Intensity	Frequency	Observed Trends[1]	Future Trends[2] Possible Evolution under climate change	Impacts	Severity[5] (% of project area affected)	Current coping strategies	Is the strategy sustainable ? If not why?
Increasing temperature	Maximum temperature increasing at 0.05° C/year (1976-2005); minimum temperature at 0.03° C /year).	-	Coffee farmers observed increasing temperature since their childhood; based on data analyses a general increasing trend in temperature has been found; farmers in many areas observed increasing temperatures based on observations on plants and animals	Average annual temperature will increase by 1.7°C to 2.6°C by the year 2050; higher increments in Western and Central Nepal than in Eastern Nepal	Higher humidity, coffee less suitable in lower areas/more suitable in higher areas (→ altitude shift); requires change in management	100%; particularly in lower lying areas (about 25%) (below 1000 meters)	• Provision of shade with shade plants and their proper management • Mulching/ moisture management practices • Proper plantation planning (slope, orientation, elevation)	Yes
Changes in precipitation (decrease and drought)	Increased precipitation in most of the country (except Western Development region)	-	Coffee farmers observed decreasing precipitation since their childhood; Eastern, central, western and far western regions showed an increasing trend in annual precipitation while most of the mid Western development region observed a decreasing annual precipitation trend; droughts were not observed; water availability decreased as shown by drying up springs and lower yields	Annual precipitation will increase by 4% to 8% (up to 120 mm more per year) by the year 2050; increase in monsoon and post-monsoon precipitation and decrease in winter precipitation	Loss in production; increased occurrence of insect pests	100%; particularly South facing slopes are earlier and more affected	• Provision of shade with proper species of shade plants and their proper management • Irrigation/moisture management practices e.g. cradle pits • Water harvesting • Mulching • Discourage planting in south facing land	Yes
Increasing humidity	-	-	Farmers observed increasing trends, however no data could be found	No mention in the relevant literature, but assumed to get higher with increasing temperatures	Increased occurrence of fungal diseases	100%; particularly in North facing slopes and areas with too much shade	• Proper plantation planning (slope, orientation, elevation)	Yes

Hazards		Intensity	Frequency	Observed Trends[1]	Future Trends[2] Possible Evolution under climate change	Impacts	Severity[5] (% of project area affected)	Current coping strategies	Is the strategy sustainable ? If not why?
Fungal diseases	Coffee Leaf Rust	Depending on districts: some districts have not observed (Nuwakot, Palpa, Gulmi, Sindhu-palchowk), while others are already heavily affected (Lalitpur, Kaski, Shyangja and Kavre)	High frequency observed in districts with reported attacks	Increasingly coffee leaf rust has become an issue	Directly related to increasing temperature and humidity, therefore expected increase in fungal disease occurrence	Can wipe out total coffee production in an area (as for example happened in other countries like in Sri Lanka.	100%; particularly in North facing slopes and areas with too much shade	• Removal of (burning) infected leaves and parts • Application of cattle urine based liquid manure • Application of Bordeaux Mixture [1] • Planting resistant variety (ies). • Shade management	Yes
	Mould in processed coffee (parchment, green beans)	Depending on the moisture content on the parchment and air circulation in the storage	Depends on processing management	Increasing trend in poorly managed storage and increasing issues of inconsistent quality.	Directly related to increasing temperature and humidity, therefore expected increase in fungal disease occurrence	Can render a consignment useless	100%; in high moisture content (> 13 % moisture in parchment), and damp store; use of plastic bags for packing parchment	• Proper drying of parchment (11-12% moisture) • Good storage (aeriation, avoid from physical contact to moist wall, temperature regulation) • Jute bag used for packing parchment.	Yes

[1] **Bordeaux mixture** (also called Bordo **Mix**) is a **mixture** of copper(II) sulfate ($CuSO_4$) and slaked lime ($Ca(OH)_2$) used as a fungicide. It is used in vineyards, fruit-farms and gardens to prevent infestations of downy mildew, powdery mildew and other fungi (Wikipedia)

Hazards		Intensity	Frequency	Observed Trends[1]	Future Trends[2] Possible Evolution under climate change	Impacts	Severity[5] (% of project area affected)	Current coping strategies	Is the strategy sustainable ? If not why?
Insect infestations	White Stem Borer	Depending on elevation zones (more affected in low lying plantations) and districts (heavily affected: Lalitpur, Gulmi, Kaski, Palpa)	High frequency observed in districts with reported attacks	Increasing infestation, reducing production and productivity, becoming national issue.	Directly related to poor management of infested plants, shade, moisture and nutrients, expected to increase in areas where water is scare; expected increase in white stem borer infestation with increasing temperature	Can wipe out coffee production at large scale (e.g. drastic loss in production in Lalitpur, Gulmi and Palpa)	100 % wipe out of orchard in poorly managed plantation as it happened in Gulmi and Palpa.	Precaution: • Provision of shade with shade plants and their proper management • Irrigation/moisture management • Nutrient management Management: • Immediate removal or burning of affected parts/plants • Scrubbing of main trunk and use of mud and cattle dung paste	Yes, but needs to be rigorously implemented to be effective

Source: Test results, HELVETAS Swiss Intercooperation Nepal 2016

[1] Practical Action (2005) Temporal and Spatial Variability of Climate Change Over Nepal (1976 - 2005); SSMP (2010) Climate Change in the mid hills of Nepal – fact or fiction?.from a farmer's perspective

[2] Ranjitkar et al. (2015) Projected climate change impacts on climatic suitability and geographical distribution of banana and coffee plantations in Nepal; Government of Nepal (2010) National Adaptation Programme of Action.

Process: This table is the result of a combination of activities: Firstly, the author excluded the irrelevant climate hazards based on her/his understanding of the sub-sector. With the help of different stakeholder groups the author prioritized the most important climate hazards. The prioritized climate hazards, their impacts and coping strategies are discussed based on the stakeholder discussions, experts' inputs and the literature.

Results Step 2c: Comparison of hazard and crop calendars

Hazard	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Local Calendar	**P**	**M**	**F**	**C**	**B**	**J**	**A**	**S**	**B**	**A**	**K**	**M**
Precipitation – High amounts				X	X	X	XX	X	X	X		
Precipitation – Low amounts	XX	XX	X								X	XX
Temperature - High				X	XX	XX	X	X	X			
Temperature - Low	XX	X										XX
Insect infestation				X	XX				X	XX		
Fungal diseases			X	X			X	X				
Crop	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Local Calendar	**P**	**M**	**F**	**C**	**B**	**J**	**A**	**S**	**B**	**A**	**K**	**M**
Seeding in nursery		X	X									
Planting of seedlings						X	X					
Harvesting	X	X	X									X
Pulping	X	X	X									X
Hulling			X	X	X							

Source: Test results, HELVETAS Swiss Intercooperation Nepal 2016

Explanation:

Nepali Calendar: Poush, Magh, Falgun, Chaitra, Baisakh, Asaadh, Shrawan, Bhada, Asoj, Kartik, Mangshir
x = "normal"; xx= very strong

Step 3: Identify each function's vulnerability to climate risks

Result: Market functions and climate risks (see below)

Functions (see Step 1)		Climate risk impact	Relevant climate risks (see Step 2)	Remarks on impacts
Core	Production	--	Increased temperature; decreased precipitation and drought; increased humidity; fungal diseases; insect infestation	Reduced yield per plant; increased mortality of plants; lower quality of the fresh cherries Shift in production area: shifting altitudinal belt; overall expected reduction in production area
	Pulping	-	Increased temperature; increased humidity; fungal diseases; insect infestation	Changed processing management
	Storage	--	Increased temperature; increased humidity; fungal diseases	Increased chances of fungal diseases (mould)
Support	Seedling production	--	Increased temperature; decreased precipitation and drought; increased humidity; fungal diseases; insect infestation	Increased mortality of seedlings
Rules/ Regulations	-		-	-

Source: Test results, HELVETAS Swiss Intercooperation Nepal 2016

Process: The climate risk relevant market functions were identified in consultation with the Coffee Promotion Programme expert team.

Step 4: Identify most climate resilient value chains based on a scoring matrix

Result: Climate relevant market functions (see below)

Category	Criteria	Weighting	Sub-sectors		Remarks
			Coffee	Banana	
Poverty Reduction Potential	Number of households engaged in the sector		1	2	Commercial farmers only
	Severity of poverty facing those engaged in the sector		2	1	Due to short production cycle poor can produce on leased land
	Potential for participation of women in the sector		1	2	Banana is more labour intensive
	Potential for participation of youth in the sector		2	1	Due to short production cycle banana is more investment friendly
	Possibility for the target group to improve income / access to jobs		2	1	
Economic Growth Potential	Previous growth trajectory (last 5 years)		2	1	
	Forecast for growth in the next 5-10 years		1	1	
	Import substitution potential		2	1	Large quantities of banana is imported currently from India
	Export potential		1	2	Coffee is mainly produced for export markets
	Level of competitiveness		1	2	Coffee has very good market potential
Potential to facilitate systemic change	Level of consistency with public/national priorities, government interest		1	2	Coffee is a crop mentioned in the National Trade Integration Strategy
	Private sector interest		1	2	
	Presence of potential lead firms		1	2	
	Availability of partners/champions with leverage		1	2	More capacity of local resource persons available for coffee
	Availability and capacity of service providers				
Climate change	Negative impacts of future climate trends		2	1	Changing climate produces lower quality of coffee
	Positive impacts of future climate trends		2	1	Potential banana growing area expanding
	Likely investment costs in risk reduction relative to actors' annual income and capital stock		2	1	
	Investment horizon: by when are the climate impacts expected to be felt? By when should the risk reduction or adaptation investments be made? How long are the benefits expected to last?		2	1	Banana provides return already after 15 months, coffee only after 4-5 years
	Flexibility: is the option flexible (does it allow for switching to other options that might be preferable in the future once more is known about the changing climate)		2	1	
Further considerations					
TOTALS			29	**27**	

MODULE B – IDENTIFICATION AND IMPLEMENTATION OF ADAPTATION AND DISASTER RISK MANAGEMENT MEASURES

Step 5: Identify possible adaptation to climate change and disaster risk management measures

Result: Possible adaptation to climate change and disaster risk management measures

Functions (see Step 1)		Relevant climate risks (see Step 2)	Remarks on impacts	Adaptation to climate change and disaster risk management measures
Core	Production	Increased temperature; decreased precipitation and drought; increased humidity; fungal diseases; insect infestation	Reduced yield per plant; increased mortality of plants; lower quality of the fresh cherries Shift in production area: shifting altitudinal belt; overall expected reduction in production area	• Varietal selection and research • Intercropping • Proper shade tree management/shade tree plantation • Moisture management/rain water harvesting • Altitude shift (above 1000 meters)
	Pulping	Increased temperature; increased humidity; fungal diseases	Changed processing management; decreased fermentation duration, Increased chances of fungal diseases (mould)	• Improved pulping facilities like clean water for washing • Improve drying system with clean drying yard: drying table • Appropriate storage facility (i.e. well ventilated room, prevent from moisture and bad odour)
	Storage	Increased temperature; increased humidity; fungal diseases	Increased chances of fungal diseases (mould)	• Appropriate storage facility (i.e. well ventilated room, prevent from moisture and bad odour)
Support	Seedling production	Increased temperature; decreased precipitation and drought; increased humidity; fungal diseases; insect infestation	Increased mortality of seedlings	• Priority to onsite nursery development • Shift in altitude (above 1000 meters)
Rules/ Regulations	-	-	-	-

Source: Test results, HELVETAS Swiss Intercooperation Nepal 2016

Process: The possible adaptation to climate change and disaster risk management measures were identified in a stakeholder meeting involving government, civil society and private sector stakeholders substantiated by the Coffee Promotion Programme experts.

Step 6: Prioritize and choose the best/most appropriate measures

Result: Possible adaptation to climate change and disaster risk management measures

Market functions	Adaptation to climate change and disaster risk management measures	Effectiveness in enhancing resilience	Cost	Feasibility	Sustainability	Further criterion?	Overall evaluation (total)
	Transferred from the Step 5 → Possible adaptation and risk management options	*Explain how effective the option is enhancing resilience and score with* *(0) not effective, (1) effective, (2) very effective*	*Explain how costly the option is and score with high costs (0), medium costs (1), low costs (2)*	*Explain how feasible the option is to implement and score with not feasible (0), feasible (1), very feasible (2)*	*Explain how sustainable the option is and score with e.g. low (0), medium (1), high (2)*	*Explain and score the options to the criterion of your choice accordingly*	*Make an overall assessment of the option with regard to the outcome of the criteria scoring Cost/benefit considerations shall be taken into account*
Production	Varietal selection and research	2	0	1	2	1 This option definitely needs to be taken up in the medium to long run, but may face major hurdles in terms of financing	6, Priority if financing can be identified
	Intercropping	1	2	2	2	2 Farmer can easily adopt the practice.	9 , Priority for CoPP
	Proper shade tree management/shade tree plantation	2	2	2	2	2 Shade management has been a major thrust for years and needs continuation	10, Priority for CoPP
	Moisture management/rain water harvesting	1	1	2	2	2 Coffee has generally been promoted on marginal land, which often does not have access to irrigation water. In-situ moisture management and water harvesting technologies need to be further promoted through technical service providers	8, Priority for CoPP in collaboration with the Integrated Water Resources Programme
	Altitude shift (above 1000 meters)	2	2	1	2	2 Shift in altitude up to frost free zone	9, Priority for CoPP and TPSD
Pulping	Improved pulping facilities like clean water for washing, drying facilities	1	1	2	2	2 Improvement of drying facilities (pre –drying table and drying floor) Alternative processing method (semi washed) in water scarce area.	8, Priority for TPSD
Storage	Appropriate storage facility (i.e. well ventilated room, prevent from moisture and bad odour, use of jute bag	2	1	2	2	2 Storage facilities to be upgraded in all pulping centers	9, Priority for TPSD and Revive Coffee

	for packing)						
Seedling production	Priority to onsite nursery development	2	2	2	2	2 Priority should be given to develop onsite nursery.	10, Priority for TPSD
	Shift in altitude (above 1000 meters)	1	2	1	2	2 Nursery development should get priority to 1000+ altitude.	8, Priority for CoPP and TPSD

Source: Test results, HELVETAS Swiss Intercooperation Nepal 2016

Process: The scoring was conducted in consultation with the Coffee Promotion Programme expert team

Step 7: Plan and implement selected measures

Result: Sustainability matrix with prioritized adaptation measures

Functions	Activities to implement adaptation to climate change and disaster risk management measures	Immediate		Longterm		Necessary interventions (including actors)
		Who will do it?	Who will pay?	Who will do it?	Who will pay?	
Production	Implement varietal selection and research	NARC	TPSD/GoN/ NARDF	NARC	GoN /NTCDB	Development of a research plan (NARC); Implementation of research plan (NARC and NTCDB)
	Promotion of intercropping	Technical service providers	NTCDB	Technical service providers	Primary Coffee Cooperatives	Documentation of potential technologies (CoPP/NTCDB/DADO/CTDS); Mobile phone based extension system development (CoPP); Capacity development of technical service providers (CoPP/TPSD/NTCDB/CTDS)
					Estates	
	Promotion of proper shade tree management/shade tree plantation	Technical service providers	NTCDB	Technical service providers	Primary Coffee Cooperatives	
					Estates	
	Promotion of moisture management/rain water harvesting technologies	Technical service providers	Primary Coffee Cooperatives	Technical service providers	Primary Coffee Cooperatives	
			Estates		Estates	
	Altitude shift (above 1000 meters)	Primary Coffee Cooperatives from Technical service providers	Primary Coffee Cooperatives with subsidies from NTCDB	Primary Coffee Cooperatives	Primary Coffee Cooperatives	Circulation of guidelines for (mandatory) shift in coffee plantation (NTCDB); Reorientation of Technical service providers (NTCDB)
		Estates with support from Technical service providers	Estates	Estates with support from Technical service providers	Estates	
Pulping	Improved pulping facilities like clean water for washing, drying facilities	Primary Coffee Cooperatives	TPSD	Primary Coffee Cooperatives	Primary Coffee Cooperatives	Present specifications for the facility (CoPP); Facilitate access to finance (CoPP)
		Estates	Estates	Estates	Estates	
	Appropriate storage facility (i.e. well ventilated room, prevent from moisture and bad odour, provision of jute bag)	Primary Coffee Cooperatives from Technical service providers	Revive Coffee in earthquake affected districts, TPSD	Primary Coffee Cooperatives	Primary Coffee Cooperatives with credits from banks and finance institutes	Present specifications for the facility (CoPP); Facilitate access to finance (CoPP)
		Estate with support from Technical service providers	Estates with credits from banks and finance institutes	Estates	Estates with credits from banks and finance institutes	
Storage	Appropriate storage facility (i.e. well ventilated room, prevent from moisture and bad odour, jute bag packing)	District Coffee Cooperative Union	TPSD	District Coffee Cooperative Union	District Coffee Cooperative Union with credits from banks and finance institutes	Present specifications for the facility (CoPP); Facilitate access to finance (CoPP)
		Traders	Traders With credits from banks and finance institutes	Traders	Traders With credits from banks and finance institutes	

Seedling production	Priority to onsite nursery development	Primary Coffee Cooperatives	Primary Coffee Cooperatives	Primary Coffee Cooperatives	Primary Coffee Cooperatives	
		Estate	Estate	Estates	Estates	
	Shift in altitude (above 1000 meters)	Estates with support from Technical service providers	Estates	Estates with support from Technical service providers	Estates	Circulation of guidelines for (mandatory) shift in coffee plantation (NTCDB) Reorientation of Technical service providers (NTCDB)

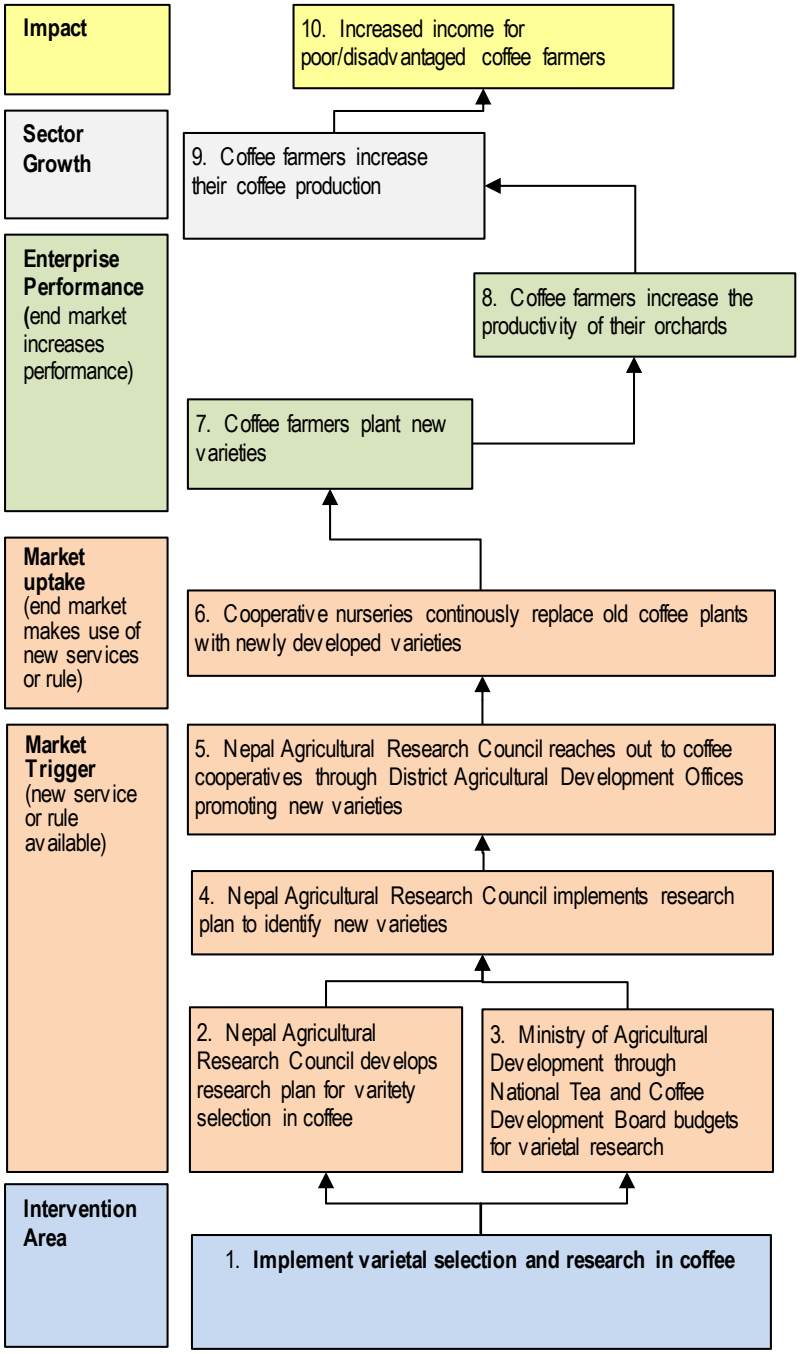
Source: Test results, HELVETAS Swiss Intercooperation Nepal 2016

Process: The sustainability matrix was developed in consultation with the Coffee Promotion Programme expert team. It will still have to be discussed with relevant stakeholders.

Step 8: Monitor and measure results

Results Chain for the Value chain of coffee – for the outcome implement varietal selection and research in coffee

Nepal Coffee Sector Climate Change Intervention Logic



Measurement Plan

Indicator	Definition	Baseline	Tools	Time	Remarks
-	-	-	-	-	
The annual plan of NARC includes a plan for varietal research on coffee		No research planned	Review of NARC annual plan	Annually in June	
The Ministry of Agricultural Development sets aside NPR 10,000,000 annually		No budget	Review of Government budget	Annually in June	
NARC implements a research project for varietal selection	Documented progress	No project	Review of NARC annual report	Annually in July	
NARC presents research results regularly to 12 District Agriculture Development Offices	Communications (meetings and publications)	0	Review of NARC annual report	Annually in July	
Number of Primary Coffee Cooperatives' nurseries in 12 districts that plant annually an increasing number of saplings of new varieties	Cooperatives	0	Review of District Coffee Cooperative Unions' annual report	Annually in July	
Number of farmers that plant the promoted, new varieties	Women and men (disaggregated)	0	Review of District Coffee Cooperative Unions' annual report	Annually in July	
Increased coffee orchard productivity	Tons of coffee per hectare	0.6	Review of District Coffee Cooperative Unions' annual report	Annually in July	National proctivity of coffee is reported as 300 kg Green Bean per hectare. Whereas CoPP working districts have 600 kg Green Bean per hectare.
Increased coffee production	Tons of coffee	133	Review of District Coffee Cooperative Unions' annual report	Annually in July	Total Production in CoPP 12 districts is 215 ton Green Bean of which 62 percent was produced by the Cooperative members which becomes 133 ton Green bean as base.

Increased coffee famers' income	Nepali Rupees	8303	Review of District Coffee Cooperative Unions' annual report	Annually in July

Note:
Total National Production is 463.5 ton Green Bean for year 2015