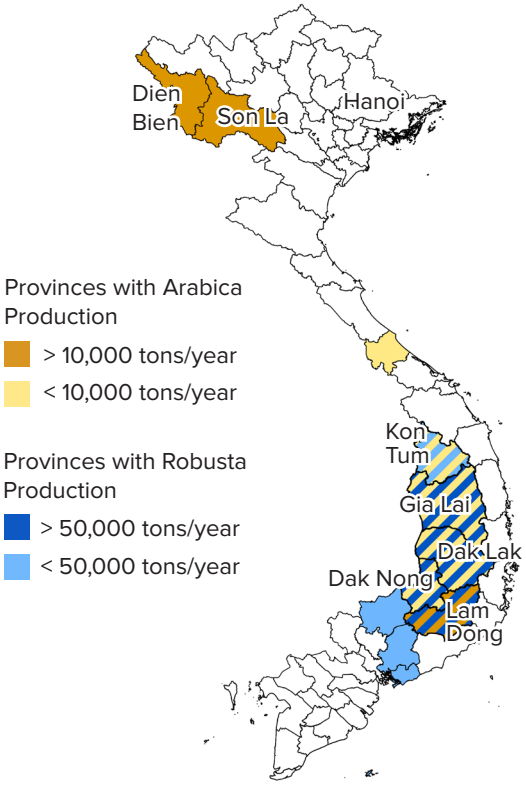
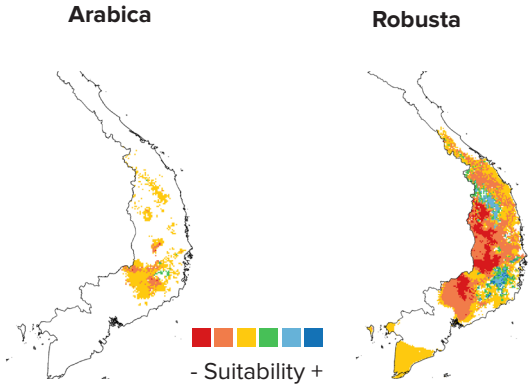
COFFEE PRODUCTION IN THE FACE OF CLIMATE CHANGE: **VIETNAM**

KEY PRODUCTION AREAS IN VIETNAM



About 90% of coffee is produced in the Central Highland provinces Dak Lak, Lam Dong, Dak Nong and Gia Lai.[2]



Changes in suitability between today and 2050 [7]

OBSERVED AND PREDICTED EFFECTS OF CLIMATE CHANGE IN COFFEE PRODUCING AREAS [6,7,8,9,10]

Rising Temperatures

- Annual mean temperature expected to increase by 1.8°C by 2050
- Increase in hot days and nights and decrease in diurnal temperature range

Changing Seasonality

- Longer rainy season
- More days with very little rain in the dry season

Changing Rainfall

- Slight increase in rainfall, with more rain in the wet and less rain in the dry season

Extreme Weather Events

- More frequent heavy rainfall events in the wet season
- Droughts becoming more frequent and intense

LIKELY IMPACTS OF CLIMATE CHANGE ON COFFEE PRODUCTION

Predicted changes in coffee producing areas:

- Over 20% of the area suitable for Arabica coffee today is expected to become unsuitable by 2050.[8]
- The altitudinal range for Robusta cultivated in the Central Highlands will likely shift from today's 300-900m to 600-1,000m by 2050. Suitability below 550m will decline sharply.[10]
- The loss of suitable area for Robusta will be biggest in Gia Lai and Dak Lak the provinces, with about 30% of the currently suitable area. Lam Dong and Dak Nong will remain suitable, with higher areas becoming more suitable.[10] However, these areas are likely forested or used for other crops, i.e. not available for coffee.
- Overall, about 100,000 farmers may have to have to transition to other crops. Adaptive measures on the remaining land require additional investments.

THE IMPORTANCE OF COFFEE IN THE VIETNAMESE AGRICULTURAL SECTOR [1,2,3]

Coffee production and export in 2017/2018

- Arabica: 90,000 tons
- Robusta: 1.68 million tons
- 90% exported in the form of green beans

Area under coffee production

Arabica
90,000 ha

Robusta
600,000 ha

Farms

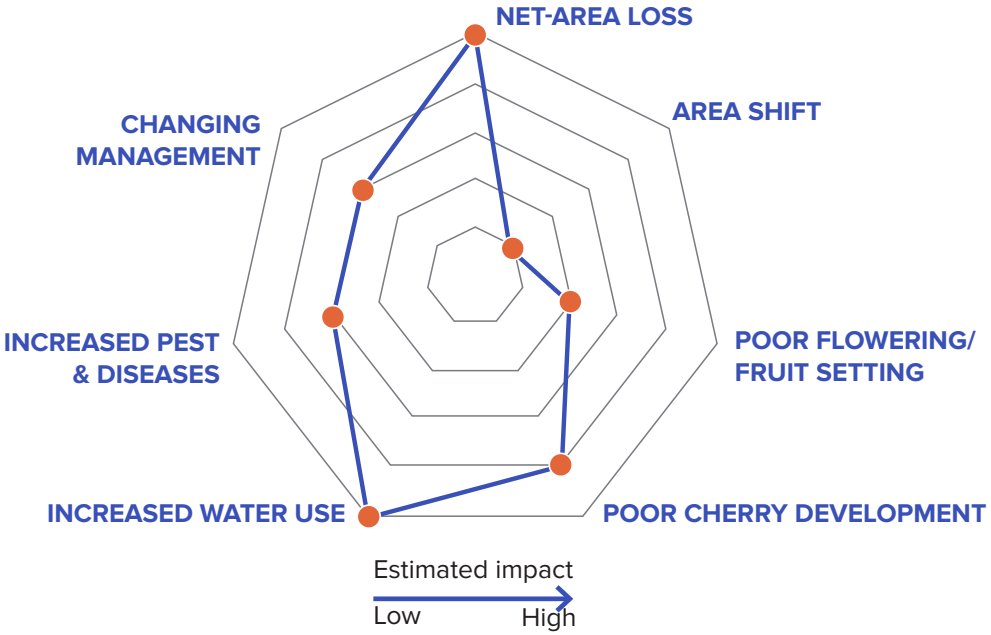
- 600,000 smallholders (~ 1ha) produce 95% of coffee

Importance in the national economy

Coffee generates:

- 1.5% of export revenues
- 3% of gross domestic product
- Is the 2nd most important agricultural commodity

LIKELY IMPACTS OF CLIMATE CHANGE ON COFFEE PRODUCTION



Water demand for irrigation under business as usual is expected to increase times, leading to: [12]

- Reduced stream flow and seasonal depletion of aquifer.
- Water shortages are forecasted every 5 years and acute shortages every 10 years.
- Rainfall late in the dry season may hinder pollination, causing reduced and heterogeneous fruit setting.
- The prolonged wet season can make sun-drying difficult and lead to reduced quality unless farmers invest into drying facilities.
- Rising temperatures result in additional life cycles of the Coffee Berry Borer.
- The lower diurnal temperature range creates more favorable conditions for Coffee Leaf Rust, allowing the fungi to spread faster, causing more damage.[6]

PRODUCTION STANDARDS AND PRACTICES

CERTIFIED PRODUCTION

- More than 25% of producers are certified according to sustainability standards: 4C, UTZ/Rainforest Alliance.
- Only 10% of coffee is exported as certified.

FARM PRACTICES

- Coffee is cultivated in mono-cropping and with Black Pepper. Shade trees rarely exist.
- Farmers rely heavily on fertilizer and irrigation - often using too much.
- An estimated 50% of irrigation needs are covered from groundwater. Water is pumped from private wells and without any control of quantity used.[4]
- Coffee cherries are mostly sun-dried.

FARM ECONOMY

- Yields are high with an average of 2.4 tons/ha.[3]
- Low cost production using family labor.
- The biggest cost items are fertilizer (46%), harvest (22%) and irrigation (13%; includes labor and energy, water is free).[5]
- Farmers receive an estimated 95% of the export price, the highest share worldwide.[3]

CLIMATE CHANGE ADAPTATION:

STRENGTHS

Technical aspects

The potential of using less water without compromising yield has been proven by science and early adopters.

Ongoing research focuses on more precise weather forecasts, groundwater availability and managed aquifer recharge.

Good practice manuals for coffee provide common guidance for all extension service providers (national, private, project), including key practices such as saving water in irrigation and prudent use of agro-chemicals.

Economic aspects

Field trials and past projects prove the economic and environmental benefits of using less but high-quality fertilizer and reduced water use.

Organizational aspects

Various projects and private sector already promote good agricultural practices which have climate change adaptation benefits.

Government agencies and parastatals are actively promoting sustainable development through research, plant breeding, and concessional finance.

The Vietnamese Coffee Coordination Board provides an important platform for coordination within the sub-sector and across ministries.

Political aspects

Political will for adjustments in the sector exists, expressed e.g. in the Master Plan for Agricultural Production Development, the Nationally Determined Contribution to climate change mitigation and adaptation, and the National Action Programme on REDD+:

- Promoting improved irrigation technologies and supporting farmers in coffee renovation
- Modernization of the hydro-meteorological observation system and forecasting technology
- Further expansion of agriculture into current forest land is expected to be minimal with REDD+ implementation

OPPORTUNITIES

Technical aspects

About 50% of the coffee growing area is stocked with old trees.[4] These can be gradually replaced with more suitable varieties.

Economic aspects

High-value crops such as Black Pepper and fruit trees are suitable for intercropping, helping to diversify farm income.

The potential to reduce cost and increase yield by adopting best irrigation and fertilization practices is a viable incentive for farmers.

Organizational aspects

The establishment of wells and the use of water resources concerns everyone within a given farming community. The potential to establish community-based monitoring systems ensuring equitable and sustainable use of water should be explored.

Existing integrated/landscape level approaches, e.g. as described in the "adaptation highlight" for Vietnam, can be up-scaled / transferred to other regions.

Political aspects

Continue the ongoing research and expansion of monitoring infrastructure to further improve the knowledge framework for adaptation and mitigation.

WEAKNESSES

Technical aspects

The vulnerability of coffee farmers to climate change is emphasized by mono-cropping and high dependency on irrigation.

Over 20% of coffee farms were established on unsuitable or only marginally suitable land, leaving no room for improvement through adaptive measures. In some locations, the share of coffee farms established on unsuitable land is much higher.[4,13]

Poor agricultural practices (e.g. incorrect/excessive use and poor synchronization/quality of fertilizers and irrigation, and the absence of shade trees) leads to soil acidification, and higher rates of evapotranspiration. Degraded soils are associated with lower yields and infestation by Nematodes.

Organizational aspects

Information on soil and water resources is very limited, as is the infrastructure for testing of nutrient content of soil and leaves. The absence of information contributes to the excessive use of water and fertilizer by coffee farmers.

Low level of organization amongst farmers poses a barrier against collective action (e.g. investments in drying facilities or harmonized use of water at micro-watershed level).

Political aspects

Regulations on water use and the establishment of wells are not enforced. Water for irrigation is free of charge, resulting in little interest to reduce water use.

Improved irrigation technology in combination with optimal land allocation (i.e. replacing coffee grown on unsuitable land with crops or land uses suitable to these locations) would result in substantial reserves of groundwater resources in many areas even in drought years.[15] However, at the moment the commitment from government to plan for and implement landscape-level action outside donor funded projects is limited.

THREATS

Technical aspects

For some impacts of climate change (reduced pollination due to rain during flowering) viable solutions do not yet exist. Where these impacts are very high, coffee farming may cease to be viable.

Economic aspects

Farmers may resist change to more suitable crops, agroforestry systems and renovation of coffee farms due to the likely short to medium term loss of income before new crops and coffee trees reach maturity.

Viable markets/market access for new or additional crops may not exist, especially for products without strong internal demand, relatively low production volume (high cost of aggregation) or not qualifying for international standards.

Coffee renovation on (degraded) soils infested with nematodes might be more costly/slower than anticipated.

Organizational aspects

Concepts or strategies for farmers having to exit coffee farming because of climate change do not exist, potentially resulting in increasing pressure on non-farm land to compensate for declining yields and/or loss of livelihoods.

Sensitization and training of all farmers are expensive. To cover this cost and reach all farmers in a short time, private and project-based extension providers/programs are needed but may not be available.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IMPROVING WATER USE IN COFFEE IRRIGATION IN VIETNAM

In the Central Highlands, water for irrigation is sourced from reservoirs (ca. 20%), rivers (ca. 28%) and groundwater. Groundwater is pumped from privately owned wells. In the Central Highlands, the biggest coffee growing area in Vietnam, more than 70% of the locally available water resources are used for agricultural production every year. In times of drought, water resources are sometimes depleted well before the end of the dry season (e.g. in 2005/06, 2009/10 and 2015/16). Impacts are not just felt by farmers but also by other businesses and domestic users. Reported production losses for coffee only in years of drought are in the range of 20% to 25%.

Coffee in the Central Highlands is irrigated two to four times, depending on the on- and offset of the wet season and sporadic rainfall during the dry season. Farmers often use more than double the amount of water needed, accelerating the seasonal depletion of water resources. Access to water and the period over which ground water is available from the shallow aquifer varies strongly within watersheds. Farmers in the upper areas and slopes of the watershed will experience water deficiency first, especially if groundwater resources are tapped excessively.

Research[5] and field trials proved that water use can be reduced from the frequently more than 1,000 liters used per tree and round of irrigation to less than 400 liters per tree and round of irrigation. With the adjusted irrigation regime, yields of three to four tons per hectare (1,100 coffee trees), i.e. well above the current average production, can be achieved. The research findings resulted in an adjustment of irrigation standards by the Ministry of Agriculture and Rural Development in 2013 to use between 400 and 500 liters per tree and round of irrigation.

Farmers can implement the improved irrigation regime without any additional cost, i.e. continue to use micro-basin irrigation. Pivot irrigation, another common system is 44% less efficient[11]. Full adoption of the standard would result in cost savings at the farm level and reduce water use by about 30%. The water footprint per kilogram green bean can be reduced from currently about 5.500 l/kg to about 3.800 l/kg.[16]

An example of the ongoing interventions, the “More Coffee With Less Water” project, focuses on improving water management. The project provided important evidence for decision makers, developed concrete tools for farmers, and explores additional measures which may help to mitigate water shortages:

- A hydrogeological study for Dak Lak shows the impact of current irrigation practices versus improved practices on water resources. A pilot for groundwater monitoring was established, providing further details on the impact of excessive water use versus best practice.*
- Led by Hanoi University, an improved weather forecasting service was established. More precise forecasts together with detailed but practical management guidelines can help farmers to fine-tune irrigation and application of agro-chemicals.*
- Together with the International Water Management Institute, the project explores the potential for managed aquifer recharge. The technology may help to extend the duration of groundwater availability throughout the dry season.

**Farmers can access a manual for good agricultural practices and the weather forecast via smart phone.*

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