VIETNAM TO PRODUCE MORE COFFEE WITH LESS WATER

By 2020 a global coffee shortage equivalent to 1.5 times the current production of Vietnam – the world's largest Robusta coffee producer – is expected. On a parallel scale coffee production is under pressure because of looming water scarcity, exacerbated by climate change, while irrigation water is crucial for coffee production in Vietnam.

This paper reconfirms that it is possible to reduce the coffee water footprint while maintaining or increasing coffee yield through better irrigation scheduling and agronomic practices. Policy recommendations are provided to bring research into practice.

Recommendations

- Raise awareness among smallholder coffee producers on sustainable water use; 400 liter/plant/ irrigation round is adequate to achieve economically viable and sustainable yields up to 4 metric ton/ha.
- Design a standard training program and build capacity for coffee farmers on sustainable water management.
- Establish and monitor on-farm demonstrations to fine-tune the new recommendation in different agro-climatic zones.
- Integrate new water management recommendations in Standards Programs.

Global Coffee Supply Shortage

Global demand for coffee is increasing. Twenty to thirty million additional bags (60kg) of coffee – equivalent to 15% of current global production – will be required by 2020.

Vietnam is the world's leading Robusta coffee producer and coffee is the second largest export-earning crop, supporting the rural livelihoods of over 2 million people. Export volumes peaked at 27.8 million bags in 2012 generating revenues of 3.74 billion USD, or 3% of national GDP.

Excessive Irrigation Endangers Water Availability

In Dak Lak province, which contributes circa 40% to the national coffee production, irrigation between January and April is critical to make coffee farming an economically viable livelihood activity. In the past, smallholders irrigated up to 2 times more than the recommendation by MARD in 2002. Yet, field experiments under controlled conditions indicate that 40% less irrigation as compared to the recommendation would not reduce coffee yields (D'haeze, 2004[i]). Irrigation makes up circa 15-20% of the total coffee production costs in terms of labor, energy and equipment costs. It is estimated that 57% of irrigation water is abstracted from groundwater sources (Cheesman and Bennett, 2005[ii]) and 95% of this volume is used for coffee. Dak Lak province is facing severe groundwater depletion issues in dry years because current irrigation is exploiting up to 71% of the total water resources.

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IWMI International Water Management Institute

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Climate Change In Vietnam Affects Global Coffee Supply?

Climate change may further exacerbate the water scarcity since forecasts show that the dry season in Vietnam's Central Highlands may start early and prolong as in the dry season of 2012–2013. Hence, the coffee productivity in Vietnam may potentially decline (Haggar and Schepp, 2011[iii]).

The implications may also spill over to the entire global coffee sector through disruptions and variability in supply, which in turn may impact global prices, farmer incomes, rural economic growth, trade balances and global coffee consumption.

Water Stress Boosts Productivity

According to FAO estimates (FAO, 2012[iv]) the total water required annually for coffee production is 1,388 mm of which 529 mm is needed in the dry months from January to April. However available rain water in this period is only 113 mm (21%) (Figure 1).

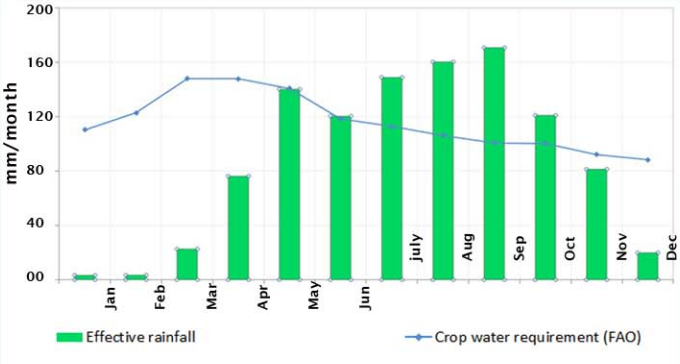

Figure 1 Effective rainfall and crop water requirement FAO

Contrary to FAO estimates, detailed analysis of multi-year farm records in Dak Lak in 2005–2009, reveals that in an average rainfall year, yield and gross income reach a maximum around 460 mm from January to April (113 mm rainfall and 347 mm irrigation, equivalent to an irrigation supply of 1,050 liter/plant/irrigation round x 3 rounds) to reach a maximum productivity level of 6,000 kg/ha green beans with 1,100 plants/ha. In line with other studies (Carr, 2001[v]) this research confirms that a certain level of water stress is required to stimulate flowering and fruit development.

However, providing such a large irrigation supply is not economically viable, since the net marginal profit (i.e. marginal gross income minus marginal production cost) becomes already negative beyond 400 mm of water inputs from January to April (113 mm rainfall and 287 mm irrigation, equivalent to 870 liter/plant/irrigation round x 3 rounds).

Optimized Irrigation Scheduling

Farm records in 2005–2009 also indicate that even higher water stress levels are possible, since circa 11–12% and 3–5% of the farmers respectively obtained yields over 3,000 and 4,000 kg/ha, applying much less irrigation water than the above levels. Optimal irrigation scheduling is required to break the 4,000 kg/ha barrier. For example, with average rainfall in November and December of the previous year, a total of about 150 mm (455 liter/plant/irrigation round x 3 rounds) from January to April is sufficient. In case of high rainfall in November–December, a total of 80 – 120 mm over these months (circa 300 liter/plant/irrigation round x 3 rounds) is adequate.




Current Irrigation Practices Are Alarming

Over 50% of the farmers however irrigates more and achieves lower yields than the records mentioned above. The average yield in Dak Lak is 2,400 kg/ha. Household survey data in 2012 under this study show that trained farmers apply 155 mm irrigation from January to April (470 liter/plant/irrigation round x 3 rounds) to achieve this yield level under average rainfall conditions. In contrast, farmers who have not received training on sustainable crop husbandry practices, may apply significantly higher irrigation, up to 1,391 liter/plant/round. Therefore a large scope exists for these farmers to obtain higher yields under higher water stress with a well-targeted irrigation scheme.

30% Water Savings

This study reconfirms that it is possible to reduce groundwater irrigation withdrawals without a significant effect on coffee yield by better scheduling of irrigation in the dry months in combination with improved agronomic practices.

Presenting the above findings as the water consumption per kilogram of green bean coffee produced – also called water footprint (Hoekstra et al., 2011[vi]) – allows for comparison with other coffee areas and other products.

The total water footprint of Robusta coffee production in Dak Lak province under the current prevailing conditions is 5,524 liter/kg green beans for an average yield of 2,400 kg/ha (Figure 2) which is low compared to the global average (21,000 liter/kg).

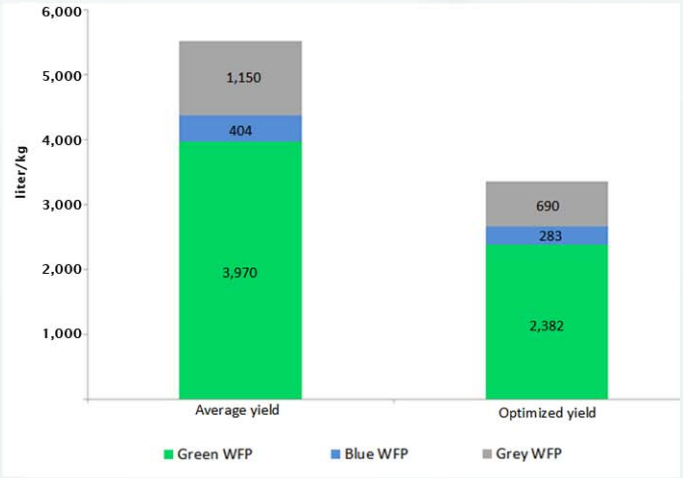

Figure 2 Green, blue and grey water footprint for different yield scenarios

However, given the increasing demand for coffee in a climate with looming water scarcity, Vietnam has the opportunities and is challenged to further significantly reduce its total water footprint to 3,815 liter/kg green beans, while increasing its yields to 4,000 kg/ha. This would reduce the country's virtual water export and realize absolute water savings up to 30%.

Policy Recommendations

In 2010 a precompetitive public-private coffee partnership was established with representatives from government,
industry, international agencies, civil society and farmers. Its goal is to align existing government resources and build a standardized training package for farmers, to avoid duplicating efforts and sending conflicting messages to farmer groups, while leveraging resources from both public and private sectors to scale sustainable development in the coffee sector. It is recommended to include the below recommendations on improved irrigation management in this program.

- The **Ministry of Agriculture and Rural Development (MARD)** has recently revised the official irrigation supply standards in the Decision 273/QD-TT-CCN by the Department of Crop Production dated July, 3rd, 2013 on Guidelines for replanting Robusta coffee. The new basin irrigation standards for mature Robusta coffee (MARD, 2013[vii]) range from 400 to 500 liter/plant/irrigation round at an interval of 20-25 days with a recommendation to increase by 10-15% for the first irrigation round. Recognizing and supporting the MARD decision this study found that 350 - 450 liter/plant/round x 3 rounds per year for average climatic conditions in combination with other agronomic practices (e.g. fertilization, pruning, etc.) is adequate to achieve yields up to 4,000 kg/ha. Therefore this paper supports the MARD guidelines and suggests to further **raise awareness on improved irrigation management** to be broadcasted on local television channels, in order to curb traditional farmers' belief that more water will yield higher productivity and income.

- The **National Agricultural Extension Centre (NAEC)** is recommended to review the latest research findings on good agricultural practices for Robusta production, **design a uniform capacity building program for farmers** and **build farmers' capacity** through farmer field schools and demonstration plots. Particular attention should be paid to better understanding and in depth training on water and input management for farmers. The cost of such programs could be negligible compared to benefits. The outcomes would improve farmers' livelihood through increased income, manage groundwater over-exploitation through reduced groundwater pumping and contribute to sustainable coffee production through higher water productivity.

- The **Western Highlands Agriculture and Forestry Science Institute (WASI)** is encouraged to **establish multi-year, on-farm demonstration plots** in different agro-ecological zones in the Robusta production areas to further assess and record crop performance under reduced irrigation supply conditions and to better understand the timing of irrigation and other inputs to attain yields of 4,000 kg/ha.

- **International & National Standards Programs** such as 4C, Utz Certified, Rainforest Alliance, and Vietgap are recommended to consider to **integrate the new water management recommendations in their compliance criteria.** This may accelerate short-term impact generation, since the Vietnamese Government and industry target to increase sustainable green coffee production according to international standards from the current 8% to 25% by 2015.

- **Traders and Roasters** engaged in certification are encouraged to **integrate the new water management recommendations in their farmer training programs**. This would not only benefit the producers, but also contribute to the individual companies' water footprint reduction.

This policy brief summarizes major research findings from a more detailed report "Towards Sustainable Coffee Production in Vietnam: Addressing Irrigation Issues" (2013) by Upali Amarasinghe and Chu Thai Hoanh (International Water Management Institute (IWMI), Colombo, Sri Lanka), Dave D'haeze (Embden Drishaus and Epping Consulting GmbH (EDE), Hamburg, Germany) and Tran Quoc Hung (Western Highlands Agriculture and Forestry Science Institute (WASI), Buon Ma Thuot, Vietnam). This research was funded by Nestec S.A. (Nestle) and Swiss Agency for Development and Cooperation (SDC).

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