Coffee vs. Cacao: A Case Study from the Vietnamese Central Highlands[1]

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ABSTRACT

Mr. Nam, the vice chair of a village in Dak Lak province of Vietnam, was keen to protect farmers in his village from the sharp decline in prices of coffee (*Coffea canephora* Pierre ex Froehner). He did this by encouraging farmers in his village to plant cacao (*Theobroma cacao* L. subsp. *cacao*). Cacao was suitable to the soil and climate of the area, and because a foreign company had promised to buy cacao from the farmers, it seemed to offer greater financial security. However, uncertainty about crop losses due to pests, the cost of chemicals such as pesticides, and potential fluctuations in the prices of cacao made it imperative to carefully evaluate the benefits of cacao production. In making his recommendation to the village, Mr. Nam utilized additional information about the potential demand and the marketing networks for cacao. The decision to switch from coffee to cacao provides a village-level example of learning about agricultural supply and demand issues, perennial crop production, and economic and environmental consequences of growing particular crops. This case was written for undergraduate students in agriculture and forestry programs at Nong Lam University. Students were expected to understand the nature of land use changes and major issues facing the coffee farmers in the central highlands of Vietnam. They were also encouraged to identify and critically evaluate economic and environmental benefits and costs, and the policy and institutional supports needed for ensuring a sustainable cocoa production in the Central Highlands. The case was subsequently translated into English and used in classrooms at Purdue University.

The province of Dak Lak is located in the Central Highlands of Vietnam. The province has a total population of nearly 1.8 million people, accounting for 58% of the population of the four provinces of the Vietnamese Central Highlands. With most of its basal soil having advantageous qualities such as a fine texture, a high water absorption level, and high fertility, Dak Lak is well-suited for the production of various perennial industrial crops including coffee, rubber, pepper, cashew, and cacao, as well as annual crops such as hybrid maize and cotton. During the past decade, both planned and spontaneous immigration have created demographic pressures in Dak Lak. The influx of people has also played a major role in transforming the physical and socioeconomic landscape of the province.

The liberalization and global integration of Vietnamese trade has resulted in a dramatic change in land use in upland areas. High market prices for coffee in the early 1990s motivated many farmers to plant coffee from valleys of the Central Highlands up to areas that were fully forested not so long ago. In the decade from 1990 to 2000, coffee area in the province expanded greatly, by about 14% per year. By 2000, the coffee plantation area in Dak Lak had reached 260,000 hectares and coffee accounted for 57% of agricultural land and 86% of industrial crop area in the province. Dak Lak is one of the most specialized coffee regions of the country, accounting for 50% of total area and 53% of national output (Ha and Shively, 2004).

The coffee production system in most areas of the province is monocultural, relying on high levels of fertilizer and pesticide, large consumption of water, and full market orientation. Households that produce coffee on a small scale (about 1 hectare per household) comprise the majority of coffee-growing households in the province. During high-price periods, with coffee as the main source of income, all coffee producers were encouraged to invest strongly in new tree plantations and maintenance of current plantations. Motivated by high coffee prices, many farmers planted coffee even when they had no experience cultivating coffee and no knowledge regarding local conditions for growing coffee. Many planted coffee on very steep slopes with unsuitable soil and water conditions.

The expansion of coffee production has broken down the ecological balance of the region. Forest cover decreased from about 90% in the 1960s to 57% in 1995 and to less than 50% in the late 1990s (ICARD and Oxfam, 2002). In the past 20 years, Dak Lak has lost 20 thousand hectares of forest a year to both public and private coffee plantations and farms. The serious devastation of the forests brought about by the increase in coffee plantations has led to an ecological imbalance, particularly an inability to regulate water resources. Agricultural expansion, especially of coffee, reduced marginal forest area. Farmers note that floods seem to be increasing in frequency and magnitude. The natural surface flow is also observed to be decreasing over the years and soil erosion is becoming increasingly common.

Coffee is a water-intensive perennial crop. About 40% of the current coffee plantation area is irrigated by groundwater, using up about 66 million m^3 during the dry season, or 438,400 m^3 per day. Provincial authorities find it difficult to manage water resources, and the high rate of exploitation has already exhausted a number of sources. Farmers report that the groundwater table is extremely low during the dry season, raising the cost of pumping.

In the 1990s Vietnamese farmers planted more than 1 million hectares of Robusta coffee, enabling Vietnam to surpass Colombia as the world's second-largest coffee producer (ICO, 2002). Fueled by the government's policy of privatization and economic liberalization (known as Doi Moi), state-sponsored migration into the

[1] This teaching case study grew out of a collaborative research project that the authors initiated following their first meeting at a conference in 1999. Through conversation they recognized a shared interest in improving undergraduate classroom experiences at their institutions, in particular making class materials more realistic for students. The idea for working together to develop case studies led to several exchange visits and the creation of four case studies at Nong Lam University. This is the first of the cases to be published.

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Abbreviations: BMPs, best management practices; CAFOs, confined animal feeding operations; HAP, high available phosphorus; M3-P, Mehlich-3 extractable P; NRCS, Natural Resource Conservation Service; PAN, plant-available nitrogen; PLAT, Phosphorus Loss Assessment Tool; RYE, realistic yield expectations; SERA-17, Southern Extension–Research Activity Information Exchange Group 17.

Central Highlands, and price spikes generated by frosts in Brazil, by the mid-1990s more than 1 million Vietnamese were participating directly or indirectly in the country's coffee economy (Nhan, 2002). However, the increase in coffee exports coincided with a precipitous decline in international coffee prices brought about by Vietnam's entry into the world coffee market, combined with rising stocks, inelastic demand, and a shift toward low-cost Robusta for processing (Ponte, 2002).

The fall in the export price of coffee led to a sharp reduction in the farm gate price. In Dak Lak, the price of dry coffee beans fell more than 60% between January and December 2000 and fell further throughout 2001, to levels insufficient to cover production costs (USDA-FAS, 2002, 2003). The low prices caused losses for coffee producers and traders, discouraging people from further investing in coffee, and leading farmers to destroy several thousand hectares of coffee plantation area to grow other crops. Meanwhile, farmers face indebtedness as it is difficult to repay loans borrowed in better times to expand coffee areas.

Policymakers, governments, and international organizations have been exploring ways to mitigate the coffee crisis in Vietnam and other coffee-dependent areas. Potential mitigating steps range from establishing fair trade coffee markets to undertaking mass destruction of coffee beans. Another possible solution is to restructure cropping patterns in favor of more profitable cash crops like cashew or cacao. This case study highlights issues surrounding the potential shift from coffee to cacao in a Vietnamese village.

THE CASE

Like many other coffee growing villages in Dak Lak province, the decline in coffee price since the year 2000 rendered coffee cultivation in Ea Tul village an unprofitable enterprise. Large and wealthy households have retained their coffee crop, but stopped investing further in coffee production. Some farms retained their best coffee trees while they cut down the less productive ones and planted other crops. The fall in coffee prices reduced the income of poor farmers in the village. Many of them had to sell assets such as animals to continue investing in and maintaining their coffee plantations. As the price of coffee continued to fall during 2001–2002, many coffee-producing households began to prioritize other crops and income sources, such as hybrid maize, cotton, rice, and livestock. Some farmers gave up coffee growing altogether. Among those who suffered economically, the poor bore the heaviest losses. With low coffee prices, farmers regularly asked, "What should we produce?"

One person most frequently asked this question was Mr. Nam, the vice chair responsible for agricultural production in Ea Tul village, located in Dak Lak province. As an example, one recent morning, just as he was stepping out the door to visit his neighbor Mr. Bay, Mr. Nam bumped into Mr. Tu, a fellow farmer from his home village in Quang Ngai province. After exchanging some pleasantries, the two men continued to Mr. Bay's house where the conversation quickly turned to farming and the state of coffee prices. Mr. Bay related his situation.

"This year, I had a good coffee harvest and solid yields, but the price was dismal. My revenue was insufficient to cover my production costs. If coffee prices don't recover, I'm going to have to cut a part of my coffee and shift to another crop."

Sipping from the cup of coffee in his hand, he continued.

"Unfortunately, our land is not well suited for rice; and other annual crops provide very low income. I want to shift from coffee to another crop to earn enough income for my family, but what crop should I grow now?"

The three men sat in silence, pondering the situation and searching for an answer. After a few minutes, Mr. Tu raised his voice.

"The other day I met one of my relatives from Dak Mil district who started growing cacao last year. According to him, cacao can generate a much higher return than coffee. I even heard that in other provinces the officials are currently encouraging farmers to grow cacao. Tell me, Mr. Nam, do you think the farmers in this village should be planting cacao, too?"

As the vice chair responsible for agricultural production in his village, Mr. Nam was concerned about helping farmers in the village cope with the decline in coffee price. Cacao seemed to hold out some hope, provided land in the village would be suitable for cacao cultivation. Mr. Nam decided he needed to learn more before making a recommendation.

Cacao: An Opportunity for Farmers in Dak Lak

In the subsequent week, Mr. Nam met with the chair of the village and discussed with him the idea of introducing cacao to farmers in the village. The village chair agreed with the idea and encouraged Mr. Nam to go to the agricultural extension center of the province to learn more about cacao cultivation. He also asked Mr. Nam to make a recommendation on how best to promote cacao in the village.

At the agricultural extension center, Mr. Nam obtained a lot of good information on cacao. He was fortunate to meet Dr. Hong, a cacao expert from the local agricultural university, who spent time explaining numerous details regarding cacao and cacao cultivation techniques. Dr. Hong explained that the Vietnam Cocoa Development Program was initiated in 1997, at which time a private cocoa company and the American Cocoa Research Institute (ACRI) were main drivers. The aim of the program had been to lay a strong foundation for Vietnam to realize its vision of having 100,000 hectares of cocoa planted in the country by the year 2010.

Mr. Nam learned a great deal about cacao during his visit. Cacao is an important tropical rain forest species. It is grown for its oil-rich seed, to produce cocoa and cocoa butter. Cacao is also called cocoa or chocolate tree. The name chocolate is believed to have originated in Mexico. Currently the largest cacao producer is Cote d'Ivoire (Ivory Coast) in West Africa. Hybrid species have been developed to grow quickly in South East Asia, especially near equatorial areas. Evergreen cacao trees grow best between 20° north and south of the equator, usually below 300 meters. The tree requires uniformly high temperatures with recommended mean of 26.6°C. Trees are wind-intolerant and are therefore often planted on hillsides for wind protection and good drainage. Being drought-intolerant, cacao thrives in climates with high humidity and rainfall. Plants are shade-tolerant and thrive in rich, organic, well-drained, moist, deep soils.

The major management requirements of cacao agro forests are shade control, weeding, pest and disease control, harvesting of pods, and processing of beans. Cocoa trees are planted in arrangement of 3 by 3 meter and 4 by 2 spacing on flat and slanted lands, respectively, resulting in 1100 trees per hectare. Before cocoa is planted, there should already be cover crops or trees that cover young cocoa trees from direct sunlight. As the cocoa trees mature these cover crops can be reduced: trees less than 2 months old require 70 to 75% shade; and those aged 3 to 5 months require 30 to 70% shade. Fields should remain partly shaded for 3 years. Cacao is often intercropped with other trees of economic value, such as banana, rubber, oil palm, or coconut.

Weeding is by hand or herbicides. Irrigation may be practiced, but drain ditches should always be provided to prevent excess water. Fertilizer is applied two to three times per year by penetrating it 10 to 20 cm under the soil surface at the tree's crown. In general, the fertilizer used should contain large amounts of nitrogen, phosphate, and potassium, not to mention small amount of micronutrients. In the market, these fertilizers are known as urea/za (N source), triple super phosphate (TSP), and KCl.

In Dak Lak, cacao starts to bear fruit in the second year after planting. Fruit requires 5 to 6 months from fertilization to harvest. The harvest season lasts about 5 months. Pods are cut from trees and allowed to mellow on the ground. Then pods are cracked and the beans are removed; the the husks are burned. Beans are fermented in leaf-lined kegs 2 to 8 days before drying in the sun, at which time they change from purple to brown. The purposes of cocoa fermenta-

tion are to prevent germination and generate cocoa-typical aroma. Cacao seeds are the source of commercial cocoa, chocolate, and cocoa butter. Fermented seeds are roasted, cracked, and ground to give a powdery mass from which fat can be expressed. This is the cocoa from which a popular beverage is prepared. In the preparation of chocolate, this mass is mixed with sugar, flavoring, and extra cocoa fat. Milk chocolate incorporates milk as well. Cocoa butter is used in confections and in manufacture of tobacco, soap, and cosmetics.

In the 1960s, cacao was introduced to Vietnam and planted in several areas. The soil and climatic conditions of the country are suitable for the crop but due to the lack of market outlets, early plantings of cacao were cut down to make way for coffee, black pepper, and cashews. Recently, with falling coffee prices, the agriculture sector has paid more attention to cacao, particularly because a foreign company recently started buying cacao from farmers.

However, Dr. Hong noted, like other perennial crops, cacao cultivation is not without some risks. There are numerous insects in the field and in storage that damage the quality and quantity of cocoa beans and that hinder cocoa production in general. Each year, an estimated one-third of the world's cacao crop is lost from diseases and pests. Conventional chemical insecticides and fungicides do not always work well in the tropics, where insect resistance develops quickly and heavy rains simply flush fungicides away. The cost of such agrochemicals makes them unaffordable for most small cacao growers, and a lack of modern agricultural extension services compounds the problem. There is also risk in the cacao market. Cacao prices are highly volatile and economic hardships occur when prices are low. World prices weakened in 1987 and remained depressed through the mid-1990s. Since 1997, however, world cacao prices have improved somewhat.

Cacao production can also be beneficial for the environment. In an agroforestry system, as the cacao tree and the other components grow to maturity, the agroforest becomes a more diverse and structurally complex, closed-canopy multi-strata system that resembles natural forest. Agroforest is capable of providing lasting economic, social, and environmental benefits. In terms of carbon sequestration and below- and aboveground bio-diversity, the cacao agroforest is superior to alternative food crops. With the exploitation of forest trees (as in many places in Dak Lak) it has become necessary to plant alternative fast growing tree species to provide shade. However zero-shading and chemical spraying are two main causes for environmental concern in the industry. There is also one concern that the high profitability from cacao production may encourage farmers to expand cacao area into the forest.

At the end of the afternoon, Dr. Hong emphasized to Mr. Nam that, at current prices, and with the favorable climatic and soil conditions that existed in Dak Lak, cacao offered a good opportunity for farmers in Mr. Nam's village. He provided Mr. Nam with data on production costs and yields for coffee and cacao (Exhibits 1 and 2) to use as inputs into his decision.

Back to the Village

At the end of the afternoon, Mr. Nam returned to his village. He was happy to have learned more about cacao and felt comfortable with the idea of promoting cacao production in his village. The soil and climatic condition in the village were suitable for cacao, and the village was located not far from the city, so that transport costs would be low. Although it was true that most farmers did not have any technical knowledge regarding cacao cultivation, Mr. Nam felt certain that the village could seek support from the provincial extension center to train farmers.

Nevertheless, Mr. Nam still had a few reservations regarding his decision. Before making a recommendation to the chair of his village, Mr. Nam decided to invite colleagues and representative farmers for a meeting to report what he had learned about cacao and to get their comments on how best to promote cacao expansion in the village. Some important issues and comments were raised at this meeting. Most farmers at the meeting felt convinced of the benefits from the possible changeover to cacao. Not only would cacao provide a good opportunity for all farmers in the village to increase their incomes, it would also provide some degree of crop diversification in the village. Furthermore, it could help the village to mitigate water shortage problems, especially because cacao would need much less water than coffee.

Another concern of farmers was the difficulty of accessing credit. Due to the collapse in coffee prices, many farmers felt they simply did not have enough cash for new investments. Many were already in debt. These farmers would be unable to shift from coffee to cacao because they had used their coffee trees as collateral for loans, and the bank would not allow them to cut the trees. Most farmers at the meeting also expressed concern about revenue uncertainty: if cacao prices were to fall in the future, or if coffee prices were to increase, they felt they would be caught on the wrong side of the market.

Exhibit 1. Information on cacao production (per-hectare basis).

Items	Unit†	Unit price 1000 VDN	Year 1	Year 2	Year 3	Year 4	Year 5	Years 6–25
Output (dried beans)	kg		0	400	1000	1500	2000	2500
Price of beans	VND 000/kg	20						
Costs								
Establishment cost	000 VND	1	17,300	0	0	0	0	0
Fertilizer (N–P–K)	kg	4.40	0	400	600	800	1500	1900
Manure	m^3	150.00	0	0	0	6	8	8
Pesticides	kg	15.00	0	10	10	10	10	10
Sacks	no. (60 kg)	1.50	0	9	21	27	32	35
Water pump	hour	20.00	0	20	20	30	30	30
Family labor	days	20.00	0	60	60	60	60	60
Hired labor	days	20.00	0	10	20	35	45	55
Processing labor	days	20.00	0	30	60	90	144	136
Land tax	000 VND	1.00	0	0	0	0	0	740
Other								
Water quantity	m^3	–	0	500	500	700	700	700

† VDN, Vietnamese Dong.

Exhibit 2. Information on coffee production (per-hectare basis).

Items	Unit†	Unit price 1000 VND	Year 1	Year 2	Year 3	Year 4	Year 5	Years 6–25
Output (beans)	kg		0	0	500	1000	2000	2500
Price of beans	VND 000/kg	10						
Costs								
Establishment cost	000 VND	1	15,748	0	0	0	0	0
Urea	kg	3.2	0	250	300	360	420	420
Phosphate	kg	2.0	0	250	300	360	420	420
Potassium	kg	3.5	0	200	240	290	375	375
Manure	m^3	150.0	0	0	9	9	9	9
Pesticides	liter	40.0	0	1	5	5	5	5
Sacks	no. (60 kg)	1.5	0	0	25	52	78	100
Water pump	hour	14.0	0	67	139	184	184	184
Processing	rate/tonne	150.0	0	0	0	1	1	2
Family labor	days	20.0	0	160	174	220	280	275
Hired labor	days	20.0	0	78	143	100	103	120
Land tax	000 VND	1.00	0	0	0	0	0	740
Other								
Water quantity	m^3	–	0	1200	2500	3300	3300	3300

† VDN, Vietnamese Dong.

Mr. Nam's Dilemma

After considering the sentiments expressed at the meeting and the data at hand, Mr. Nam decided to recommend that the village farmers switch from coffee to cacao. However, that evening, just as he was sitting down to write his recommendations to the chair, he saw a shocking news story about farmers in a neighboring province who had resorted to feeding cacao to pigs, because prices were too low to justify taking the crops to market. Hearing this news, Mr. Nam wavered. If the village promoted cacao cultivation too slowly or waited until other villages had planted cacao, farmers in his village would lose the opportunity to earn high incomes from cacao. Nevertheless, if the village promoted cacao too aggressively, the farmers in the village might end up like those in the news.

TEACHING NOTE

Learning Objectives

This case offers a look at land use and agricultural land management in a low-income tropical environment. It is to be used as a basis for students to identify and discuss the complex issues relating to the introduction of a new crop to an existing agricultural production system and natural environment. The case also helps students in applying their knowledge in crop budgeting, sensitivity, and risk analysis in analyzing a practical situation using spreadsheet analysis.

Upon completion of this case study, students will:

1. Understand the nature of land use changes and major issues facing the coffee farmers in the Central Highlands of Vietnam.
2. Understand how to perform a crop budgeting for competing crops and assess the risks of competing crops under different scenarios.
3. Identify and critically evaluate economic and environmental benefits and costs, environmental risks, and market risks that likely result from future cacao expansion in the Central Highlands of Vietnam.
4. Identify policy and institutional supports needed for ensuring sustainable agricultural production in the low-income tropics.

Intended Student Audience

This case was written for undergraduate agriculture and forestry students at Nong Lam University, in Vietnam. It was used in a course for the first time in 2004 for undergraduates majoring in extension and rural development. Students worked in groups of five to complete case study assignments. In late 2004 the case was translated into English and used for classroom discussion and as a homework assignment in an environmental and natural resource economics course for undergraduate students at Purdue University. A primary benefit of using the case in an American classroom is that it provides an opportunity to discuss a wide range of issues related to economic development in the low-income tropics, including poverty, environmental degradation, and sustainable development. Students found the case to be highly realistic and they spontaneously identified areas of ambiguity in the case in which more information was required or simplifying assumptions were critical.

DISCUSSION QUESTIONS

1. What is the major problem facing decision makers in the case? If there is more than one problem, list them in order of importance.
2. What have been the historical changes in land use in the Central Highlands and what are the major factors affecting these land use changes?
3. Do you think that the current agricultural production and resource management system is sustainable in the long run (at local, national, or global levels)? If not, what are the key socioeconomic and environmental problems associated with the continued production of coffee in the Central Highlands of Vietnam, particularly in Dak Lak?
4. How might the problems of Dak Lak be linked to the current plight of coffee farmers in other countries? How might the patterns described here be similar to or different from the historical experiences of farmers in other countries (e.g., cacao farmers in Malaysia in the 1970s and 1980s)?

5. The information in Exhibits 1 and 2 fully describe the economic costs and returns associated with producing 1 hectare of cacao and coffee. Use these data to construct a spreadsheet to compute the annual net income per hectare of coffee and cacao in Years 1, 2, 3, 4, 5, and 6 (each year separate). In addition, compute these returns per m^3 of water used for irrigating cacao and coffee. Based on your results, what conclusions do you draw from the analysis and why? Which crop seems to make the best use of water?
6. Assuming a discount rate of 5% and a 25-year horizon, use your data from (5) to compute the net present value (NPV) of income for each crop. Now assume the price of cacao decreases by 10, 20, 30, 40, and 50%. What happens to the NPVs? Do you think this is a good method to assess price risk? Based on results from this calculation, discuss how farmers may react to reductions in price. Who is likely to suffer most from the risk of falling prices?
7. Repeat your analysis from (6), but now assume that, due to pests and disease, cacao yields decrease by 10, 20, 30, 40, and 50%. As in the previous question, use benefit–cost analysis to show how the changes in yield affect farmers' income. Briefly discuss.
8. Identify some of the benefits and risks associated with the expansion of cacao production in Dak Lak province. Use S-W-O-T analysis to identify major strengths, weaknesses, opportunities, and threats associated with cacao expansion in this area.
9. You have been asked to identify major stakeholders involved in the process of cacao expansion in Dak Lak province and the issues they may face. Might small and large farmers look at cacao differently? Farmers and policymakers? Why?
10. If you were Mr. Nam, the vice chair responsible for agricultural production in Ea Tul village, what would you recommend to help the village to achieve sustainable development? What other factors would you consider?

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REFERENCES

Ha, D.T., and G.E. Shively. 2004. Coffee boom, coffee bust, and smallholder response in Vietnam's central highlands. Staff Pap. 04-16. Dep. of Agricultural Economics, Purdue Univ., W. Lafayette, IN.

ICARD and Oxfam. 2002. The impact of the global coffee trade on Dak Lak province, Viet Nam: Analysis and policy recommendations. ICARD, Oxfam Great Britain, and Oxfam Hong Kong.

ICO. 2002. International Coffee Organization. Available at www.ico.org (verified 3 Oct. 2005). ICO, London, UK.

Nhan, D.T. 2002. International cooperation and strategic adjustment in each and every country: The musts for sustainable world coffee production. Speech delivered at International Coffee Organization Conf., May 2002. Available at www.vicofa.org.vn/ (accessed 1 July 2004).

Ponte, S. 2002. The "Latte Revolution"? Regulation, markets and consumption in the global coffee chain. World Development 30(7):1099–1122.

USDA Foreign Agricultural Service. 2002. Vietnam Coffee SEMI-ANNUAL 2002 (19 Nov. 2002). Agricultural Affairs Office, USDA-FAS, Ho Chi Minh City, Vietnam.

USDA Foreign Agricultural Service. 2003. Vietnam Coffee SEMI-ANNUAL 2003 (2 June 2003). Agricultural Affairs Office, USDA-FAS, Ho Chi Minh City, Vietnam.