

Case Study: Coffee in Dak Lak Province

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Buon Ma Thuot, the capital of Dak Lak Province Vietnam; photo: H. Waibel

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I. Background

The province of Dak Lak is the most southern of the three provinces in Vietnam of the Thailand Vietnam Socioeconomic Panel (TVSEP) research project. Dal Lak is a landlocked, mostly mountainous province of about 13,000 square kilometres and a population of some 1.8 million, the majority of which live in rural areas. The province is located some 300 km north of Ho Chi Minh City and is bordering Cambodia to the west.

All over Vietnam, Dak Lak is known to be the coffee province of the country, accounting for almost one third of coffee production in Vietnam (GSO, 2018). It is the home of robusta coffee, of which Vietnam is the world's second-largest exporter. In 2018, Vietnam exported almost 1.9 million tonnes of coffee with a market value of over 3.5 billion USD. Between 2007 and 2017 the value of coffee export grew (compound growth rate) by over 5 % annually (MARD, 2019).

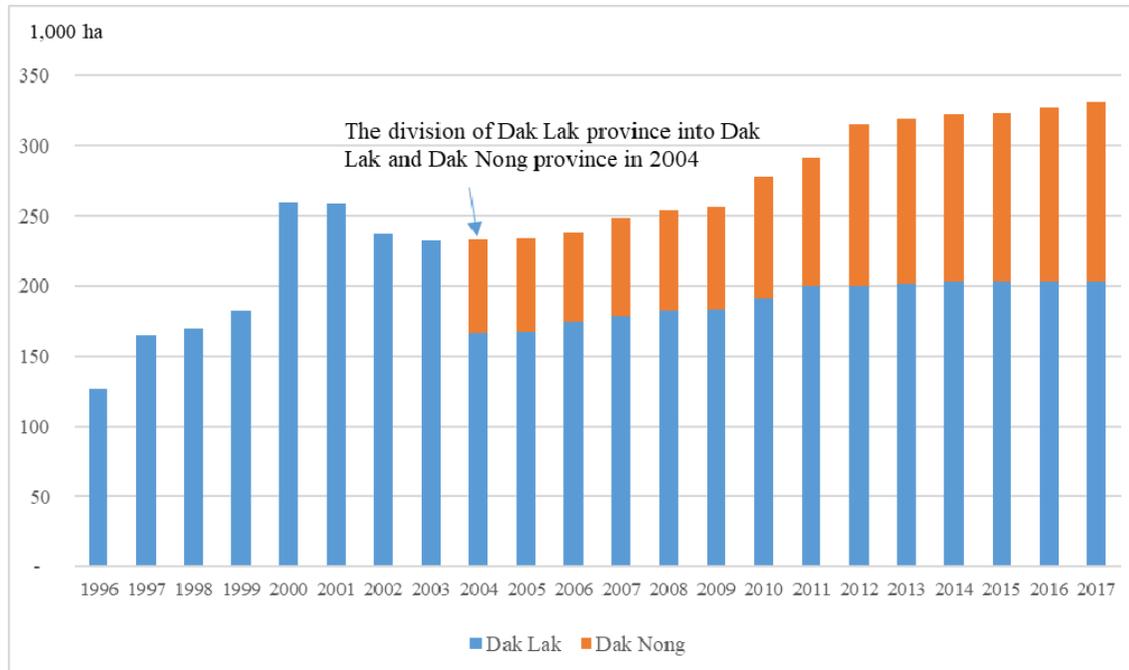
In Buon Ma Thout (BMT), the provincial capital, the flavour of coffee is everywhere. Some of the most authentic coffee brands are Trung Nguyen, Thang Loi and An Thai Coffee. Famous coffee shops and outlets are the Trung Nguyen Coffee Village, the CE coffee and the Arul coffee. The latter is a typical Ede¹ style house with antique furniture and artworks (see picture below).



Arul Coffee and Ede Cultural House in BMT; photo: Dr. Niem Le Duc

Agriculture in Dak Lak is dominated by coffee, which is the main source of income for around 220,000 coffee households. This equates to about 60 % of all farm households in the province (GSO, 2017). Driven by favourable coffee prices, the cultivated area allocated to coffee increased from about 179,000 ha in 2007 to almost 204,000 ha in 2017. Figure 1 shows, that the actual area of coffee cultivation in Dak Lak would be close to 350,000 ha, had the new province of Dak Nong not been the formed in 2004.

¹ Ede is the major indigenous ethnic group in Dak Lak province with specific cultural heritages such as matrilineal traditions and a language of Malayo-Polynesian origin



Note: Dak Lak province was split into Dak Lak and Dak Nong province in 2004

Source: (GSO, 2018)

Figure 1: The expansion of coffee cultivation area in Dak Lak province between 1996 and 2017.

Aside from coffee farming, the processing, trading and sale of coffee is important for the socio-economic development of Dak Lak province. In 2017, the coffee industry contributed to over 40% of the provincial GDP. In addition, 60 % of the provincial government budget was generated by the coffee industry by means of fees and taxes (Cairns, 2017).

There are reportedly about 500 small-scale collectors/traders at the district and commune levels, 301 roasters/processors (including 204 roasters, 95 green beans processors, and 2 instant coffee processors), and 11 exporters (including 3 Foreign Direct Investment enterprises) in Dak Lak province (DPI, 2018). The coffee value chain has created jobs for about half a million people, comprising of about 44 % of the total labour force in Dak Lak province (DOLISA, 2017).

In this case study, we demonstrate the use of the unique TVSEP panel data (Hardeweg et al., 2013) from Dak Lak province TVSEP with several panel waves covering the period of 2007 to 2017. In the following, we present some interesting features of coffee production by smallholder farmers in Dak Lak province. Our aim of presenting this simple and mainly descriptive analysis of the Dak Lak data is to stimulate researchers to develop their own research topics using the TVSEP data. This could be a single study either on a provincial or country level basis - or a study that combines TVSEP data with other data sets like climatic data, for example.

In this case study, however, we focus on one province and on one commodity: coffee in Dak Lak!



Green coffee beans prior to ripening; photo: Man Hung Do

II. Some observations from a decade of TVSEP data collection on coffee production in Dak Lak

In the following, we present some simple descriptive statistics of coffee production in Dak Lak, based on TVSEP data of about 650 rural households. These descriptions include: 1) profitability of coffee production; 2) the structure of coffee production including coffee replacement strategies; and 3) environmental problems in connection with coffee farming.

1. Productivity and profitability of coffee

Coffee is not an easy crop to grow. Good management is a prerequisite to producing high quality coffee and achieving a good harvest. Conventional, non-organic coffee requires chemical inputs like pesticides and mineral fertilizer. The latter makes up around 60 % of the cost of production, while pesticides ranks second with almost 10 %, which is about the same as the labour costs for harvesting.

There are two ways of marketing coffee. One consists of farmers selling freshly harvested coffee beans and the second method is drying the beans before selling. The latter system is dominant with almost 90 % of coffee growers following this practice. Beans are usually dried in the sun to 12 – 13 % moisture so dried beans weigh much less than freshly harvested beans, but of course command a higher price.

Using some of our panel data, we describe the coffee production system in Dak Lak province (Table 1). We have interview data from over 700 rural households. Between 2007 and 2017 an attrition rate of some 15 % can be observed. However, the share of coffee producers has remained almost constant over time at ~60 %. On average, coffee farmers are small-scale, like most farmers in Vietnam, and most of their cropland is allocated to coffee. However, the share of coffee as a percentage of cropland has declined from almost 72 % in 2007 to 60 % in 2017, which indicates that some diversification into other crops has taken place. Today, Dak Lak is not only famous for coffee but also for pepper, avocado and durian. For example, the number of households that cultivated pepper trees in the TVSEP sample increased from 5,7 % in 2007 to 18,6 % in 2017. The average pepper area per household increased from 0.17 ha in 2007 to 0.33 ha in 2017, corresponding with an doubling of the share of pepper in agricultural land.

As shown in Figure 1, close to 80 % of the coffee plots per farm are smaller than 1 ha and 40 % are smaller than half a ha. Only about 5 % of farmers grow more than 2 ha of coffee and this picture has barely changed between 2007 and 2017. Hence, coffee farming in Dak Lak is really mini-scale but whether or not it is also “*small and beautiful*”, the data below will tell us.

Table 1: General information of coffee production in Dak Lak.

| | 2007 | 2010 | 2013 | 2017 |
|----------------------------------------------|-------|-------|-------|-------|
| Total Interviewed Households (HHs) | 757 | 715 | 703 | 646 |
| Coffee HHs | 470 | 466 | 462 | 409 |
| Share of HHs planting coffee (%) | 62.1 | 65.2 | 65.7 | 63.3 |
| Size of Coffee Area per HH (ha) | 0.84 | 0.90 | 0.90 | 0.81 |
| Share of coffee in agricultural land (%) | 72.1 | 68.9 | 68.0 | 59.5 |
| Average yield per ha (kg green beans) | 1,996 | 2,241 | 1,984 | 2,062 |
| Average production cost in USD per ha | 975 | 1,148 | 1,533 | 1,535 |
| Average net income in USD per ha | 1,273 | 1,488 | 1,307 | 2,402 |
| Average coffee prices | | | | |
| Fresh cherries (in USD per kg) | 0.30 | 0.23 | 0.31 | 0.32 |
| Dried beans (in USD per kg) | 1.29 | 1.24 | 1.80 | 1.81 |

Note: All monetary data are nominal values.

Source: www.tvsep.de

Productivity of coffee in Dak Lak is higher than in Brazil, the world’s major coffee producer. This is also what the TVSEP data show, with around 2 tonnes of green beans per ha and with relatively small variation throughout the years. Generally, yields can be influenced by weather and pests like coffee berry borers or diseases like coffee rust, in addition to the farmer’s crop management skills and input use. As shown in Table 1, production costs have increased by almost 40 % between 2007 and 2017. Since these are nominal figures, the increase in fertilizer prices explains part of the increase but it can also be related to higher fertilizer use due to rising problems with soil fertility. Furthermore, the data indicate some gaps in efficiency as input costs bear little relationship with yields.

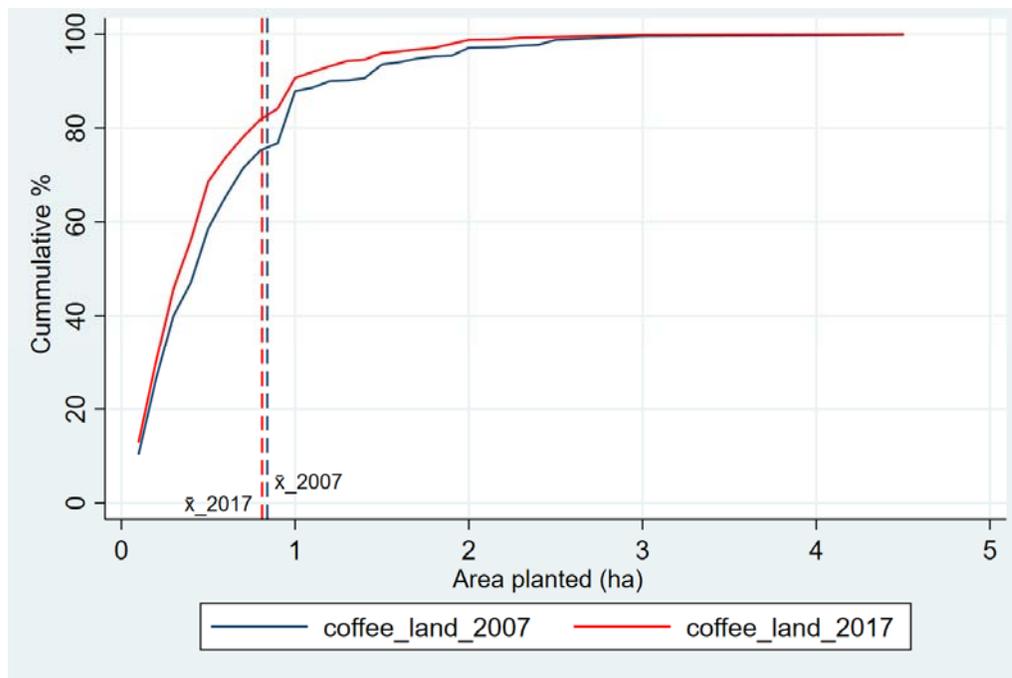
Net income from coffee can be as high as 2,400 USD but as low as 1,300 USD per ha (Table 1). Much depends on the price of coffee, which dropped in 2010 but rebounded in 2013². The income data suggests that most coffee farmers remain poor. For example, a farmer with half a ha of coffee, in the best case scenario, would just get over 3 USD per day from coffee. For a family of five, this would put them well below the poverty line, considering that coffee is the major source of income. Hence, income from other crops like pepper (here net income can be up to 4,500 USD per ha) or non-farm income becomes more and more important for coffee farmers in Dak Lak.

2. The ageing of Dak Lak’s coffee trees

One of the problems of coffee farming in Dak Lak is that the trees are getting old. The World Bank, in one of its reports about Vietnam (2011), has pointed to tree age as a major threat to Vietnam’s coffee industry. The data collected under the TVSEP project allows an analysis of this problem since

² Coffee prices also dropped in late 2013 (after the survey) but increased again in 2017.

TVSEP is the only survey that includes tree age information in its panel dataset. Both, the Vietnam Household Living Standards Survey (VHLSS) and the Vietnam Agri-census do not collect such data.



Source: (www.tvsep.de)

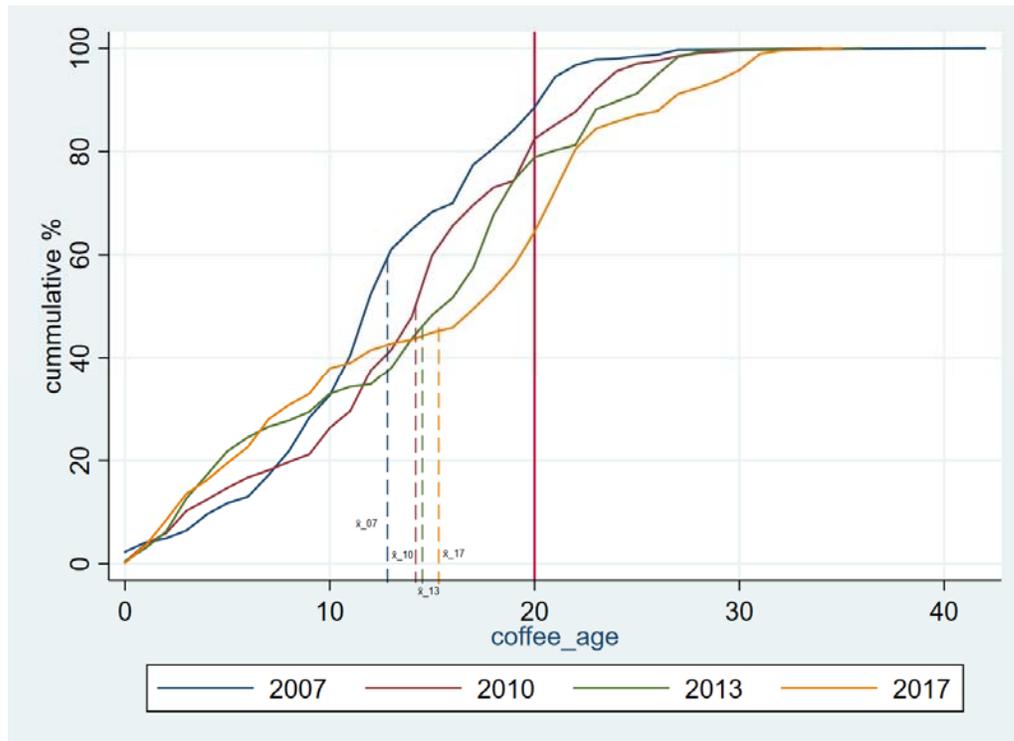
Figure 2: Distribution of coffee land size among panel households.

Of course, the optimal replacement of a durable asset is a standard management question. In theory, the optimal replacement of a perennial crop like coffee is reached when the marginal net revenue of another year falls below the expected maximum annuity value of a new plantation (or tree). In practice, this is not always easy to determine due to lack of information and lack of financial resources. As a rule of thumb, 20 years is considered to be the age when coffee trees should be replaced (ICO, 2019). The productivity of older coffee trees can only be maintained with higher fertilizer inputs; else productivity will decline rapidly. The TVSEP data gives record to what extent this rule is being implemented in Dak Lak province.

In Figure 3, a cumulative distribution function/curve (CDF) is shown for all the four panel waves. In 2007, only 15 % of coffee trees were older than the threshold value while this increased to almost 40 % by 2017. At the same time, very few of the plantations are in their gestation period, i.e. below three years of age.

Farmers in Dak Lak have delayed the replacement of coffee plantations and may have missed the optimal replacement time. This hypothesis is supported by the rising input costs as shown in Table 1. Currently, replacement of old coffee trees must be carried out under challenging conditions with, for example, rising labour costs, natural resources degradation, and climate change effects (Havemann et al., 2015). Hence, a good replacement strategy may include adopting intercropping or switching to other crops. Clearly, if current trends continue, more than half of Dak Lak's coffee trees will become too old. If no replacement or shifting to other more profitable crops will take place, income from farming may decline and poverty and inequality (Doutriaux et al. 2008) in Dak Lak could increase

again, especially if other shocks like the recent Covid-19 pandemic occur. Good agricultural extension services, supported by targeted credit programs, may be needed to sustain the unique coffee production systems of the province. Certainly, there is also room for conducting interesting research around this theme, by making use of the TVSEP panel data, eventually supplemented by an add-on projects or well-targeted case studies.



Source: (www.tvsep.de)

Figure 3: Age distribution of coffee plantations in Dak Lak.

3. Coffee and the environment

One of the downsides of the dominance of a single agricultural commodity in a region is that on the one hand, it can lead to economic dependency, but it also can have negative effects on natural resources and the environment. The rapid expansion of coffee areas since the mid-nineties has been a root cause for deforestation, also resulting in loss of biodiversity. Dak Lak planning authorities have set a maximum of 180,000 ha for the area planted to coffee in the province (GSO, 2018). By 2017, however, the coffee area was over 200,000 ha, i.e. more than 10 % over the target. In addition, chemical-based crop management practices with heavy doses of mineral fertilizers, which, more often than not, are far above the recommended rates, have led to a decrease in soil organic matter and fertility (D’haeze et al., 2005; Byrareddy et al., 2019). Likewise, mis- and overuse of chemical pesticides has led to more pest problems. The rapid expansion of well irrigation has caused the depletion of ground water resources (Amarasinghe et al., 2015).

In Figure 4, a simple scatterplot of coffee yield versus fertilizer input indicates a “higgledy-piggledy” pattern instead of the expected production function shape. This again points to possible efficiency

gaps in farmers' fertilizer management indicating the need for appropriate extension services and participatory training (i.e. bringing in farmers' experience and indigenous knowledge) to achieve need-based application of fertilizer, which is in concurrence with the principles of sustainable soil management. It appears from Figure 4 that the inefficiency even increased in 2017 when compared to 10 years previously.

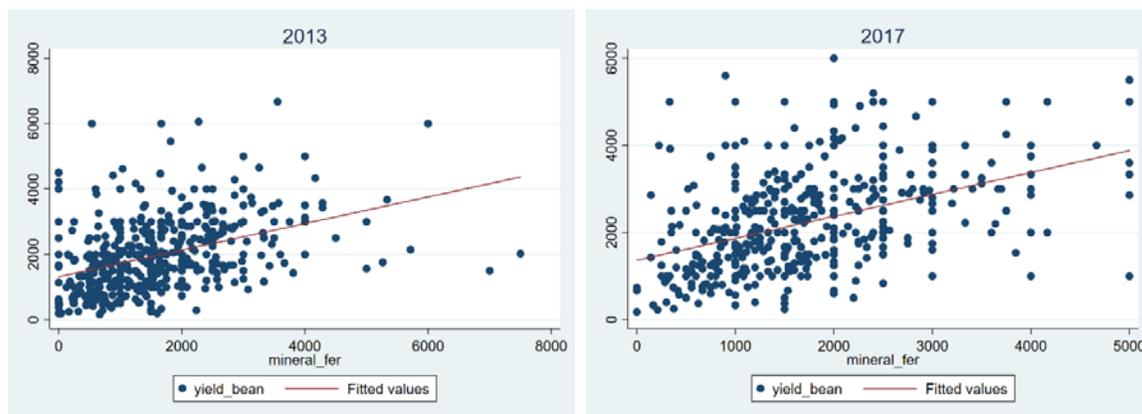


Figure 4: Coffee yield versus mineral fertilizer use (kg per ha).

III. The future of Dak Lak coffee

Coffee has been an economically attractive crop for Dak Lak province for a long time, which is why the province' economy is "coffee-driven". If managed well, the coffee industry will continue to be the backbone of the economy in Dak Lak. Productivity and profitability of coffee is highly competitive compared to other production locations in Vietnam and relative to many other crops. However, the agricultural portfolio is diversifying as a result of domestic and foreign demand for other commodities. For example, black pepper is growing in importance due to the promotion of environmentally-motivated certification schemes (IDH, 2018). Another emerging business is related to fruit trees such as avocados, which are gaining huge popularity in the international market (GIZ, 2006) and Durian, a fruit known for its strong smell that is very popular among Asian consumers, with an especially growing market in China. Farmers sometimes start these crops by intercropping them with coffee. For example, avocado is known to be a good "shade tree" in coffee plantations. The TVSEP panel has the capacity to capture these changes and thus provide valuable information for policy making at the provincial level and offering a model to other coffee producing regions.

Finally, as this case study has shown, there are a number of interesting topics that may emerge for future research using the TVSEP data set. Additionally, the panel can serve as an entry point for TVSEP add-on projects with additional data collection activities beyond the TVSEP panel (link: [Add-on projects](#)).

To conclude, three topics are suggested, which of course are just examples and could easily be expanded:

1. Coffee or fruit trees: Where is more money?
2. The impact of ageing coffee trees on the coffee industry.
3. The prospects for structural change in Dak Lak farming: How long will small still be beautiful?

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