

# **Lao Coffee Industry: Evaluation of VINACAFÉ pulper/demucilager**

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Note: A Thai language version of this report is also available.

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## SUMMARY

Trials producing washed coffee conducted at the Lao PDR Coffee Research Experimentation Centre (CREC) in 2005/06, compared traditional fermented and hand washed coffee to machine washed coffee for Arabica and Robusta. There was little difference detected in cup taste evaluations between the two processing styles of machine washing (Process A) and traditional ferment and hand washing (Process C) for both Arabica and Robusta. The additional cost to machine wash (pulp and demucilage) using the VINACAFE pulper/demucilager (US\$900) is US\$22/MT of green bean. Thus the cost is small to produce excellent washed coffee from high altitudes in Bolovens Plateaux.

The paper focuses on physical characteristics and performance of the VINACAFE pulper/demucilager.



VINACAFE pulper/demucilager

## INTRODUCTION

A series of coffee quality trials were conducted at the CREC, at Ban Itou KM 35 Paxong using the imported VINACAFE pulper/demucilager. The aim of the trials was to assess this new system to produce a washed coffee using a pulper/demucilager compared to the traditional systems of pulping, fermenting and hand washing. Arabica and Robusta coffees were both produced using the traditional pulp, ferment and hand wash methods (Process C) and by the VINACAFE pulper/demucilager (Process A). The coffees produced were cup tasted and evaluated for quality in the CREC cupping laboratory.

Detailed analyses of the quality and tasting results from these trials are found in *Arabica Quality Trials and Robusta Quality Trials* in the full Special Final Report. This paper focuses on some of the physical characteristics and performance of the VINACAFE pulper/demucilager.

## MACHINE DETAILS

The VINACAFE MXT Drum Pulper and MDN-0.5 Demucilager is an imported machine from Viet Nam consisting of a standard drum pulper feeding into a vertical demucilaging unit to produce parchment coffee with approximately 95% mucilage removed. The pulper uses a 1.5 hp single phase motor and the demucilager uses a 3 hp three phase motor. The unit requires from 5 to 10 L water/kg of fresh cherry for good pulping and demucilaging. The cost of the machine delivered to Lao was US\$900. During the trials the processing through-put of the machine was adjusted to 300 kg/hour of fresh cherry and water input was adjusted to a constant 10 L/kg of cherry to give very good demucilaging. Previous trials in Vietnam, Myanmar and Thailand in other FAO projects showed that the VINECAFE MDN-05 unit is cheaper (\$900-\$1200) than similar pulper/demucilagers such as the Brazilian Pinhalense-ECO-OSVX (approx. \$7000) and the Colombian Penagos UCBE-500 (\$3230), and produces comparable parchment and green bean out-turn quality.





VINACAFE pulper/demucilager

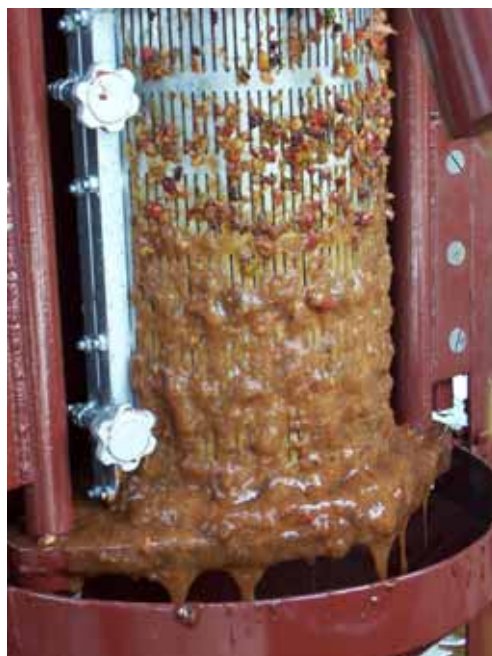
### Materials and methods

Arabica and Robusta trials produced both machine washed and traditional hand washed coffee. In each comparative trial, 200 kg of fresh cherry coffee from 17 areas for Arabica and 3 areas for Robusta were collected. Each 200 kg sample of coffee was divided into two lots — 100 kg each for Process A and Process C.

**Machine washed (Process A).** The imported VINACAFE pulper demucilager pulped the 100 kg batch of coffee and the mucilage was immediately removed by the second stage demucilaging unit. Within one hour, the wet parchment was spread at 20 kg/m<sup>2</sup> on the mesh drying trays to dry in the sun.



VINACAFE demucilager



Mucilage being removed

**Traditional hand-washed (Processes C).** The VINACAFE machine was used to pulp the 100 kg batch of coffee. The wet parchment was stored in a free draining plastic container for

18 hours (Arabica) and 36 hours (Robusta). The fermented parchment was washed in clean water by hand until free of mucilage was spread at 20 kg/m<sup>2</sup> on the mesh drying trays to dry in the sun.



**Pulped coffee**



**Fermenting coffee**



**Hand washing coffee**



**Wet demucilaged coffee (left) compared with hand washed coffee (right)**



**Dry demucilaged parchment (left) compared with dry hand washed parchment (right)**

## Results and discussion

**Table 1.** VINACAFE pulper/demucilager processing of Arabica cherry versus hand washed coffee (Physical data)

Sample No	Weight of sorted red cherry for process A & C (kg)	Process date semiwash A & full wash C	Weight of wet parchment A & C (kg)	Weight of washed parchment C (kg)	No of days to dry	Weight of dry parchment A & C (kg)	Moisture content (wb) of dry green bean (%)	Out turn ratio cherry to dry parchment
1 A	A 98	15/11/05	38	-	13	17.5	11.5	5.6
1 C	C 98	15/11/05	43	33	13	15.2	11.5	6.4
2 A	A 92	16/11/05	38	-	13	17.8	12.0	5.1
2 C	C 92	16/11/05	49	38.5	13	16.5	12.0	5.5
3 A	A 87	17/11/05	38.5	-	13	16.0	12.0	5.4
3 C	C 87	17/11/05	56	45	13	18.5	12.0	4.7
4 A	A 93	18/11/05	45	-	11	19.5	11.5	4.7
4 C	C 93	19/11/05	55	45.5	11	18.7	11.5	4.9
5 A	A 81.5	20/11/05	35.5	-	12	17.2	11.0	4.7
5 C	C 81.5	20/11/05	47	36	12	14.8	11.0	5.5
6 A	A 83	22/11/05	37	-	13	19.2	12.0	4.3
6 C	C 83	22/11/05	53	43	13	16.4	12.0	5.0
7 C	A 94.5	22/11/05	41	-	13	17.3	12.0	5.5
7 C	C 94.5	22/11/05	54	38.5	13	16.5	12.0	5.7
8 A	A 68	22/11/05	33	-	9	14.0	11.6	4.8
8 C	C 68	22/11/05	42	30	9	14.3	11.6	4.7
9 A	A 90.5	25/11/05	36.5	-	10	21.5	11.5	4.2
9 C	C 90.5	25/11/05	41	32	10	19.8	11.5	4.5
10 A	A 98.5	26/11/05	39.5	-	10	15.8	12.0	6.2
10 C	C 98.5	12/11/05	42	35	10	18.8	12.0	5.2
11 A	A 102	28/11/05	48	-	8	19.1	12.0	5.3
11 C	C 102	28/11/05	57	46.5	8	17.6	12.0	5.8
12 A	A 86.75	29/11/05	38	-	9	13.2	11.4	6.6
12 B	C 86.75	29/11/05	47	39	9	15.3	11.4	5.6
13 A	A 99	29/11/05	43	-	9	17.2	11.5	5.7
13 C	C 99	29/11/05	55	40.5	9	13.8	11.5	7.2
14 A	A 98.75	30/11/05	40.5	-	8	19.5	11.7	5.1
14 C	C 98.75	30/11/05	49	36	8	18.2	11.7	5.4
15 A	A 97.75	01/12/05	38	-	9	19.1	11.3	5.1
15 C	C 97.75	01/12/05	46.5	34	9	16.2	11.3	6.0
16 A	A 97.8	02/12/05	39	-	9	16.0	11.5	5.9
16 C	C 97.8	02/12/05	48	35	9	16.4	11.5	6.0
17 A	A 2.25	03/12/05	36	-	9	15.0	11.5	6.2
17 C	C 2.25	03/12/05	44	33.5	9	16.8	11.5	5.5

Data show that for any given amount of fresh cherry the output of parchment for A is less than C. This difference represented the amount of mucilage removed from the parchment in Process A was more, and some mucilage still adhered to the parchment in Process C. When Process C was washed, the resulting weight was similar to A for that sample. For the 17 pairs of samples, the washed parchment of Process A was heaviest for 11 samples while washed parchment of Process C was heaviest for 6 samples. It is not possible to determine if this variation was due to variation between the processes or experimental errors. The expected out-turn ratio for cherry to parchment for Arabica coffee is 5:1. In this trial, the ratio varied

from 7.2 to 4.2. It was not possible to determine if this variation was due to variation between the coffee samples, the difference in processing system or experimental errors.

The results show an approximate average out-turn ratio for all samples of 5.42. For machine washed Arabica, the out turn ratio was 5.32 (cherry to parchment) and 5.51 for hand washed.

**Table 2.** VINACAFE pulper/demucilager processing of Robusta cherry versus hand washed coffee (Physical data)

Sample No	Weight of sorted red cherry A & C (kg)	Process date semi-wash A & full wash C	Weight of Wet parchment A & C (kg)	Weight of washed parchment C (kg)	No of day to dry	Weight of dry parchment A & C (kg)	Moisture content (wb) of dry green bean (%)	Out turn ratio cherry to dry parchment
1 A	94.5	20/001/06	52.0	N/A	9	20	12.0	4.7
1 C	94.5	20/01/06	72.0	49.5	9	19	12.0	5.0
2 A	94.75	23/01/06	53.5	N/A	9	20.5	11.5	4.6
2 C	94.75	23/01/06	70.5	48.5	9	18.5	11.5	5.1
3 A	95.5	26/01/06	50.0	N/A	9	19.5	12.5	4.9
3 C	95.5	26/01/06	71.0	49	9	19	12.5	5.0

Data show that the out turn ratio of fresh cherry to dry parchment for the machine washed Robusta was 4.7 and for hand washed, 5.0. This result may be insignificant in terms of output of green bean which was not overall assessed as the preference is to store and hold parchment. The result may simply mean more mucilage or rubbish adhering to the dry parchment in the hand wash processing.

### Costings

Costs to produce washed Robusta by traditional fermentation and hand washing are high due to the large amounts of labour, water and fermenting and washing infrastructure required. As an estimate based on time and labour cost in Lao, it may cost an additional US\$50/MT to pulp, ferment and hand wash Robusta over the cost of natural processing to produce washed Robusta green bean.

The additional cost to produce washed Robusta coffee by a VINACAFE pulper demucilager is calculated at approximately 2.2 cent/kg or US\$22/MT green bean more than for natural dry processing. This is based on the following assumptions.

- Capital cost and depreciation of the purchase price of the VINACAE machine at US\$900 is calculated 0.6 cents/kg of green bean. The cost of the machine is averaged over 15 years and is assumed to produce 10 tonnes of green bean per year.
- Electricity cost is calculated at 0.6 cents/kg of green bean based on electricity consumption of 3 kwhr for processing fresh cherry at 300 kg/hour and an electricity cost of 10 cents /kwhr.
- Labour cost to produce wet parchment is calculated at 0.7 cents/ kg of green bean based on 2 labourers/day at US\$3/day, processing 6 MT of cherry to produce 1 MT of green bean equivalent.
- Water cost is calculated at 0.1cent/kg of green bean based on water use of 10 L/kg of cherry.
- Maintenance cost for the pulper/demucilager is estimated at 0.2 cents/kg green bean equivalent.
- Based on the trial results, fresh Robusta cherry is assumed to convert to dry green bean equivalent at the ratio of 6 kg of fresh cherry to produce 1 kg of dry green bean at 12% moisture.



### **Drying efficiencies**

Drying efficiencies were not calculated in the Lao trials. However, trials conducted by FAO at coffee research centres in Viet Nam and Thailand showed that apart from benefits of improved quality, coffee dried as washed parchment dries twice as fast as coffee dried as natural cherry coffee. Alternatively, only half the drying space is needed to dry the same amount of coffee if it is processed to washed parchment. Figures from FAO trials in southern Thailand and southern Viet Nam showed that under sunny conditions, concrete slabs had bean drying efficiencies of approximately 1 kg/m<sup>2</sup>/day for washed parchment drying and approximately 0.5 kg/m<sup>2</sup>/day for natural cherry.

### **Cup quality/tasting**

Full cup quality assessments of Arabica and Robusta coffee processed by the VINACAFE pulper/demucilager and handwashing with fermentation are given in the Special Final Report. In summary, differences between coffee processed by the two methods were small and insignificant. Thus the VINACAFE pulper/demucilager as tested is acceptable and is recommended to standardise coffee quality out-turn for both Arabica and Robusta coffee in Lao.

### **Recommendations**

If the international market confirms that Lao washed Robusta is of interest and there is a price incentive above the cost to produce washed Robusta, this valued added Robusta coffee should be investigated via some small commercial shipments. More focus on developing the prototype VINACAFE machines will be required since engine driven models or electric generators would be needed for remote areas without electricity, and water pumps to provide water pressure for the demucilager are essential. A village level model would be need to be developed to ensure high quality washed Robusta is produced. Farmers at present are not processing Robusta coffee with a view to improving quality as no high quality washed Robusta market prospects are now just being explored. Early international assessments confirm that high grown washed Robusta coffee from Lao is a very high quality product.

### **Machinery manufacturer**

VINACAFE MXT Drum Pulper and MDN-0.5 Demucilager available from:

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05 Truong Son St Binh Tan Industrial Zone  
Nha Trang City, Khanh Hoa Province, Viet Nam

Email: ckvinacafe@dng.vnn.vn