

Mechanization: an issue for coffee curing workers of India

Molly Chattopadhyay

Economic Analysis Unit, Indian Statistical Institute, Bangalore 560059, India
molly@isibang.ac.in

Abstract

Objective: To study the impact of mechanization on coffee curing workers using both primary and secondary data.

Methods: To measure the impact of mechanization on coffee curing workers in India, unit level data from employment-unemployment survey collected by National Sample Survey Organization (NSSO) for two time points 1999-2000 and 2011-12 were considered. Proprietors of six coffee curing factories based in Karnataka were interviewed due to the fact that among all the states in India 73% of coffee curing factories is based in Karnataka.

Findings: Adaptation of electronic grader and colour sorter had reduced the size of workforce – both male and female workers. Since, coffee curing factories are covered by Factories Act, 1948, a significant number of workers lost their regular source of income due to adaptation of technology.

Application: The study clearly indicates that workers – both male and female workers are being affected by the technologies related to coffee curing. The impact is severe in forcing workers into unorganized sector as contract worker with little or no social security benefits. Therefore, there is a need to protect employment and strengthen them with the help of government agencies and non-government organisations for entitlements to social security benefits.

Keywords: Coffee curing, mechanization, colour sorting.

1. Introduction

With the onset of globalisation, India's coffee sector has been at the receiving end of unrestricted imports and sharp declines in the international prices. The implications for coffee sector have been serious. Indian coffee was compulsorily pooled with the Coffee Board by all growers. The Board served as a monopoly trading institution and was directly regulated by the central government. Coffee Board basically acted as an insurance against short-term swings and manipulations in the global market. In 1992, the central government amended the Coffee Act of 1942 and announced that 30% of coffee that was produced could be retained by growers for sale under the Free Sale Quota (FSQ). In 1994, it made yet another amendment and raised FSQ to 50%. In 1996 pooling of coffee with the Coffee Board was totally abolished. What remained was free sale without any quotas. The market was totally deregulated and the Coffee Board was reduced to an advisory body.

Due to restructuring of Coffee Board, Indian coffee planters are also going through one of the most trying periods due to declining coffee prices and exports. According to Coffee Board [1-2] India's exports of coffee fell by 82 per cent in value and realized unit value declined by 48% between 1997-98 and 2003-04. Further the glut in the world coffee market deepened the crisis for the coffee producers. A world glut had pushed coffee producers into one of the industry's deepest crises with the growers being forced into debts, bankruptcy and worse [3].

With labour being the most important single cost, plantation companies in South India have invested heavily in mechanization to increase labour productivity like tea estate in South India. The Coffee Board is implementing Integrated Coffee Development Project under which various interventions such as research & development, technology transfer, capacity building, support to mechanization of estates; coffee area development, market development, support to value addition etc. are undertaken for the overall improvement of production, productivity and quality of coffee.

The changes in the size of employment within this sector needs serious assessment in the light of current concerns on declining workforce participation rate in the coffee curing sector. The impact of technical change on division of labour, thereby resulting in displacement of labour will be explored in case of coffee curing industry of India.

2. Background

The coffee landscape of India has undergone tremendous transformation over the past two decades induced by several socio-economic, political and institutional factors. The Indian coffee industry is the fifth largest in the world followed after Brazil, Vietnam, Indonesia and Colombia. Coffee production in India is dominated by Karnataka, Kerala and Tamil Nadu forming the traditional coffee growing regions of South India, followed by the new areas developed in the non-traditional areas like Andhra Pradesh and Orissa as well (Table 1). Coffee production in India has grown rapidly from 18,893 tonnes in 1950–51 to 316,700 tonnes in 2016-17 at an annual growth rate of 26%. Similarly, the area of coffee harvested in India increased from 92523 hectares in 1950-51 to 360,485 hectares in 2010-11 at an annual growth rate of 24%.

Table 1. State wise area and production of coffee in India, 2015-16

State	Production (in MT)	% to India	Area (in Hec.)	% to India
Karnataka	251520	72.3	235438	54.2
Kerala	69230	19.9	85501	19.7
Tamilnadu	17295	5.0	34932	8.0
Total traditional area	338045	97.2	355871	81.9
Non-traditional area	9955	2.8	78565	18.1
India	348000	100.00	434436	

Source: Coffee Board, 2017

The phenomenal increase in area under coffee cultivation between 1990-91 and 2015-16 has been visible all over India (Table 2). Southern region covering three districts namely Chikmagalur, Hassan and Kodagu had a clear dominance in the area and production. Kodagu occupying 71% of gross cropped area produces 40% of total production in Karnataka in 2016-17. Expansion of coffee area and production suggests that coffee industry has survived by the year 2005 after initial slowdown of export following introduction of free sale quota in 1996.

Table 2. Growth of coffee planted area between 1990-91 and 2015-16

	1990-91	% to India	2015-16	% to India	Growth
Karnataka	123700	60.2	235438	54.2	90.3
Kerala	70400	34.2	85501	19.7	21.5
Tamilnadu	2940	1.4	34932	8.0	18.8
Total traditional area	197040	95.8	355871	81.9	80.6
Non-traditional area	8600	4.2	78565	18.1	813.5
India	205640	100.0	346716	100.0	111.3

Source: Coffee Board, 2000 and 2017

Total number of coffee curing factories in India is as follows: Karnataka (62), Kerala (7), Tamilnadu (15) and Assam (1). Karnataka has highest number of coffee curing factories: out of 85 factories spread over Karnataka, Kerala, Tamil Nadu and Assam, 62 factories are located in Karnataka (Coffee Board, 2018). That is 73% of total establishments are centred in Karnataka. In this backdrop, visit was made to six factories comprising Chikmagalur, Hassan and Kodagu district to study the impact of mechanization on the workforce.

3. Literature

Internationally and nationally, impact of technology on women's labour was discussed by several scholars. When the village replaced the manual irrigation system through bucket system in which women are very active with tube well irrigation system, women lost their jobs [4]. New jobs (e.g. wheat grinding, machine operator) usually go to men and it is even rare for women to be employed in the factories producing such equipment.

The study by [5] in Tamilnadu, West Bengal, and Kerala highlight that any innovation in paddy cultivation, whether it is a switch over from traditional manures to artificial fertilizers, from weeding out herbs to use of herbicides from manual transplanting to machine transplanting, throws women out of work. In the agriculturally developed villages of Hooghly District in West Bengal, the demand for male workers has increased and a section of female agricultural workers have been displaced [6]. Before the introduction of technology, natural manures such as neem seeds, dried neem leaves, cattle wastes and so on were used largely and women's involvement was greater [7]. But the introduction of chemical fertilizers and pesticides has displaced the requirement of women's labour and promoted male domination in this operation. Also, the hand sprayers, which are widely used in, for using the fertilizers and pesticides weights about 30-35 kilograms. Since women lack the physical strength to carry the equipment on their backs for five hours, they are excluded from the operation. The economic development entails the introduction of machinery. With the economic development of an agricultural area, the participation of farm work by women declines in Punjab and Haryana [8-9]. Removal of women from their means of production and from their productive function by the introduction of new technology was extensively examined [10-13]. Removal of female unskilled labour with technological development in agriculture sector is widely discussed. Nevertheless, impact of technology or mechanization on male labour is not common in the literature.

There exist a few scholarly literatures on labour market issues on coffee industry in the Indian context. It is to be noted that literature on labour market issues in coffee are rather scant. Much of the literature on coffee plantations focused thematically on labour history including slavery, colonialism; on role of labour market institutions including the legislations and nature of labour relations in the plantations. In this perspective, this article will explore whether decreasing labour force, particularly male labour in curing factories is due to introduction of labour displacing technology. This study is an attempt to study the impact of technology on workers of coffee curing industry of India.

4. Data

To measure impact of technology on coffee workers in India, unit level data from employment-unemployment survey collected by National Sample Survey Organization (NSSO) for two time points 1999-2000 and 2011-12 were considered. Gender disaggregated data on size of employment was analyzed using National Industrial Classification (NIC) five digit industry codes; NIC 2008 for 2011-12 and NIC 1998 for 1999-2000. Gender disaggregated data on size of employment was tabulated using usual principal status employment.

Regarding labour replacement, managers of six coffee curing factories based in Chikmagalur, Hassan and Kodagu districts of Karnataka were interviewed. Out of 85 coffee curing factories, 62 factories that is 73% are located in Karnataka; due to this reason, factories located in Karnataka were taken up for the study.

5. Findings

5.1. Employment pattern

At all India level, there has been decline by 45% in average daily total employment in coffee curing industry from 21416 in 1999-2000 to 11742 in 2011-12. Total employment in India decreased by 45%; accompanied by 57% decrease of male workers and 13% increase of female workers (Table 3). To understand the changes in the employment size, division of labour and production process in coffee curing needs elaboration.

Table 3. Distribution of employment pattern in coffee curing factories in India

	Year		Growth/Decline
	1999-2000	2011-12	
Male	17846	7692	-57%
Female	3570	4049	+13
India	21416	11741	-45%

Source: NSSO Employment and Unemployment Survey, 1999-2000 & 2011-12

5.2. Production processes and Division of labour

To understand the presence and nature of employment in the coffee curing industry, it is important to briefly describe the production processes (Table 4). Within the factories, coffee processing assumes following sequence: The coffee curing plant is the final stage in the processing of coffee. In the curing factories, the production process consisted of: a) Stick and stone separator, b) Hulling, c) Peeler/Polisher, d) Winnower, e) Graders, f) Catadors, g) Electronic colour sorters, h) Garbling, i) Packing and storing.

Table 4. Division of labour in coffee curing factories

Curing operations	Labour use Male/Female (manual)	Male/Female (machine)
Stick and stone separator	F	M
Hulling	M	M
Winnower	M	M
Sorting & grading	F	M
Catadors	M	M
Electronic Colour Sorters	F	M
Garbling	F	F (No change)
Packing & storing	M	M (No change)

Trucks containing coffee from the estates arrive at the plant. The truck, along with the loaded coffee is driven over the weigh bridge, after which the coffee is unloaded and stored in the raw coffee go down. Then, the trucks are weighed again and the difference gives the weight of the coffee unloaded. It is then taken to the milling section. There, machines called stick & stone separators process the coffee to remove the impurities like sticks and stones. Before introduction of machine, women were engaged in stick and stone separator process manually. Then, the coffee beans are sent to the machine called huller. It is used to remove the outer skin of the coffee berries. Next in line is the peeler/polisher, for cherries, which removes the silver lining or the dried coffee berry skin. The berries are then sent to the winnower, which removes the loose husk and other debris, which are blown off. Excepting stick and stone separator, male workers remain engaged in all other operations, traditionally and also after introduction of mechanization.

The graders then grade them into P-berries, AB1, and bits, cuts & blacks using sieves to separate the different varieties. Traditionally, women workers were involved in grading. Machines known as catadors remove the remaining husks. Then beans are sent to the electronic colour sorters, which work on the principle of the difference in wave length of light for different colours. Poor varieties like the bits, blacks and cuts are not sent to the colour sorter, but used in making instant coffee. After colour sorting is done, they are sent for garbling - which is done manually by hand, mostly by women. This is the final sorting. Garbling is done by female workers only. Finally, they are then weighed, bagged by male workers and exported. Women have traditionally been contributing more heavily to grading and colour sorting of coffee beans.

5.3. Labour use un coffee production

How did the use of labour change due to the introduction of technology in coffee production? Before the start of technology in 1999-2000, average output per person day was 0.5 tonne. By 2011-12, output increased to 0.9 tonne per person day; an increase by 80% (Table 5). By task, a significant reduction was recorded for stick and stone separator, hulling and winning because of the increasing power of traditional machines. Significant reduction was recorded for colour sorting of beans. In other words, the labour absorptive capacity of technology was able to decrease manpower drastically. Garbling is still done manually by female workers. Labour input in garbling remained same in view of the perception of exporters that quality is maintained in manual garbling only. Colour sorter machine is run by male workers only, thereby displacing female labourers.

Table 5. Changes in output per person day out between 1999-2000 and 2011-12

Year	Number of worker	Output (in tonne)	Output per person day
1999-2000	21416	14	0.5
2011-12	11742	27	0.9
Increase of output per person day by 80%			

Source: NSSO, 1999-2000 and 2011-12 and field visit, 2018

A major decrease in labour input occurred with the introduction of electronic colour sorter. In coffee curing factories, significant reduction was recorded for colour sorting of beans. Electronic colour sorter reduces sorting of beans according to size and colour from 20 workers per ton per day (eight hours) to 80 ton per day by two workers, resulting in 90% decrease of workers (Table 6). For an average coffee producer producing 5000 metric ton of coffee manually requires 10000 person days for colour sorting; electronic colour sorter trims down to 125 person day. Therefore, only one factory is capable to decrease manpower by 98.8%. In other words, the labour absorptive capacity of technology was able to decrease.

Table 6. Person days required for colour sorting of coffee beans, manually and by machine

Colour sorting of coffee beans	Time (in hrs.)	No. of worker	Production (in tonne)	Production (in tonne) per person day
Manual	8 hrs	20	1	0.5
Machine	8 hrs	2	80	40

**Person days = 1 person for 8 hrs. of work*

6. Conclusion

The first wave of mechanised technology in colour sorting of coffee beans in curing factories was the most female-labour-displacing of all, as it replaced manual sorting which had been worked entirely by women. It thus restricted demand for female wage workers to work as garblers in the curing factories. On the other hand, male workers also lost their jobs due to mechanization and increasing capacity of separator, huller, winnower and catadors. Overall, decline of 45% of curing workers between 1999-2000 and 2011-12 can be explained due to the introduction of technology. A moderate amount of increase by female workers (13%) compared to male workers (57%) can be explained by the presence of garblers in all the curing factories which is female concentrated job. Even, the largest coffee exporter, being one of the two fully integrated coffee companies of Asia employs large number garblers for manual checking of quality beans. Whereas other operations, specifically used to be done manually by male workers is replaced by male machine operators excepting the job of packing. Consequentially, manual job used to be done by male workers is replaced by male workers only, but in diminishing number. That explains huge reduction in male job in curing factories. Since, all the curing factories are not going for mechanization at the same time for all the units within the factory, the increase of female workers seem encouraging. But it is clear from the findings that more displacement of labour will occur due to mechanization. This necessitates the need to address the livelihood options of the workers to have a secured employment opportunity.

7. References

1. Coffee Board. Market Research and Intelligence Unit. <https://www.arrowpointindia.com/about.php>. Date accessed: 2017.
2. N. Duvury. Work participation of women in India: A study with reference to female agricultural labourers 1961 to 1981. ILO/ Asian Regional Team for Employment Promotion (ARTEP) New Delhi. 1987.
3. National Productivity Council (NPC). Impact of trade and Globalisation on Gender in India. New Delhi, 2006.
4. M. Kishwar and Ruth Vanita. In search of answers: Indian women's voices (Eds.). Manushi, London. 1985.
5. J. Mencher, Saradmoni. Muddy feet dirty hands: rice production and female labour. *Economic and Political Weekly*. 1992; 17(57), 1789-1794.
6. R. Singha. Women and New Technology Development. New Delhi, Allied Publishers. 1992.

7. S. Sundari, V. Gowri. New agricultural technology: a gender analysis. *Indian Journal of Social Work*. 2002; 63(4), 517-539.
8. M. Billings, A. Singh. Mechanisation and wheat revolution: effects of female labour in Punjab. *Economic and Political Weekly*. 1970; (52), 169-174.
9. K. Chakravarthy, G. Tiwari. Regional variation in women employment: a case study of five Indian villages in three Indian States. Indian Council of Social Science Research, New Delhi. 1979.
10. M.A. Chen. Women's Work in Indian Agriculture by Agro Ecological Zones Meeting Needs of Landless and Land poor Women. *Economic and Political Weekly*. 1989; 24(43), WS79-WS89.
11. M. Mies. Capitalist development and subsistence reproduction: rural women in India. *Bulletin of Concerned Asian Scholars*. 1980; 2(1).
12. S.P. Sinha. Technological Change in Agriculture and Women Workers in Rural Bihar - A Case Study. In: Alakh N.Sharma and Seema Singh (ed.), *Women and Work Changing Scenario of India*, B.R. Publishing Corporation, Delhi. 1993.
13. United Nations. *Status of Women in Asia and the Pacific Region*. ESCAP, Series. 1986.

The Publication fee is defrayed by Indian Society for Education and Environment (www.iseeadyar.org)

Cite this article as:

Molly Chattopadhyay. Mechanization: an issue for coffee curing workers of India. *Indian Journal of Economics and Development*. June 2019, Vol 7 (6), 1-6.

Received on: 04/06/2019

Accepted on: 22/06/2019