

# **UNEP-CI PROJECT (2017-2019)**

National Cleaner Production Centre,  
66/1,  
Dewala Road,  
Nugegoda.



## **Inventory Tables for Life Cycle Inventory (LCI) Analysis – Tea Processing**

**Year 2015-2017**

### ***Factory Details***

Name : .....

Address : .....

Regional Plantation Division : .....

District : .....

GPS Location :Latitude ..... Longitude ..... (if possible)

Tel. No. : .....

### ***Contact Person's Details***

Name : .....

Designation : .....

Tel. No. : .....

Email Address : .....

### ***Field Assistant's Details***

Name : .....

Tel. No. : .....

Email Address : .....

.....

Field Assistant's Signature

.....

Visited Date

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## **1) PLANT LAYOUT**

Plant layout of the factory should be sketched here. Sample plant layout has been provided in the **Appendix 1**.

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## **2) PROCESS FLOW DIAGRAM**

Machine/Unit Processor wise Process Flow Diagram should be sketched here. Sample of a process flow diagram has been given in the **Appendix 2**.

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## 3) PRELIMINARY INFORMATION

1) What is the main technology used for tea processing at the factory?

CTC Technology     Orthodox Technology     Other (Specify).....

2) Does this factory produce special types other than black tea? (ex: Green Tea-Chinese variation)

Yes     No

If yes, what are the percentages?

..... +/- ..... %  
..... +/- ..... %  
..... +/- ..... %

3) What are the packaging materials used in the factory?

Wooden boxes  
 Cardboard  
 Foil paper bags

.....  
.....  
.....  
.....

4) Are there any renewable & other sources of electricity generation in addition to the national grid supply?

Generator (Fuel Type) .....  
 Mini hydro power plant     CEB Grid Connected  
 Solar energy     CEB Grid Connected  
 Other energy     CEB Grid Connected

5) What are the different quality grades of the black tea been produced? (production share % )

BOP +/- ..... %  
BOPF +/- ..... %  
Dust +/- ..... %  
..... +/- ..... %  
..... +/- ..... %  
..... +/- ..... %  
..... +/- ..... %

6) What are sources of bought leaves arrive to the factory? (the collector share/ % of intake)

..... +/- ..... %  
..... +/- ..... %  
..... +/- ..... %  
..... +/- ..... %

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7) What are the fuel sources use to generate hot air/stream?

- | <u>Biomass</u>                       | <u>Petroleum Fuel</u>                |
|--------------------------------------|--------------------------------------|
| <input type="checkbox"/> Wood logs   | <input type="checkbox"/> Diesel      |
| <input type="checkbox"/> Rubber      | <input type="checkbox"/> LP Gas      |
| <input type="checkbox"/> Off-Cuts    | <input type="checkbox"/> Furnace Oil |
| <input type="checkbox"/> Other       | <input type="checkbox"/> Other ..... |
| <input type="checkbox"/> Wood chips  |                                      |
| <input type="checkbox"/> Saw dust    |                                      |
| <input type="checkbox"/> Other ..... |                                      |

8) What is the source of water supply?

- Water board supply       Deep well       stream       Other (Specify).....

9) What is the percentage weight reduction expected from withering process?

Rainy days ..... % Non-Rainy days .....%

10) Is this factory certified with following ISO standards

- ISO 14001 (Environmental Management)
- ISO 22000 (Food Safety Management)
- ISO 50001 (Energy Management)
- ISO 9001 (Quality Management)
- Other .....

11) What are the CSR projects carried out over last three years by this factory/Plantation company?

.....  
.....  
.....

12) What are the main technical problems face by the factory currently?

.....  
.....  
.....

13) What are the main environmental problems face by the factory currently?

.....  
.....

14) What are the main social problems face by the factory currently?

.....  
.....





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## 4.2) TRANSPORT INFORMATION – TEA LEAF TRANSPORTING VEHICLE DETAILS

Time Duration : 1 Week

Vehicle Type	Brand Name	Vehicle Model	Vehicle Reg. #	Load Capacity	Fuel Type	Ownership of Vehicle`		
						Own	Hired	Other
<i>Ex: Tipper</i>	<i>TATA</i>	<i>xxxxxx</i>	<i>62-3085</i>	<i>2.5 Cubes</i>	<i>Diesel</i>			

 **Extendable**

### **HINTS:**

- Details of all vehicles which are arrived to factory during 1 week should be recorded.
- Ownership of the vehicle should be concerned according to the factory perspective.
- Own indexing syntax can be used to prepare the list.



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## 5.1) TRANSPORT INFORMATION – RESOURCE COLLECTION SOURCE

Resource	Collection Point	Source Index	Location	Distance (km)
Ex:Biomass – wood Logs	xxxxxx	BM1	xxx, xxxxxxxx, Kitulgala	40 km


 **Extendable**

### HINTS:

- Consider fuel types (ex: biomass, diesel) and packaging materials (ex: wooden boxes, foil paper bags) for Source (Estate/Division/Collection Point) to Destination (Factory) should be taken based on route direction not aerial distance.
- Google map on area or vehicle meter reading can be used to measure the distance.
- Own indexing syntax can be used to prepare the list.
- If one resource is transported from different locations include all sources under such resource category.

## 5.2) TRANSPORT INFORMATION – RESOURCE TRANSPORTING VEHICLE DETAILS

	Vehicle Type	Vehicle Model	Vehicle Reg.#	Load Capacity	Load Allocation	Fuel Type	Ownership of Vehicle`		
							Own	Hired	Other
Ex:Diesel	Bouser	xxxxxx	62-5060	13200L	80 %	Diesel			√

 **Extendable**

### HINTS:

- Most commonly transported vehicle should be considered for particular resource transportation
- Ownership of the vehicle should be concerned according to the factory perspective.
- Own indexing syntax can be used to prepare the list.

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## 6.1) TEA LEAF INPUT INFORMATION (DAILY BASIS)

Time Duration : October, November, December of 2017

Selected Month : .....

Daily Tea Leaf Collection / (Kg)												
#	Date	Estate/ Division/ Collection Point										Total
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												

√ Extendable for other months

**HINTS:**

- Refer "Tea Book" available in any tea factory which is used to record production flow data

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## 6.2) TEA LEAF INPUT INFORMATION (MONTHLY BASIS)

Time Duration : Year 2017

Monthly Tea Leaf Collection /(kg)											
Month	Estate/ Division/ Collection Point										Total
January											
February											
March											
April											
May											
June											
July											
August											
September											
October											
November											
December											

## 6.3) TEA LEAF INPUT INFORMATION (YEARLY BASIS)

Time Duration : 3 Years

Yearly Tea Leaf Collection /(kg)											
Year	Estate/ Division/ Collection Point										Total
2015											
2016											
2017											

### **HINTS:**

- Refer "Tea Book" available in any tea factory which is used to record the production flow data



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## 7.2)BIOMASS CONSUMPTION INFORMATION (MONTHLY BASIS)

Time Duration : Year 2017

Month	Monthly Biomass Consumption - 2017							
	Wood Logs		Wood Chips		Saw Dust		Other biomass	
	Cu. Yards	Rs.	kg	Rs.	kg	Rs.		Rs.
January								
February								
March								
April								
May								
June								
July								
August								
September								
October								
November								
December								

## 7.2)BIOMASS CONSUMPTION INFORMATION (YEARLY BASIS)

Time Duration : 3 Years

Month	Yearly Biomass Consumption							
	Wood Logs		Wood Chips		Saw Dust		Other biomass	
	yard <sup>3</sup>	Rs.	kg	Rs.	kg	Rs.		Rs.
2015								
2016								
2017								

### Wood specification used in factory

- Rubber
- Off-cuts
- Other (Specify) .....

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## 7.3) PETROLEUM FUEL CONSUMPTION INFORMATION (MONTHLY BASIS)

Time Duration : Year 2017

Month	Monthly Petroleum Fuel Consumption - 2017							
	Diesel		LP Gas		Furnace Oil		Other Fuels	
	L	Rs.	kg	Rs.	L	Rs.		Rs.
January								
February								
March								
April								
May								
June								
July								
August								
September								
October								
November								
December								

## 7.4) PETROLEUM FUEL CONSUMPTION INFORMATION (YEARLY BASIS)

Time Duration : 3 Years

Month	Yearly Petroleum Fuel Consumption							
	Diesel		LP Gas		Furnace Oil		Other Fuels	
	L	Rs.	kg	Rs.	L	L	Rs.	L
2015								
2016								
2017								



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## 7.5) WATER CONSUMPTION INFORMATION (MONTHLY BASIS)

Time Duration : Year 2017

Month	Consumption	
	L	Rs.
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

Purpose of water consumption records?

- Process Only       Process + General Purpose

## 7.6) WATER CONSUMPTION INFORMATION (YEARLY BASIS)

Time Duration : 3 Years

Month	Consumption	
	L	Rs.
2015		
2016		
2017		

If water pumps are used to pump the water to the overhead tank,

Measurement	Unit	Amount
Volume of water tank	L	
Capacity of the water pump	Hp/kw	
Time taken to fill the tank	min	
How frequently tank fills	Per week	

Water sources used in the factory

- Water board supply  
 Deep well  
 River  
 Water stream  
 Other

What is the average water consumption for general purpose? .....%

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## 8.1) ELECTRICITY BILL INFORMATION (MONTHLY BASIS)

Time Duration : Year 2017

Monthly Electricity Bill Information – Year 2017					Generator		Other Electricity (kWh)
Month	Consumption (kWh)				kVA	Units (kWh)	
	Peak	Day	Off-Peak	Total			
January							
February							
March							
April							
May							
June							
July							
August							
September							
October							
November							
December							

Scope of electricity consumption records,

- Process Only       Process + General Purpose

## 8.2) ELECTRICITY BILL INFORMATION (YEARLY BASIS)

Time Duration : 3 Years

Yearly Electricity Bill Information					Generator		Other Electricity (kWh)
Year	Consumption (kWh)				kVA	Units (kWh)	
	Peak	Day	Off-Peak	Total			
2015							
2016							
2017							

### Electricity sources using in factory

- National Grid  
 Generator  
 Hydro Power  
 Solar Energy  
 Wind Power  
 Other (Specify) .....

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
## 8.3) SECTION WISE ELECTRICITY METER READING INFORMATION (DAILY BASIS)

\*\*\* If sub electricity meters are available

Time Duration : October, November, December of 2017

Selected Month : .....

#	Day	Daily Section wise electricity consumption (kWh)					
		Withering	Rolling	Drying	Sifting	Hot Air Gen.	Other
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

 Extendable for other months

### HINTS:

- Please check the scope of electricity meters and list down the machines which are categorized under the meter.
- Include total electricity consumption under the “other” category which are not categorized in “withering”, “rolling”, “drying” or “sifting” (Ex: Office, Meeting Room, Stores etc.)

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## **8.4 ) SECTION WISE ELECTRICITY METER READING INFORMATION (MONTHLY BASIS)**

**\*\*\* If sub electricity meters are available**

Time Duration : Year 2017

Month	Monthly Section wise electricity consumption (kWh)					
	Withering	Rolling	Drying	Sifting	Hot Air Gen.	Other
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						

## **8.5) SECTION WISE ELECTRICITY METER READING INFORMATION (YEARLY BASIS)**

**\*\*\* If sub electricity meters are available**

Time Duration : 3 Years

Year	Yearly Section wise electricity consumption (kWh)					
	Withering	Rolling	Drying	Sifting	Hot Air Gen.	Other
2015						
2016						
2017						

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## 9.1) PRODUCTION DATA / INFORMATION (DAILY BASIS)

Time Duration : October, November, December of 2017

Selected Month : .....

Daily production data											
#	Date	Withered Tea (kg)	Made Tea/Final product (kg)	Sifted Tea (kg)					Gain	Drier Blow Out (kg)	Sifting Refuse (kg)
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
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22											
23											
24											
25											
26											
27											
28											
29											
30											

*Extendable for other months*

### HINTS:

- Refer "Tea Book" available in any tea factory which is used to record the production flow data

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## 9.2) PRODUCTION DATA INFORMATION (MONTHLY BASIS)

Time Duration : 1 Year

Monthly production data										
Month	Withered Tea (kg)	Made Tea/ Final Product (kg)	Sifted Tea (kg)					Gain	Drier Blow Out (kg)	Sifting Refuse (kg)
January										
February										
March										
April										
May										
June										
July										
August										
September										
October										
November										
December										

## 9.3) PRODUCTION DATA INFORMATION (YEARLY BASIS)

Duration : 3 Years

Yearly production data										
Year	Withered Tea (kg)	Made Tea/ Final Product (kg)	Sifted Tea (kg)					Gain	Drier Blow Out (kg)	Sifting Refuse (kg)
2015										
2016										
2017										

### **HINTS:**

- Refer "Tea Book" available in any tea factory which is used to record the production flow data

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## 10) TECHNICAL INFORMATION OF THE MACHINERIES (YEARLY BASIS)

Section	Machine Index	Machine Name	Model	No of Devices	Rated Power (HP/kW)	Production Rate (kg/h)
Withering		Lifter motors (if any)				
		Trough - Type 1				
		Trough - Type 2				
Rolling		Sand Shifter				
		Conveyor motors				
			Rotor Vane - Type 1			
			Rotor Vane - Type 2			
			Conveyor motors			
			Biter Box – Type 1			
			Biter Box – Type 2			
			Roll Breaker - Type 1			
			Roll Breaker - Type 2			
		Humidifier Fan				
Drying		Conveyer motors				
		Dryer - 1				
		Dryer - 2				
		Dust Separator				
		Conveyor motors				
Sifting		3T Stalk Extractor				
		Fibre Mat Machine				
		Middton Machine				
		Trick Shifter				

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		Chota Shifter				
		Terry Nipper				
		Winnower				
		Conveyor motors				
Hot Air Gen		Boiler				
		Heat exchanger				
		Fan motors				

**HINTS:**

- Sections should be divided as Withering, Rolling, Drying and Sifting
- Similar machines should be considered under one machine index by mentioning number of similar machines.
- Label of ratings printed on machines can be referred to record power consumption and production rate. Else machine manuals available in the factory could be referred.




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## 11.1) TROUGHWORKING HOURS RELATED INFORMATION (BATCH BASIS)

Time Duration: 1 week

Date	Parameter	Unit	Trough .....		Trough .....		Trough .....		Trough .....	
			Date	Time	Date	Time	Date	Time	Date	Time
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Withered Amount	kg/batch								
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Withered Amount	kg/batch								
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Withered Amount	kg/batch								
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Withered Amount	kg/batch								
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Withered Amount	kg/batch								
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Withered Amount	kg/batch								
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Withered Amount	kg/batch								
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Withered Amount	kg/batch								
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Withered Amount	kg/batch								

 **Extendable for rest of batches**

### HINTS:

- Take the start time just with switching on the motor after loading a batch to a trough.
- Take the end time just with the switching off the motor before unloading a batch from a trough
- Information should be recorded for each trough for each batches continuously during data collection period
- “#” notation represents the batch number

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## 11.2) ROLLERWORKING HOURS RELATED INFORMATION (BATCH BASIS)

Time Duration: 1 week

#	Parameter	Unit	Roller .....		Roller .....		Roller .....		Roller .....	
			Date	Time	Date	Time	Date	Time	Date	Time
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Rolled Amount	kg/batch								
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Rolled Amount	kg/batch								
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Rolled Amount	kg/batch								
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Rolled Amount	kg/batch								
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Rolled Amount	kg/batch								
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Rolled Amount	kg/batch								
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Rolled Amount	kg/batch								
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Rolled Amount	kg/batch								
	Start Time	Date/h:min								
	End Time	Date/h:min								
	Rolled Amount	kg/batch								

√ Extendable for rest of batches

### HINTS:

- Take the start time and end time similar to the trough working hours recording procedure.
- Information should be recorded for each roller for each batches continuously during data collection period.
- “#” notation represents the batch number.

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## 11.3) SECTION WISEWORKING HOURS RELATED INFORMATION (BATCH BASIS)

Time Duration: 1 week

#	Parameter	Unit	Section wise data										
			Rolling		Ferment.		Drying		Sifting		Hot Air Gen.		
			Date	Time	Date	Time	Date	Time	Date	Time	Date	Time	W%
	Start Time	Date/h:min											
	End Time	Date/h:min											
	Processed Amount	kg/batch											
	Start Time	Date/h:min											
	End Time	Date/h:min											
	Processed Amount	kg/batch											
	Start Time	Date/h:min											
	End Time	Date/h:min											
	Processed Amount	kg/batch											
	Start Time	Date/h:min											
	End Time	Date/h:min											
	Processed Amount	kg/batch											
	Start Time	Date/h:min											
	End Time	Date/h:min											
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	Start Time	Date/h:min											
	End Time	Date/h:min											
	Processed Amount	kg/batch											
	Start Time	Date/h:min											
	End Time	Date/h:min											
	Processed Amount	kg/batch											
	Start Time	Date/h:min											
	End Time	Date/h:min											
	Processed Amount	kg/batch											
	Start Time	Date/h:min											
	End Time	Date/h:min											
	Processed Amount	kg/batch											
	Start Time	Date/h:min											
	End Time	Date/h:min											
	Processed Amount	kg/batch											

√ Extendable for rest of batches

### HINTS:

- Take the start time when the machines are turn on after an idling time period
- Take the end time when the section turns for idling after turn of machines
- “#” notation represents the batch number
- W% represents hot air contribution supplied for withering process. Contact technical officers for that.

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## 11.4) TROUGH& ROLLERWORKING HOURS RELATED INFORMATION (MONTHLY BASIS)

Time Duration: 1 Year

Month	Monthly Total Working Hours– Troughs (2017)					
	Trough ...	Trough ...	Trough ...	Trough ...	Trough ...	Trough ...
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						
Month	Monthly Total Working Hours - Rollers (2017)					
	Roller ...	Roller ...	Roller ...	Roller ...	Roller ...	Roller ...
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						

## 11.5) TROUGH& ROLLERWORKING HOURS RELATED INFORMATION (YEARLY BASIS)

Time Duration: 3 Years

Year	Yearly Total Working Hours - Troughs					
	Trough ...	Trough ...	Trough ...	Trough ...	Trough ...	Trough ...
2015						
2016						
2017						
Year	Yearly Total Working Hours - Rollers					
	Roller ...	Roller ...	Roller ...	Roller ...	Roller ...	Roller ...
2015						
2016						
2017						

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## 11.6) SECTION WISEWORKING HOURS RELATED INFORMATION (MONTHLY BASIS)

Time Duration: 1 Year

Month	Monthly Section Wise Total Working Hours (2017)					
	Withering	Rolling	Fermentation	Drying	Sifting	Hot Air Gen.
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						

## 11.7) SECTION WISEWORKING HOURS RELATED INFORMATION (YEARLY BASIS)

Time Duration: 3 Years

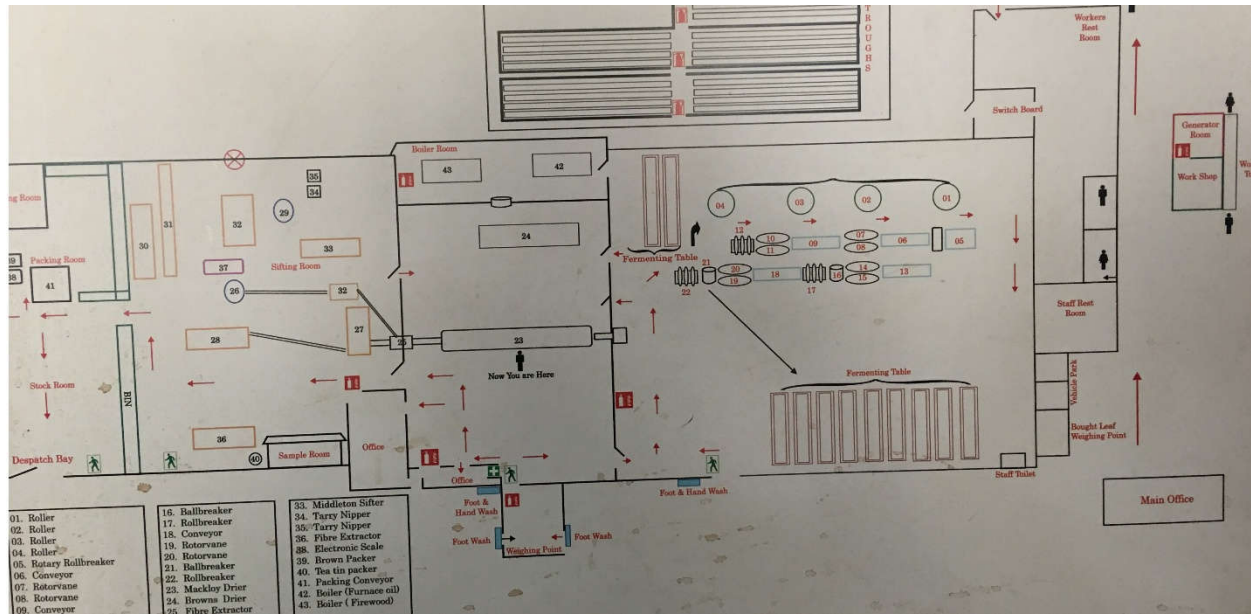
Year	Yearly Section Wise Total Working Hours					
	Withering	Rolling	Fermentation	Drying	Sifting	Hot Air Gen.
2015						
2016						
2017						

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## 12) APPENDIX

### Appendix 1: A sample plant layout of a tea factory



### Appendix 2: A Snapshot of a sample process flow diagram

