




SUPPORTING INFORMATION FOR:

Madrid-Solórzano, J.M., García-Alcaraz, J.L., Jiménez Macías, E. & Blanco Fernández, J. (2022). Sustainable Industrial Sotol Production in Mexico—A Life Cycle Assessment.

Summary

This supporting information provides the primary empirical data on research from the sotol-producing firm.

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1. Contact information			
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2. Details about conducted research			
2.1 Research period			
One month			
2.2 Processing type			
Industrial manufacturing			
2.3 The quantity of the finished product produced on the research period			
The quantity processed of sotol pineapple biomass during the research period was equal to 15 tons, which is equivalent to approximately 1250 L of distilled spirit (45% Alc. Vol). After graduation of the total alcohol by volume, the quantity of finished product was 1806 bottles of 750 ml at 40% Alc. Vol.			
3. Inputs and Outputs			
Harvest			
Stage description	Quantity	Units	Notes
Inputs			
Draft animal (mule)	1	pc.	Not considered in the study
<i>The period used</i>	15	hrs.	

3. Inputs and Outputs			
Harvest			
Stage description	Quantity	Units	Notes
Inputs			
Metal basket made of a bar of corrugated iron	4	pcs.	Not considered in the study
<i>The period used</i>	15	hrs.	
<i>Average useful life</i>	5	yr.	
<i>Weight</i>	4.60	kg	
Axe	3	pcs.	Not considered in the study
<i>The period used</i>	15	hrs.	
<i>Average useful life</i>	5	yr.	
Bowie knife	3	pcs.	Not considered in the study
<i>The period used</i>	15	hrs.	
<i>Average useful life</i>	3	yr.	
Shovel	3	pcs.	Not considered in the study
<i>The period used</i>	15	hrs.	
<i>Average useful life</i>	3	yr.	
Four wheels tipping trailer (axle number: 2)	1	pc.	Not considered in the study
<i>Average useful life</i>	18	yr.	
Pickup truck	1	pc.	
<i>Fuel consumption</i>	70	L	
<i>Average useful life</i>	15	yr.	
The transport distance of <i>Dasyilirion</i> plants	512	km	
Log truck (Kenworth T800)	1	pc.	
<i>Average useful life</i>	15	yr.	
<i>Fossil fuel (Diesel)</i>	230	L	
Outputs			
<i>Dasyilirion</i> leaves left in the place of the harvest	0.5	t	Not considered in the study
Cooking			
50-hp steam boiler machine	1	pc.	
<i>The operation hours of the steam boiler per 15 tons of sotol pineapples</i>	45	hrs.	
<i>Average useful life</i>	18	yr.	
<i>Average consumption of LPG</i>	80	kg/hrs.	
<i>Average consumption of water</i>	3,500	L/45 hrs.	

3. Inputs and Outputs			
Cooking			
Stage description	Quantity	Units	Notes
Inputs			
<i>Steam generation</i>	100	kg/cm ²	
<i>Working pressure per hour</i>	3	kg/cm ²	
Technical details of steam boiler machine			
<i>Steam working pressure</i>	8	kg/cm ²	
<i>Steam output</i>	782	kg/hr.	
<i>Electric motor</i>	1	pc.	
<i>Capacity</i>	3	hp	
	220YY/440 Y	V	
	8.4/4.2	A	
	3485	rpm	
	60	Hz	
Water pump motor	1	pc.	
<i>Capacity</i>	220/440	V	
	7.4/3.7	amp.	
	3486	rpm	
	60	Hz	
Supplementary equipment			
<i>2000 L propane tank</i>	1	pc.	
<i>Average useful life</i>	10	yr.	
<i>2000 L water storage tank (made of stainless steel)</i>	1	pc.	
<i>Water filtration system</i>	1	pc.	
<i>Average useful life</i>	2	yr.	
<i>Three-phase water pump</i>	1	pc	
<i>Capacity</i>	50	hp	
	3,600	rpm	
<i>Average useful life</i>	20	yr.	
<i>Schedule 40 steel pipe</i>	60	m	
<i>Average useful life</i>	15	yr.	

3. Inputs and Outputs			
Cooking			
Stage description	Quantity	Units	Notes
Inputs			
Autoclave			
<i>Baking process per 8 hrs.</i>	3,000	kg	
<i>The operation hours of the Autoclave</i>	40	hrs.	
<i>Steam consumption per hour</i>	100	kg/cm ²	
<i>Average useful life</i>	30	yr.	
Outputs			
<i>Wet sludge from autoclave</i>	19	L/45 hrs.	
<i>Water drained from autoclave</i>	20	L/45 hrs.	
Milling			
Stage description	Quantity	Units	Notes
Inputs			
Mill	1	pc.	
<i>Cutting capacity</i>	1,000	kg	
<i>The operation hours of the mill</i>	15	hrs.	
<i>Electric motor</i>	1	pc.	
	10	hp	
	208 – 220 / 440	V	
	27/13.5	A	
	1760	rpm	
<i>Water consumption</i>	2,500	L/15 hrs.	
<i>Average useful life</i>	10	yr.	
<i>Stainless Steel tanks</i>	250	kg	
<i>Average useful life</i>	20	yr.	
<i>Capacity</i>	5,000	L	
<i>Water pump</i>	1/2	hp	
	9.10/3.70	A	
	60	Hz	
<i>The operation hours of the mill</i>	15	hrs.	
<i>Average useful life</i>	5	yr.	
<i>Transfer pumps</i>	1	pc.	
<i>Capacity</i>	1/2	hp	
	9.10/3.70	amp.	
<i>Average useful life</i>	3	yr.	

3. Inputs and Outputs			
Milling			
Stage description	Quantity	Units	Notes
Inputs			
<i>Flexible PVC tubing (use in applications for the beverage industry)</i>	43	m	
<i>Stainless steel tank (weight)</i>	16	kg	Capacity: 300 L
Outputs			
Sotol bagasse (waste)	12	t	
Fermentation			
Inputs			
Fermentation tank	3	pcs.	
<i>Stainless steel tank</i>	62	kg	Weight
<i>Capacity</i>	1,000	L	
<i>Steam consumption per hour</i>	100	kg/cm ²	
<i>Average useful life</i>	20	yr.	
Distillation			
Inputs			
Stainless Steel alembic distiller	1	pc.	Made of sheet metal stainless steel caliber 16
<i>Capacity</i>	1000	L	
<i>Weight</i>	210	kg	
<i>Distillation time</i>	25	hrs.	
<i>Steam consumption per hour</i>	100	kg/ cm ²	
<i>Average useful life</i>	20	yr.	
Hydrometer	1	pc.	
<i>Average useful life</i>	10	yr.	
Cooling tower system			
<i>Electric motor</i>	3	hp	
	220YY/440Y	V	
	8.4/4.2	A	
	3485	rpm	
	60	Hz	
<i>Water pump</i>	1.5	hp	
	1,119	kW	
	60	Hz	

3. Inputs and Outputs			
Distillation			
Stage description	Quantity	Units	Notes
Inputs			
Cooling tower system			
<i>PVC tubing 2"</i>	42	m	
<i>Galvanized steel sheet</i>	84	kg	Weight
<i>Fiber glass</i>	48	kg	Weight
<i>Low density polypropylene-panels</i>	18	kg	Weight
<i>Water consumption</i>	900	L	
<i>Average useful life</i>	15	yr.	
Bottling			
Stainless steel tanks	2	pcs.	
<i>Capacity</i>	1000	L	
<i>Weight</i>	58.6	kg	
<i>Average useful life</i>	20	yr.	
Oak Casks	5	pcs.	Cask with six dip-galvanized hoops
<i>The transportation of oak casks by truck</i>	1,628	km	Distance travelled
<i>Capacity</i>	180	L	
<i>Average useful life</i>	15	yr.	
<i>The loss of distilled liquor during aging in oak barrels</i>	10	L	Period: four months to rested sotol
<i>The loss of distilled liquor during aging in oak barrels</i>	40	L	Period: fourteen to aged sotol
Semi-automatic bottle washing	1	pc.	
<i>Weight</i>	12.5	kg	Washing machine made of food grade stainless steel (304)
<i>Load capacity</i>	400	bottles/hrs.	
<i>Water consumption per 400 bottles</i>	50	L	
Water pump	115	V	
	60	Hz	
	3400	rpm	
	0.5	hp	

3. Inputs and Outputs			
Bottling			
Stage description	Quantity	Units	Notes
	Inputs		
Water heating equipment	1	pc.	It is used for pre-washing of bottles
LPG tank (10 kg)	1	pc.	
<i>Average useful life</i>	10	yr.	
<i>LPG tank weight</i>	7.8	kg	
<i>LPG consumption</i>	10	kg	
Heavy-duty single burner propane stove	1	pc.	It is made of black steel
<i>Weight</i>	5.6	kg	
<i>Average useful life</i>	5	yr.	
1200 H-O aluminum container	1	pc.	
<i>Weight</i>	1.68	kg	
<i>Average useful life</i>	4	yr.	
Semi-automatic liquid filling machine	1	pc.	Filling capacity: 200 bottles per hour
<i>Electric motor</i>	1	pc.	
	1/4	hp	
	0.187	kW	
	127	V	
<i>Average useful life</i>	15	yr.	
<i>Weight of filling machine</i>	55	kg	Washing machine made of food grade stainless steel (304)
<i>The operation hours of the machine</i>	14	hrs.	
Stainless steel tank (300 L)	2	pcs.	
<i>Weight</i>	24.5	kg	
<i>Distilled water</i>	125	L	
<i>The transportation of distilled water by truck</i>	36	km	Distance travelled
<i>White glass bottle (1 pc)</i>	0.844 – 0.878	kg	
<i>Wooden caps (1 pc)</i>	0.028	kg	
<i>Synthetic cork made from low-density polyethylene (1 pc)</i>	0.007	kg	

3. Inputs and Outputs			
Bottling			
Stage description	Quantity	Units	Notes
	Inputs		
Quantity of white glass bottles, wooden caps, synthetic cork purchased	10000	pcs. /yr.	
Quantity of labels purchased	20,000	pcs. / yr.	
<i>The transportation of glass bottle, wooden cap, synthetic cork, labels, heat shrink seals, and RSC boxes by truck</i>	1,628	km/yr.	
Ixtle loop used per bottle	1.13	m	
<i>Weight</i>	0.003	kg	
<i>The transportation of ixtle loop by truck</i>	36	km	
Heat gun	1	pc.	
<i>Power</i>	1400	W	
<i>Average useful life</i>	5	yr.	
Heat shrinks seals for bottles (70 mm X 90 mm)	1	pc.	
<i>Weight</i>	<1	gm	
Silicone hot glue gun (12.7 mm)	1	pc.	
<i>Capacity</i>	127	V	
	60	Hz	
	25	W	
Glue sticks	20	pcs.	
Weight for piece	0.373	kg	
Packaging			
Wooden skid	50	pcs.	
<i>Weight for a piece (average)</i>	19	kg	
<i>Average useful life</i>	5	yr.	
RSC boxes	151	pcs.	The holding capacity for an RCS box is twelve bottles
<i>Weight for a piece</i>	0.44 – 0.48	kg	
<i>The amount of RCS boxes purchased</i>	834	pcs. /yr.	

3. Inputs and Outputs			
Vinata facilities			
Stage description	Quantity	Units	Notes
Inputs			
Spotlights to illuminate	11	pcs.	
Duration of use	30	hrs.	
<i>Capacity</i>	25	W	
Electric motor for air extractors	3	pcs.	
<i>Capacity</i>	0.5	hp	
	50/60	Hz	
	1625	rpm	
<i>Average useful life</i>	5	yr.	
Computer equipment	1	pc.	
<i>Technical specifications</i>	1	pc.	
	50 - 60	Hz	
	1.30	A	
	2.31	A	
	19.50	V CC	
<i>Average useful life</i>	4	yr.	