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# Value Proposition / Mission Statement

## ***GOAP-preciate Yourself!***

Self-care is important to us. Here at GOAP we are a local soap maker, using locally sourced products to provide everyone a luxury spa experience at home at a price that is right for everyone. Rejuvenate, moisturize and revitalize your skin and body. Why settle for expensive spa soaps and treatments or inferior products? We strive to achieve zero waste in our processes to help contribute to the social, sustainable and environmental goals in our community and globally. Our quality handmade soap is made using organic ingredients and will provide a luxurious, soothing experience that will leave you feeling clean and beautiful.



# Background, Design and Shape of GOAP

- Four University of Waterloo students combined their efforts and came together for the purpose of making a quality soap that not only cleans, but also conditions and soothes the skin (criteria of soap properties desired by group 32), and that product was GOAP
- GOAP is a moisturizing, spa-like quality soap that benefits from the emollient properties of whole fat goat's milk, vegetable shortening and canola oil while incorporating the calming and stress-relieving scent of organic lavender, enhancing the sensory experience experienced while using the product
- Most ingredients and additives involved in the production of GOAP (such as goat's milk, lavender essential oil) are high quality materials, locally sourced in the province of Ontario
- In terms of constraints, group 32 were provided 10 oil and 2 lye choices to work with when designing/formulating GOAP, with the additives category remaining open (constraint-free)
- Chemically speaking, soap is the salt of a fatty acid, so in the cold-process soap making method (the method used to create GOAP), a caustic ingredient (lye solution) is reacted with fatty acid chains (a mixture of oils) in order to create soap. With regards to GOAP, goat's milk is added to the lye solution to produce a creamy, moisturizing soap
- To go more in-depth, the positively charged cation from the lye solution will react/bond with the negatively charged fatty acid chain (long saturated or unsaturated hydrocarbon chains, depending on the fat/oil used)
- The mold used to hold fresh batches of GOAP is what gives the large bars their signature cubic shape, or the thinner bars their square shape
- Specifically, a silicone mold is used to hold liquid GOAP and allow it to harden. The reasons for using a silicone mold over any other material is for flexibility when removing the soap from the molds, and to prevent the chemicals in the soap from reacting with the walls of the container over time (which may occur if a metal mold is used)

## The Ingredients in GOAP

- GOAP consists of: vegetable shortening, water, coconut oil, ghee, goat's milk, canola oil, lye (sodium hydroxide), lavender essential oil and mica powder
- The vegetable shortening contributes most to the conditioning properties of GOAP, as it is a source of linoleic and oleic fatty acids
- Coconut oil is used to add hardness to GOAP. This is a property attributed to lauric acid, which coconut oil is mostly composed of
- Ghee contains palmitic acid, which is added to achieve a creamy lather in the product soap
- Canola oil is used mainly because it is rich in oleic acid, and therefore adds extra moisturizing properties to GOAP. It is also used to help slightly reduce production costs
- Using goat's milk provides emollient properties to the final product soap, meaning that because it is added, washing with GOAP will condition and hydrate your skin even more than the standard moisturizing bar or other, non-moisturizing bars of soap
- GOAP receives its luscious scent from the addition of organic lavender essential oil during the cold process of soap making, after the saponification reaction takes place
- The blue mica powder used in the production of GOAP is an extra fine shiny metallic blue powder, which adds the blue colour to the signature swirled design of GOAP
- Sodium hydroxide (or NaOH) is the lye used to create GOAP. This is because NaOH makes a soap more firm, hard and durable; it is usually used in the production of bar soaps
- Water is a necessary ingredient in GOAP as well, as it is used to dissolve the lye, making a solution that can be easily mixed with the oils stated above

# GOAP's Packaging and Other Considerations

- GOAP comes in artisan-inspired, responsibly sourced/created packaging. It includes the GOAP logo, as well as a full ingredients list, including commonplace ingredient names for better consumer awareness
- Inside the fabric bag sold with large bars of GOAP is a small wooden “canoe”; despite it possibly being a “single-use item”, the canoe(s) are made from thin sheets of bamboo wood, which is a biodegradable material
- The bags that hold the “canoe” and bar of soap add an artisanal style to the overall product and furthermore is made of all natural (non-synthetic) fibers, meaning that it will decompose within a reasonable timeframe if disposed of
- Recyclable cardstock/cardboard material is used in the boxes sold with small bars of GOAP
- In addition, GOAP is a superfatted soap; this means that roughly 95% of the required NaOH required in the saponification reaction is used to make GOAP
- This technique is used as an extra safety precaution to ensure that all of the lye reacts with the oils. It has also been found to provide extra softening qualities to bars of soap
- Conversely, there are some negatives associated with producing GOAP
- While the goat's milk used to create GOAP is sourced provincially (in Ontario), its purchase promotes more livestock farming which in turn, leads to greater amounts of greenhouse gasses being released into the atmosphere, accelerating global climate change
- The bamboo “canoes” used to hold the soap sold to customers provides extra demand for forestry and lumber businesses, leading to the depletion of the world's forests/trees
- The bags that hold both the wood canoe and soap, although made of natural fibers, are sourced from China; such an import requires transportation, meaning that said bags have a carbon footprint that should be taken into consideration

## Prices and Costs of GOAP

- The current cost of making GOAP is 0.0118 CAD (or 1.18 Canadian cents per gram of GOAP) with all ingredients and additives included (oils, lye, goat's milk, lavender oil, mica powder). Adding the price of packaging, the total cost of producing one large cube is \$1.99, while the cost for a small bar is \$0.73
- The above costs do reflect the mass of oils used when producing GOAP, as mid to high priced oils and additives were used in the majority of the saponified oils used to make GOAP
- The decision to use mid to highly priced oils such as vegetable shortening, ghee, and coconut oil in GOAP was to achieve luxurious properties sought after by consumers in a bar of soap; mainly moisturizing/conditioning attributes and a creamy lathering profile
- Additionally, the cost of packaging for GOAP products varies; it costs about 99 Canadian cents per large cube and about 20 Canadian cents per small bar sold
- Due to the above considerations, the current price for GOAP is \$3.00 CAD for a small bar (about 45 grams of soap), and \$5.00 CAD for a large cube of GOAP (about 85 grams of soap)
- Comparing the selling prices to the costs, there is a \$3.01 difference for the large cubes of GOAP, and a \$2.27 difference for the small bars. These values correspond to a 151% markup for large GOAP cubes, and a 311% markup for the small GOAP bars
- For the soap symposium, four large cubes and four small bars were made with their respective packaging. Together, the combined total cost is \$10.88, which represents the amount of revenue required to break even (and start making a profit). If this target is not met, then group 32 will face a loss

# The Soap Calculator Process

- A list of oil-chemical compositions and corresponding physical properties of ten common oils was compiled. These quantities were organized into an Excel sheet.
- Each oil was calculated to have five main characteristic values. Target values were manually picked between the recommended ranges, listed below.
- An objective function was written for the Solver tool to optimize. Our particular function prioritized low cost and relatively adhering to our desired hardness value. The result was manually modified to encompass stronger cleansing properties.
- Additives were considered after the lye-to-oil recipe was finished. Goat's milk was determined to be used in a 1:4 ratio with water. Lavender essential oil and mica powder were loosely calculated based on the soap's final weight. Thus, each additional ingredient has a corresponding weight and density.

## Design Changes, Iterations and Possible Alternatives

- Throughout the duration of the design process of GOAP, some alternative ideas/concepts were pitched; one main idea was making the soap vegan and more cost efficient, sacrificing quality for a lower production cost. This iteration would have fit our criteria for a moisturizing bar, but would not have been the same luxurious, quality bar that GOAP is today. The aforementioned concept is shown below next to our final formulation (for comparison) in terms of mass, mass percentage of 500 grams of oil, and soap properties.

Vegan/Cost-Effective Oils Alternative		
Oils	Percentage	Quantity (g)
Coconut Oil, 76 deg	23%	115
Ghee, any bovine	0%	0
Crisco, old	36%	180
Avocado Oil	0%	0
Olive Oil	0%	0
Sesame Oil	0%	0
Corn Oil	0%	0
Grapeseed Oil	0%	0
Sunflower Oil	0%	0
Canola Oil	41%	205
<b>Total</b>	<b>100%</b>	<b>500</b>

Final GOAP Oils Formulation		
Oils	Percentage	Quantity (g)
Avocado Oil	0%	0
Canola Oil	4%	22.5
Coconut Oil, 76 deg	18%	90.8
Corn Oil	0%	0.0
Crisco, old	65%	323.5
Ghee, any bovine	13%	63.2
Grapeseed Oil	0%	0.0
Olive Oil	0%	0.0
Sesame Oil	0%	0.0
Sunflower Oil	0%	0.0
<b>Total</b>	<b>100%</b>	<b>500</b>

Hardness	Cleansing	Bubbly Lather	Creamy Lather	Conditioning	Cost
29.99	15.41	15.41	14.58	64.81	<b>\$3.44</b>

Hardness	Cleansing	Bubbly Lather	Creamy Lather	Conditioning	Cost
38.39	14.07	14.07	24.33	53.98	<b>5.98</b>

Recommended Ranges	Hardness	Cleansing	Bubbly Lather	Creamy Lather	Conditioning
	29 - 54	12 - 22	14 - 46	16 - 48	44 - 69

# Raw Ingredient Data Tables

Oil	SAP - KOH	SAP - NaOH	Lauric	Linoleic	Linolenic	Myristic	Oleic	Palmitic	Ricinoleic	Stearic
Avocado Oil	0.186	0.133	0	12	0	0	58	20	0	2
Canola Oil	0.186	0.133	0	21	9	0	61	4	0	2
Coconut Oil, 76 deg	0.257	0.183	48	2	0	19	8	9	0	3
Corn Oil	0.192	0.137	0	51	1	0	32	12	0	2
Crisco, old	0.192	0.137	0	52	0	0	18	13	0	13
Ghee, any bovine	0.227	0.162	4	2	1	11	19	28	0	12
Grapeseed Oil	0.181	0.129	0	68	0	0	20	8	0	4
Olive Oil	0.19	0.135	0	12	1	0	69	14	0	3
Sesame Oil	0.188	0.134	0	43	0	0	40	10	0	5
Sunflower Oil	0.189	0.135	0	70	1	0	16	7	0	4

Oil	Hardness	Cleansing	Bubbly Lather	Creamy Lather	Conditioning	Density	Cost (per 100g)
Avocado Oil	22	0	0	22	70	0.92	1.86
Canola Oil	6	0	0	6	91	1.01	0.21
Coconut Oil, 76 deg	79	67	67	12	10	0.81	1.63
Corn Oil	14	0	0	14	84	0.92	0.86
Crisco, old	26	0	0	26	70	0.92	0.42
Ghee, any bovine	55	15	15	40	22	0.92	1.67
Grapeseed Oil	12	0	0	12	88	0.92	0.86
Olive Oil	17	0	0	17	82	0.92	0.6
Sesame Oil	15	0	0	15	83	0.92	1.77
Sunflower Oil	11	0	0	11	87	0.92	0.28