March 17, 2022 Issue 3

GOOD BINES BIANNUAL

A PUBLICATION OF THE HGA
BEST PRACTICES COMMITTEE

MARCH 2022

IN THIS ISSUE

WELCOME TO THE HGA BEST PRACTICES COMMITTEE NEWSLETTER

The Best Practices Committee operates to connect Hop Growers of America members to reputable approaches to farm management. The committee provides educational platforms and funds research to develop novel advancements to inform the operational decisions of producers.

The primary focus of the March newsletter is to showcase the results of the first Life Cycle Assessment (LCA) representative of the entire U.S. hop industry. We thank our participants and donors for the generous investment of time and funding to bring this insightful information to the industry.

U.S. HOP INDUSTRY BASELINE LIFE CYCLE ASSESSMENT

OBJECTIVE OF THE STUDY

Guided by the International Organization of Standardization (ISO 14040/14044) a LCA is a systematic quantitative assessment used to gauge a broad spectrum of environmental impacts.

The LCA is the most advanced standardized method to assess and compare claims to environmental performance of products throughout their respective life cycle stages. LCAs compare the contributions of these stages to improve efficiencies and inform decision making.

The U.S. hop industry baseline LCA takes into account the inputs required to produce hop pellets. Hop growers in Washington, Idaho, and Oregon compiled data throughout the 2021 growing season to measure the environmental impacts of cultivating the crop. Hop processors, collectively representing 50% of U.S. hop pellet production, also submitted figures regarding the energy and supplies required to transform whole dried hops into pellets.

Together this information grants a holistic perspective of the U.S. hop industry's environmental impact in three key areas:

Carbon Footprint (Greenhouse Gas Emissions)

Water Footprint (Water Withdrawl)

Agricultural Land Usage

U.S. HOP INDUSTRY LCA SYSTEM BOUNDARIES

Supply

- Fertilizer production
- Pesticide production
- Hop Plant production
- Production of other consumables

Hop Production

- Energy (electricity and fuel)
- Water use
- Surface area used to grow hops

Hop Pelletizing

- Transport of hops to processor
- Energy (electricity and fuel)
- Water use
- Refrigerant

Packaging

- Packaging production

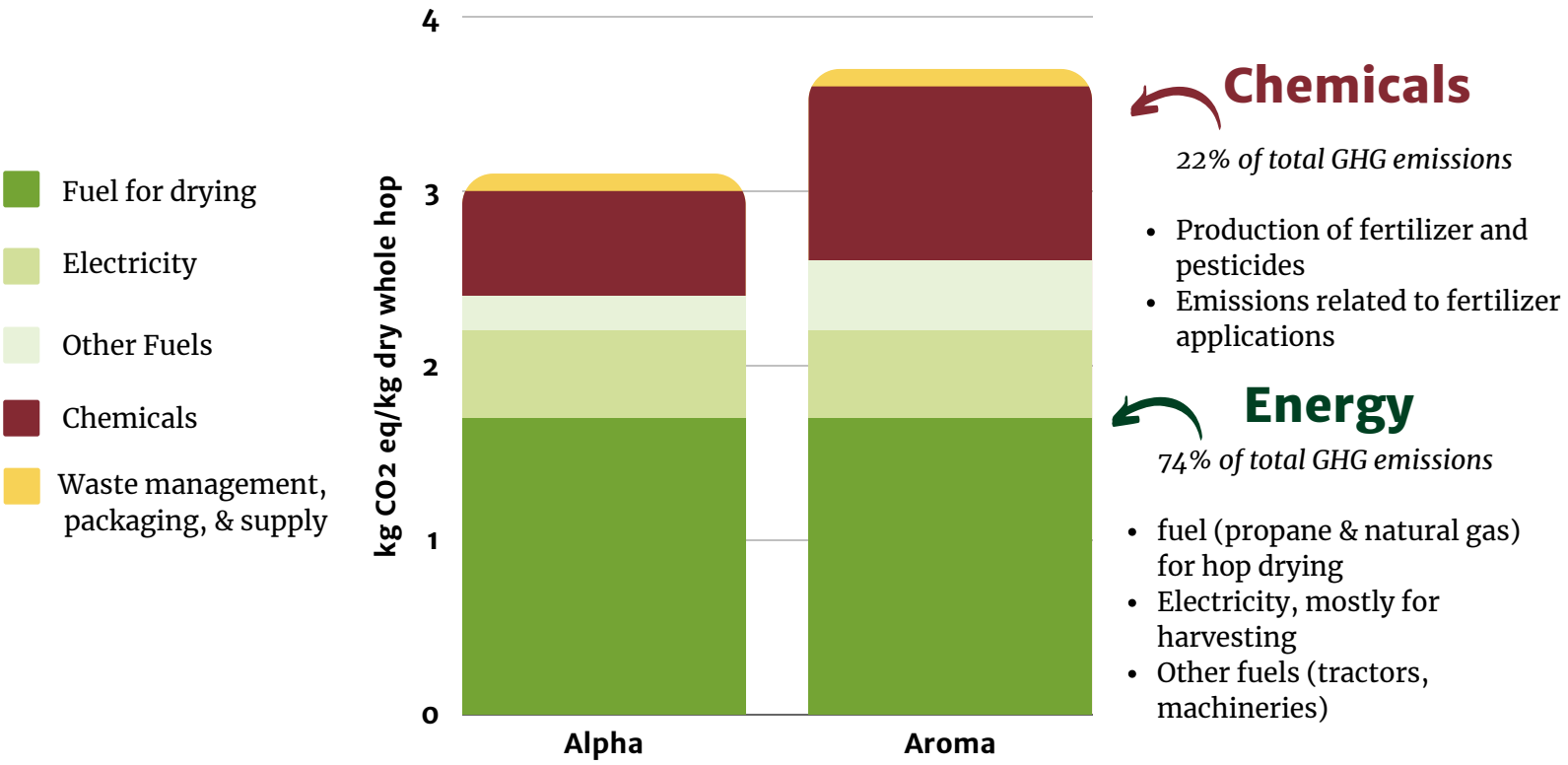
Results from the LCA encompass the cultivation and drying of hops, transport to the processor, as well as the transformation and packaging of hop pellets. As this study was a "baseline" and not a "full-spectrum" LCA, the data excluded the details of the greenhouse gas emissions generated by employees commuting to work, machinery replacement, as well as infrastructure maintenance such as painting and annual repairs.

CARBON FOOTPRINT OF DRY WHOLE HOPS

3.1 kg CO_2 eq. is generated by the production of 1 kg of **alpha** whole hops

3.7 kg CO_2 eq. is generated by the production of 1 kg of **aroma** whole hops

Alpha and aroma hop varieties carry different carbon footprints because of the contrast in yield. Since alpha varieties generally yield higher, they require less inputs per kilogram.



Chemicals

22% of total GHG emissions

- Production of fertilizer and pesticides
- Emissions related to fertilizer applications

Energy

74% of total GHG emissions

- fuel (propane & natural gas) for hop drying
- Electricity, mostly for harvesting
- Other fuels (tractors, machineries)

The greenhouse gas emissions generated by the production of 1 kg of dry whole hops is equivalent to a 8-9 mile drive in an average passenger vehicle

The greenhouse gas emissions generated by U.S. dry whole hop production in 2021 was the equivalent of driving around the world 36,000 times.

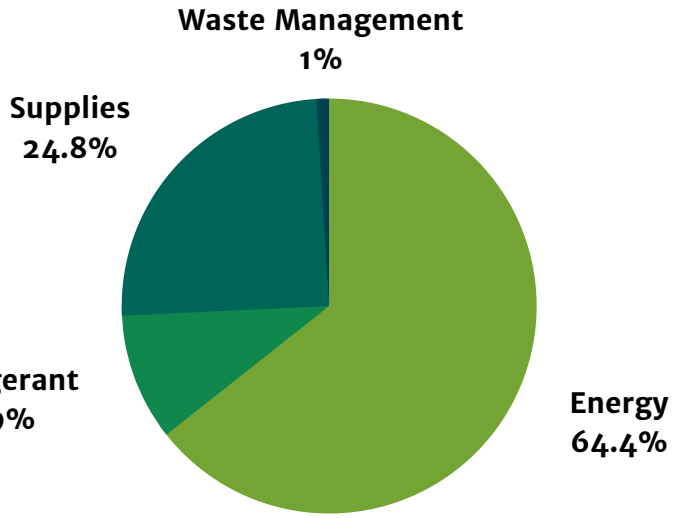
CARBON FOOTPRINT OF HOP PELLETS

The processing of 1.02 kg of dry whole hops into 1 kg of pellets generates .32 kg CO2 eq., meaning:

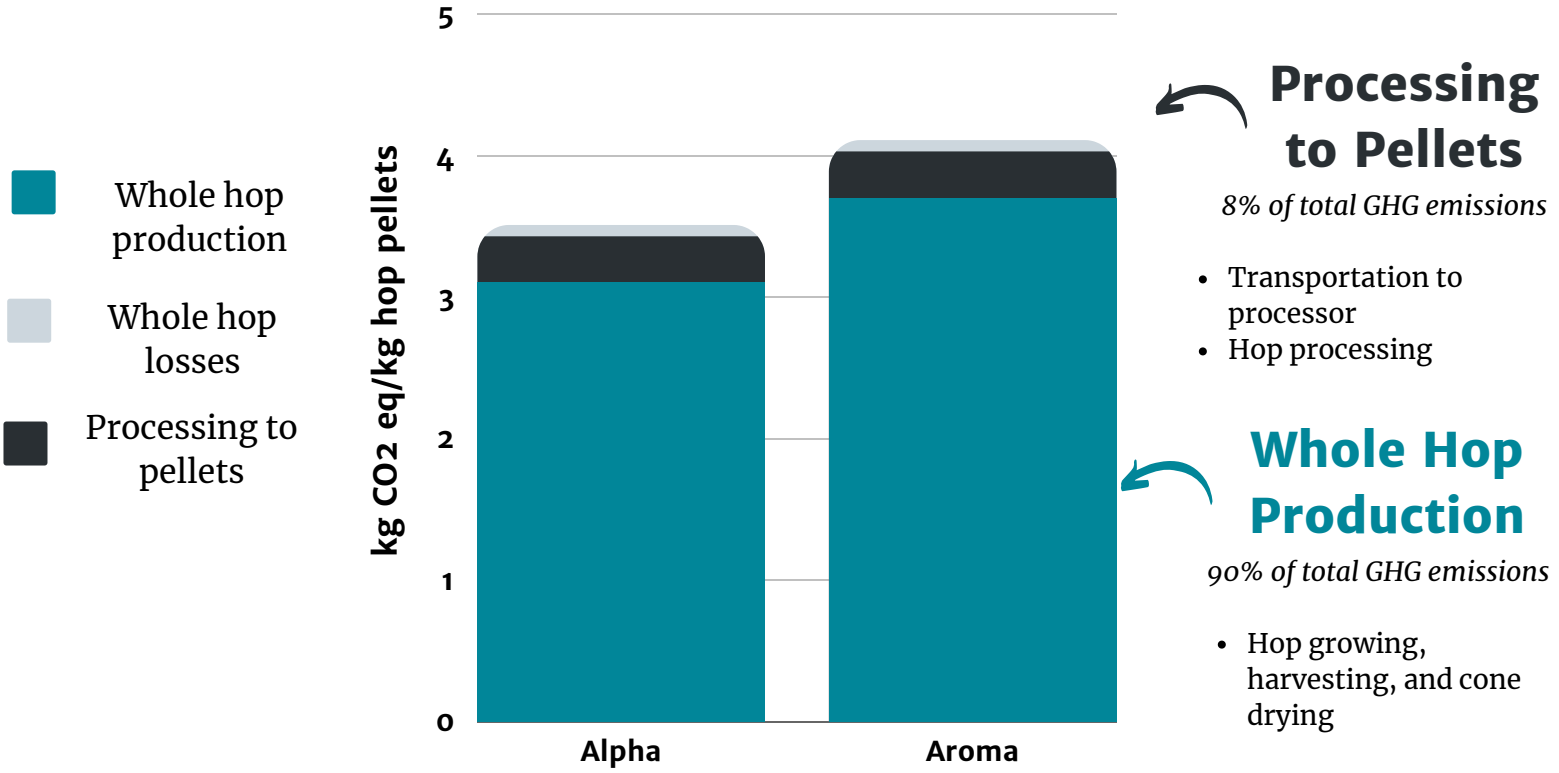
3.5 kg CO2 eq. is generated by the production of 1 kg of **alpha** hop pellets

4.1 kg CO2 eq. is generated by the production of 1 kg of **aroma** hop pellets

The greenhouse gas emissions generated by the production of 1 kg of hop pellets is equivalent to a 9-10 mile drive in an average passenger vehicle



Greenhouse Gas Emissions of Hop Processing



Processing to Pellets

8% of total GHG emissions

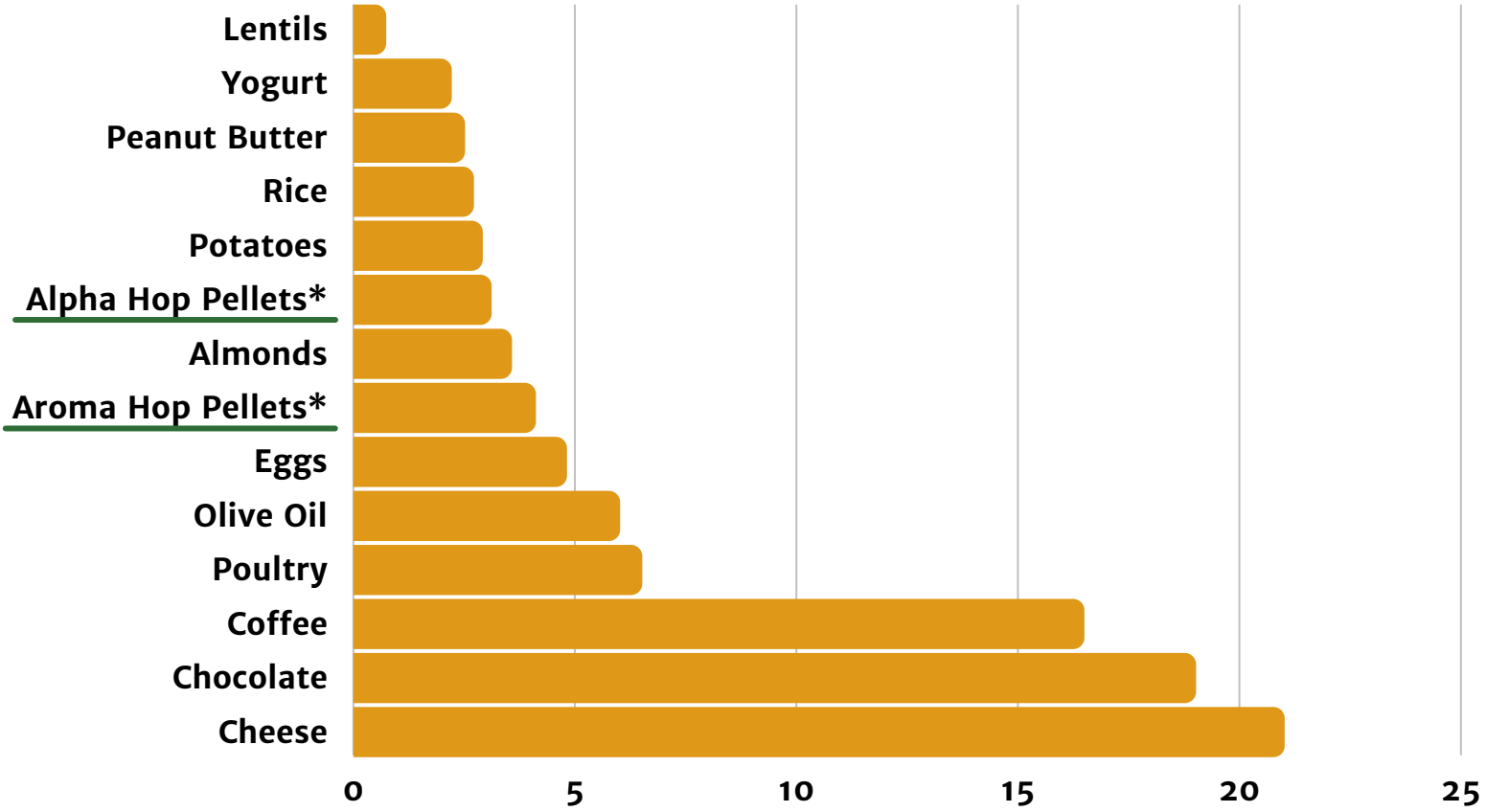
- Transportation to processor
- Hop processing

Whole Hop Production

90% of total GHG emissions

- Hop growing, harvesting, and cone drying

HOW DOES OUR CARBON FOOTPRINT COMPARE?



Please note these are preliminary figures used to correlate a general estimate. Hop figures are undergoing a peer review to ensure consistent data points are compared with other food products.

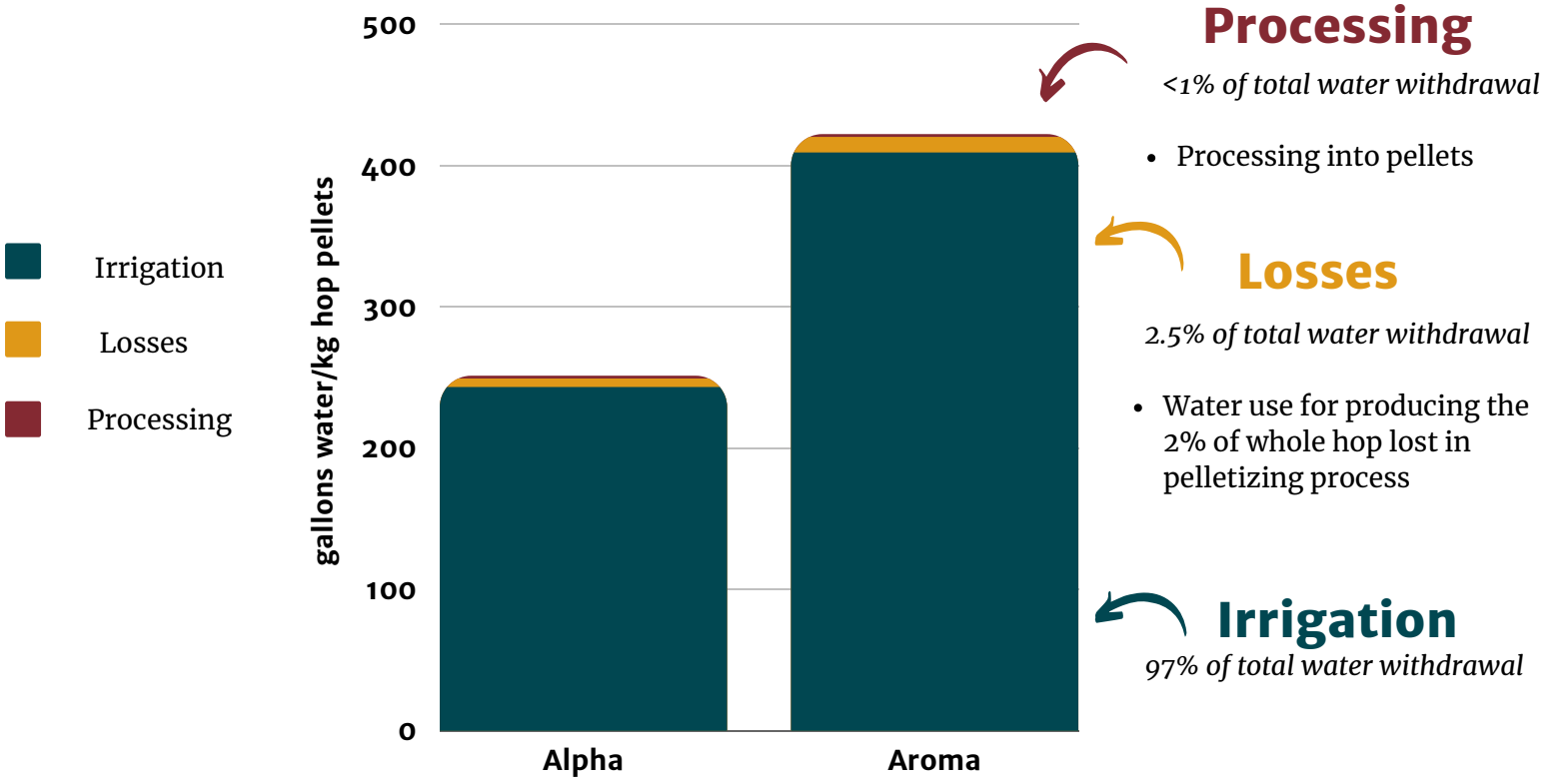
kg CO_2 eq/kg produced

While hop pellets may not boast the smallest carbon footprint per kilogram, it is important to consider how many servings 1 kg of hops can stretch. The potency of the bittering and flavoring agents of this crop means 1 kg of dry whole cone hops contributes to over **100 pints of IPA.**

WATER FOOTPRINT OF HOP PELLETS

251 gallons of water is required to produce **1 kg of alpha** hop pellets

423 gallons of water is required to produce 1 kg of **aroma** hop pellets



Processing

<1% of total water withdrawal

- Processing into pellets

Losses

2.5% of total water withdrawal

- Water use for producing the 2% of whole hop lost in pelletizing process

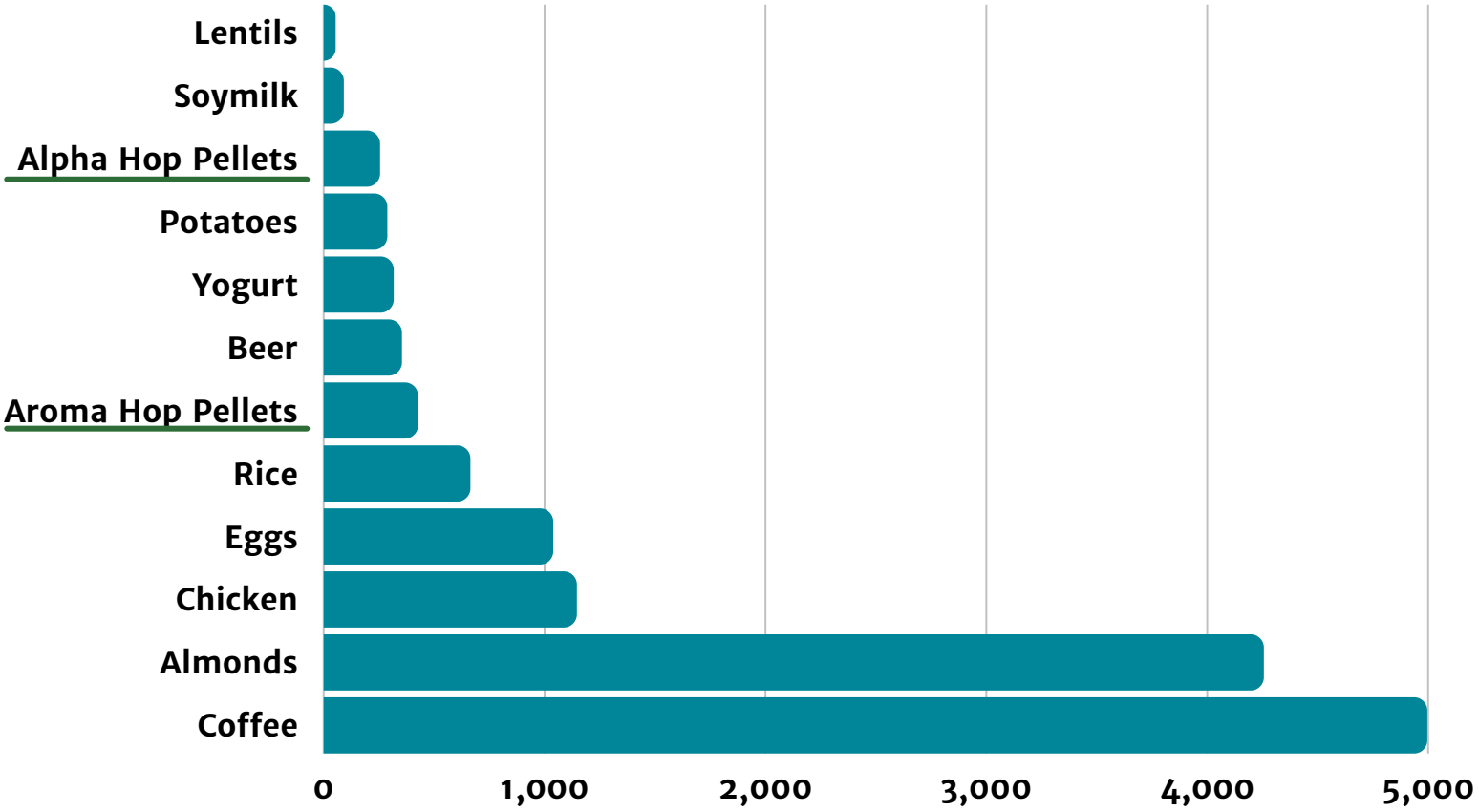
Irrigation

97% of total water withdrawal

The water volume equivalency of 7 baths is required to produce 1 kg of alpha hop pellets and 12 baths for aroma hop pellets

The water volume equivalency of 450 million baths was required to meet the water need for U.S. hop production in 2021

HOW DOES OUR WATER FOOTPRINT COMPARE?



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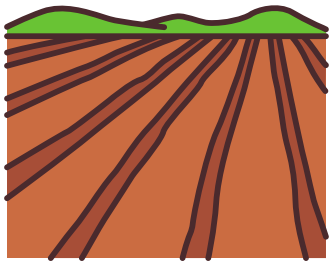
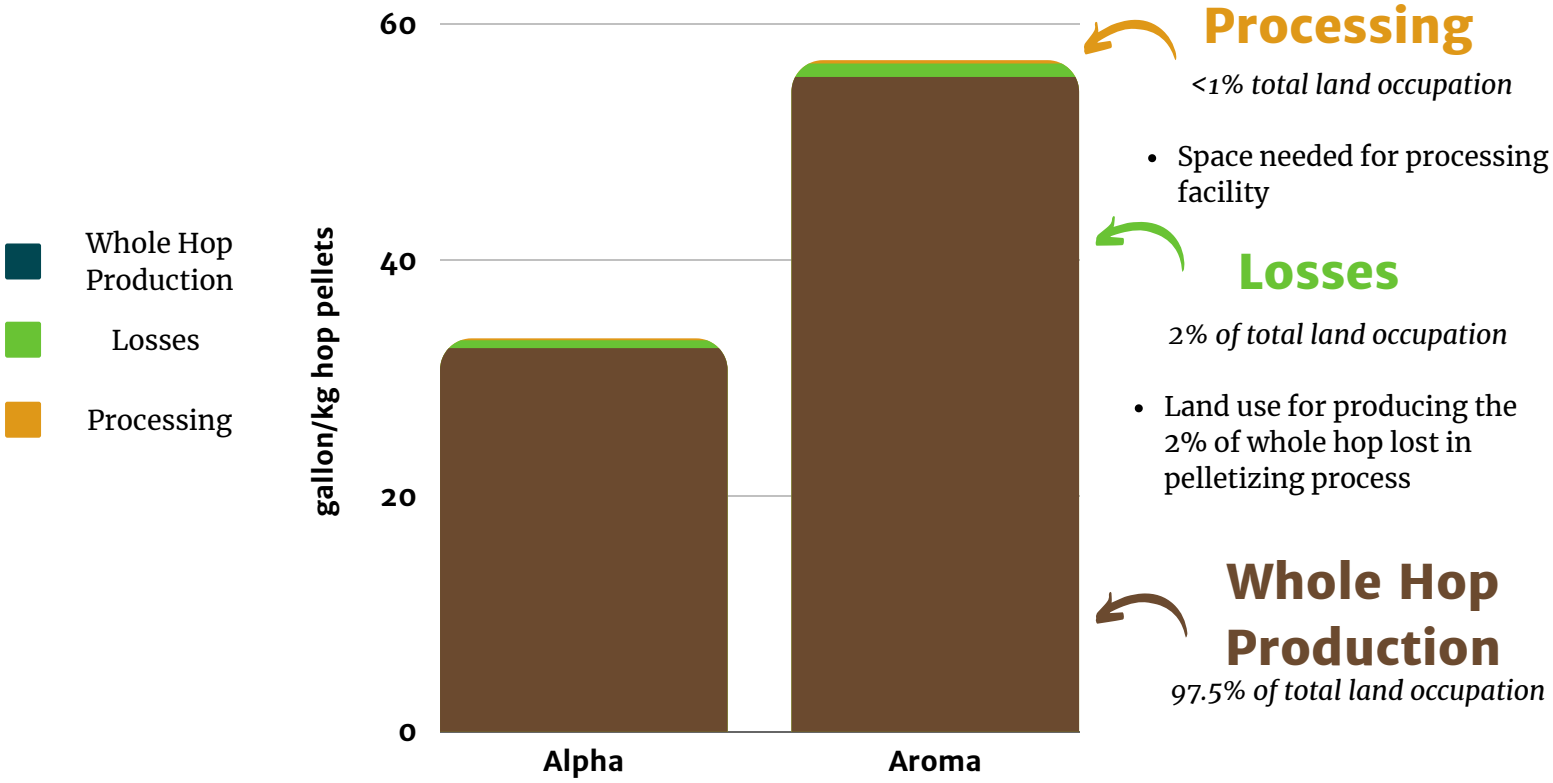
gallons of water/kg produced

AGRICULTURAL LAND USAGE OF HOP PELLETS

33.3 square feet of land is required to produce 1 kg **of alpha** hop pellets



57 square feet of land is required to produces 1 kg **of aroma** hop pellets



Processing

<1% total land occupation

- Space needed for processing facility

Losses

2% of total land occupation

- Land use for producing the 2% of whole hop lost in pelletizing process

Whole Hop Production

97.5% of total land occupation

One parking space can fulfill the land needed to produce 4 kg of alpha hop pellets or 2.3 kg of aroma hop pellets

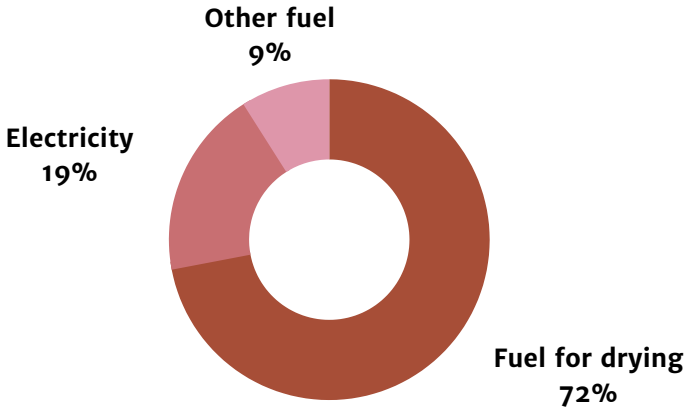
The land equivalency needed for 2021 U.S. hop production was twice the size of Seattle

CONTRIBUTION ANALYSIS OF CARBON FOOTPRINT

ENERGY

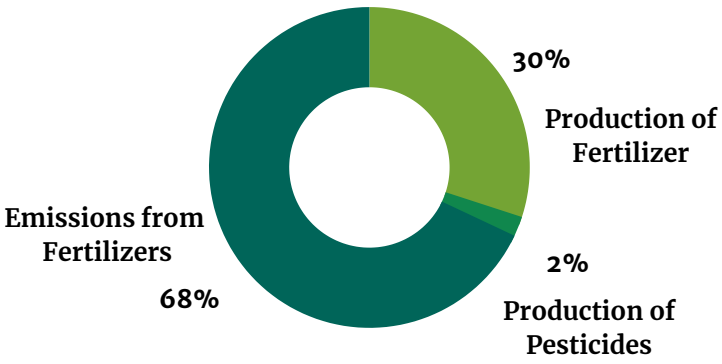
Energy is the largest contributor to greenhouse gas emissions from the production of hop pellets. The drying of hop cones is the most substantial investment, accounting for 72% of total energy consumption. The **kilning process alone commands an average of 47%** of total hop pellet production greenhouse gas emissions.

Exploring technological advancements to modify kilning systems and reduce fuel needs represents a top priority for the industry to consume less energy.



Greenhouse Gas Emissions of Energy Consumption

CHEMICALS



Greenhouse Gas Emissions of Chemical Applications

The production and application of chemicals is the second largest contributor of hop pellet production's total greenhouse gas emissions. Most greenhouse gases are emitted by the application of fertilizer which releases N2O, a powerful greenhouse gas.

As producers strive to maintain strong soil fertility programs, reducing dependency on conventional fertilizers may serve as another means of lowering the carbon footprint of the crop.

Research examining potential alternatives to conventional fertilizers could support producers efforts to retain high yields while also decreasing greenhouse gas emissions.

KEY MESSAGES

CARBON FOOTPRINT

Reducing greenhouse gas emissions is linked to decreased cost, as energy efficiency reduces fuel expenses. Research investigating opportunities to streamline efficiencies and assist producers in using less fuel, most notably in the hop drying process, could save money while lowering emissions.

WATER FOOTPRINT & AGRICULTURAL LAND USAGE

Water use and land occupation are intertwined with yield, as higher yields reduce the environmental impact of hop production per unit. Initiatives seeking to strengthen hop yields should remain a foundational area of research for the industry.

MOVING FORWARD: CARBON SEQUESTRATION

WHAT'S NEXT

The baseline LCA took into account the consumption metrics of U.S. hop production and detailed the impacts of the inputs required to sustain operations.

One piece still unsolved is the biological potential of the hop plant to sequester carbon from the atmosphere. As hops are physiologically distinct plants and are grown in concentrated volumes across the world, no research has been conducted on the on the ability of the hop plant to perform this key role.

Hop Growers of America is launching a research initiative to uncover the sequestration patterns of U.S. hop production and investigate the best practices producers can implement to maximize the carbon sequestration potential of their crop.

Together the LCA and Carbon Sequestration studies will endow the U.S. hop industry with a well-rounded perspective of our carbon footprint and reveal opportunities for advancements.

THANK YOU

THE BASELINE LCA COULD NOT HAVE BEEN POSSIBLE WITHOUT OUR PARTICIPANTS

OR OUR DONORS

ANHEUSER-BUSCH

US HOP INDUSTRY PLANT PROTECTION COMMITTEE

GRIEF ENTERPRISES, LLC