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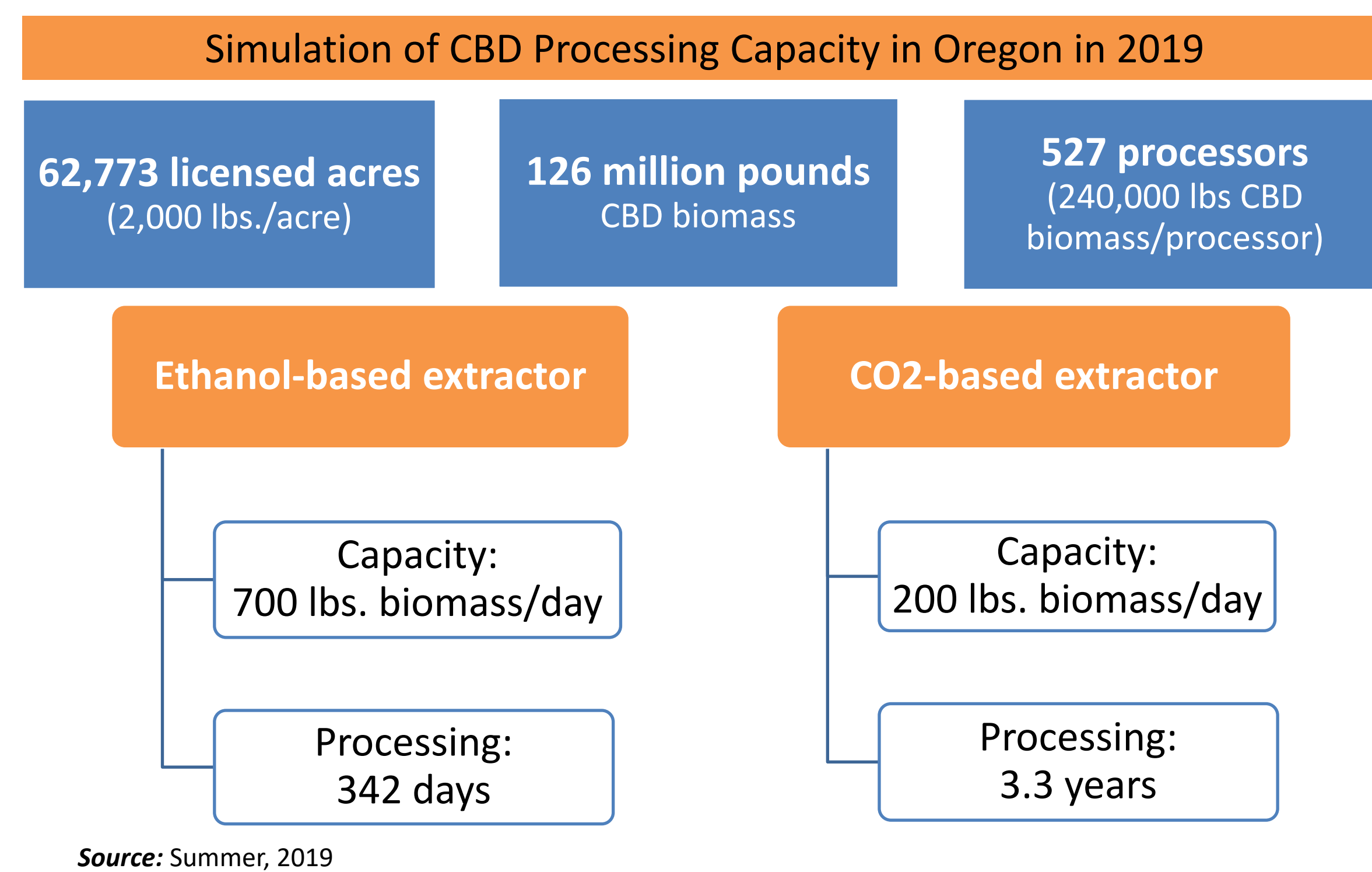
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GLOBAL OVERVIEW OF HEMP PRODUCTION AND THE MARKET OF HEMP-DERIVED CBD IN THE US

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Introduction

- 1938: Hemp was first considered as a potential billion-dollar crop in the US, given the promising opportunities for hemp fiber.
- 2024: Hemp-derived cannabidiol (CBD) sales of dietary supplements, pharmaceuticals, pet treats, etc. are projected to reach nearly \$13 billion.
- The hemp industry still faces similar challenges over 80 years later:
 - Cultural: Difference between hemp and marijuana is still not clear for many Americans.
 - Regulation: Approval of hemp products at the federal level remains very limited.
 - Processing: Limited capacity of processors.



CBD oil and hemp oil are not the same

- CBD oil is extracted from the flowers, leaves, and stalks. Hemp derived CBD oil must contain up to 0.3% of the psychoactive compound delta-9-tetrahydrocannabinol (THC).
- Hemp oil (hemp seed oil) is extracted from the seeds, contains little to no CBD, and does not contain THC.

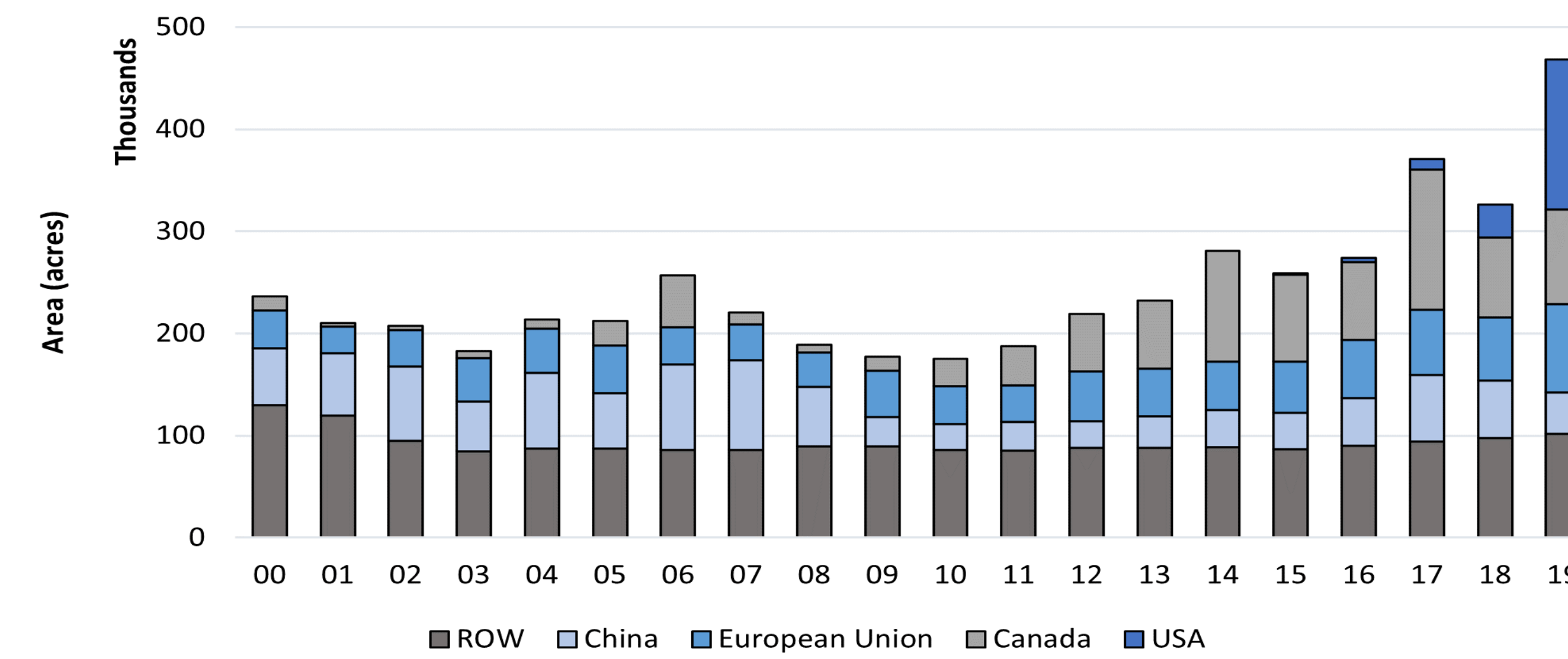
Motivation

- This is a critical time when states and the federal government are evaluating their hemp policies, and farmers are making decisions about participating in the new industry.

Objective

- Estimate the market size (acres) of hemp grown for CBD in the US.
- Evaluate opportunities for hemp grain as an alternative to increase demand for hemp in the US.

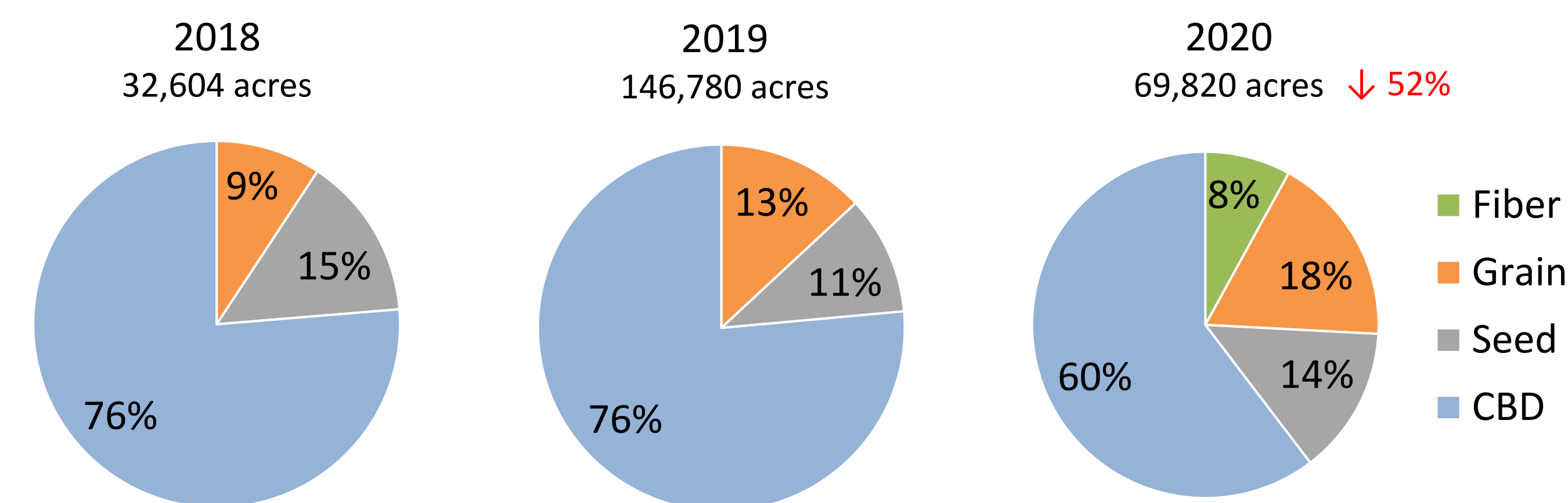
Global hemp acreage



Note: US: planted acreage (USDA-FSA); Canada: licensed acreage (Health Canada); China, EU, and ROW: harvested acreage (FAOSTAT)

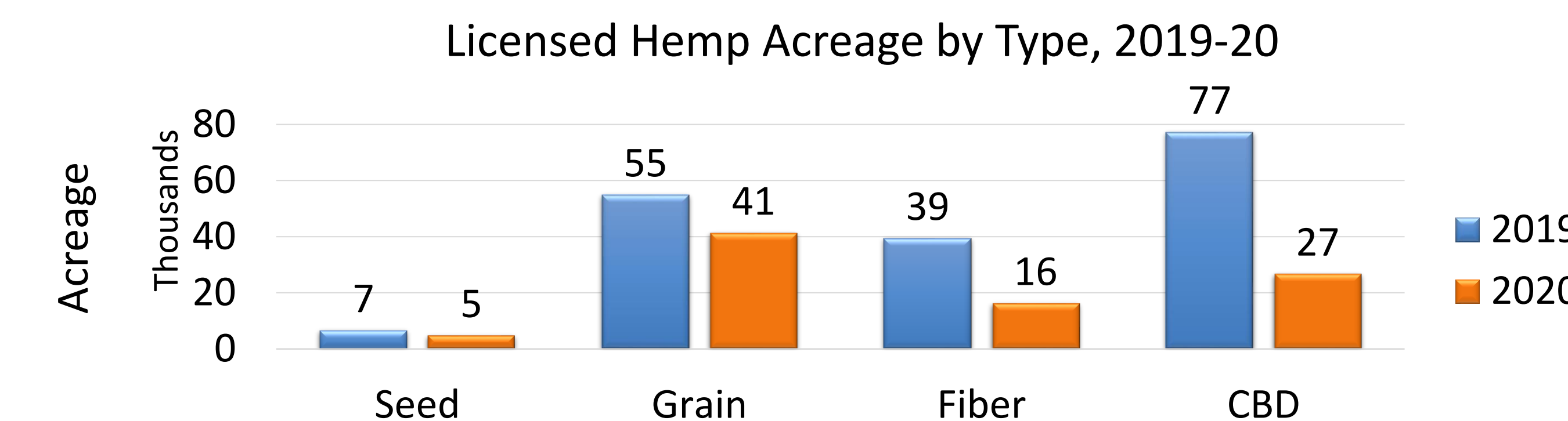
- Global hemp acreage in 2019 reached 468,304 acres, up 44% from 2018.
 - US, Canada, China, and France accounted for 68% of total acreage, specializing in different hemp products.

United States



- Largest producer of hemp grown for CBD, despite a reduction of 62% from 112,204 acres in 2019 to 42,891 acres in 2020.
- CBD biomass: Price dropped 79% from \$38,00 in 04/19 to \$8.10 in 04/20.

Canada



- Multiple purpose crop. Fields can be harvested for more than one product.
- Hemp grain: Large producer and exporter (US: 63% of total imports in 2020).

European Union

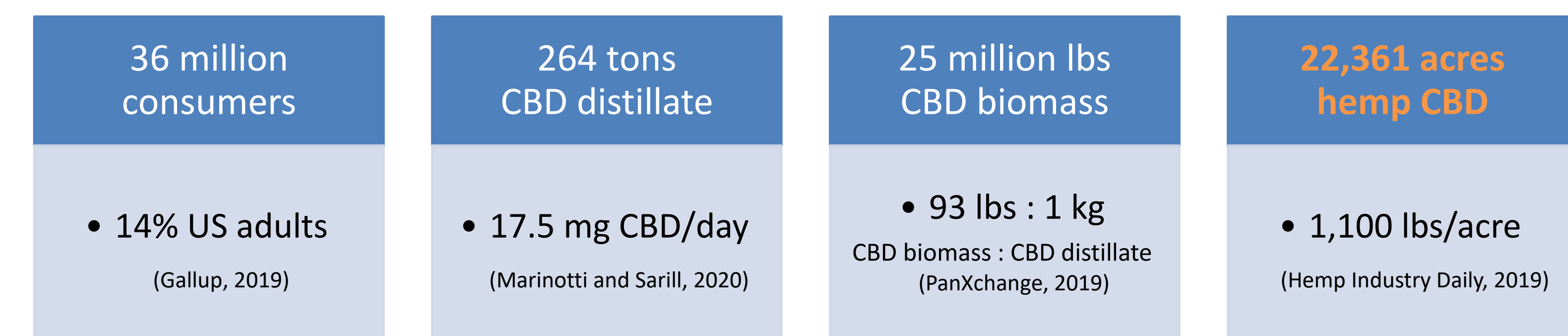
- Hemp fiber: automotive, paper, and construction industries.
- France: 42% of total acreage in 2019 (35,954 acres).
 - CBD production is prohibited.

China

- Hemp fiber and hemp grown for CBD: 75% and 5% of the hemp market value in 2017 (\$1.7 B USD).
- Unofficial data pointed out to 165,000 acres of hemp in 2019.

US demand for hemp-derived CBD

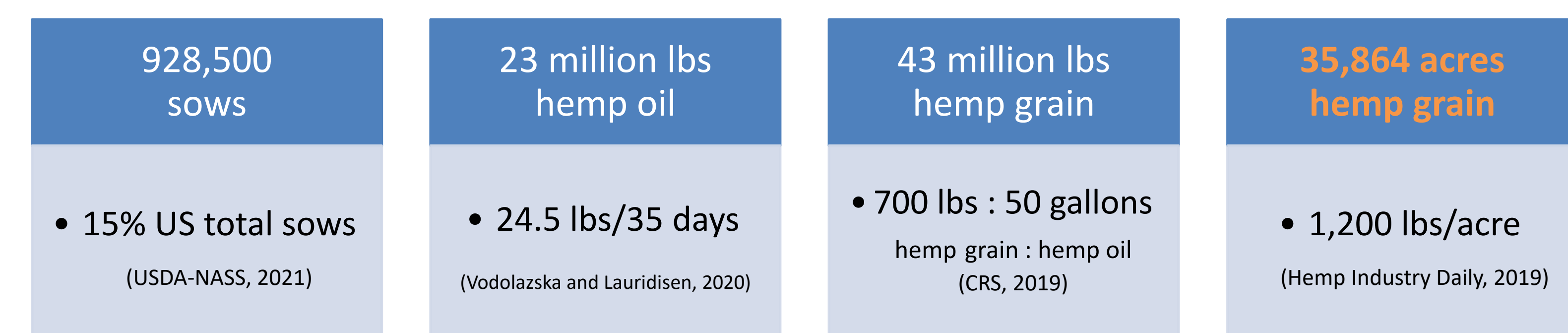
- In 2019, CBD was the most sold supplement in naturalist and health foods stores and the 9th in retail stores, with total sales of nearly \$127 M (Smith et al., 2020).
- Edibles and sublingual tinctures are the most consumed products (Wheeler et al., 2020).
- The estimation of hemp acreage demand follows a methodology proposed by PanXchange (2019), based on the total number of CBD consumers, daily consumption of CBD per person, industry conversion of CBD biomass into CBD distillate, and average yield of CBD biomass per acre.



- Improvements in hemp breeding and hemp processing could increase yield and potentially reduce planted area of hemp grown for CBD in the upcoming years.

Hemp grain as an alternative to increase demand for hemp in the US

- The use of hemp in animal nutrition is still not approved in the US, but there is evidence that hemp could be used in swine nutrition.
- Addition of 5% hemp seed oil to the diet of sows increased weight gain of piglets (Vodolazska and Lauridsen, 2020).



- Hemp could also potentially benefit laying hens and dairy cows (Klir et al., 2019).

Conclusions and policy implications

- The optimism with multibillion-dollar projections for the domestic market of hemp-derived CBD has not been converted into a significant demand for hemp acres.
- Currently, the US demands no more than roughly 22,000 acres of hemp annually, but in 2020, acreage of hemp grown for CBD reached 42,891 acres.
- Trade policies to support international trade of hemp-derived CBD could open new markets for US hemp farmers.
- With a market penetration of 15%, the use of hemp seed oil in swine nutrition could generate demand for nearly 36,000 acres of hemp grain per year.
- Market and animal nutrition research is needed to guide policy makers in determining whether to allow hemp grain and its derivatives for use as animal feed.