Opportunity Cost and Crowding Out the Food Supply

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Abstract

This article examines the utilization of farmland and inquires whether we are making the most informed choices regarding its use. It focuses on opportunity cost, which means that using land for one purpose—such as fuel or alcohol—means we cannot use it for another—such as growing food. Right now, vast amounts of land are used to grow crops for ethanol (a fuel additive), alcohol, tobacco, and marijuana, even though many people around the world do not have enough to eat. To carry out this study, I gathered data on the agricultural inputs required to produce one gallon of various alcohols and ethanol blends. This involved consulting recipe information, distilling guides, and technical production sources to determine the average number of pounds or bushels of crops, such as potatoes, corn, grapes, and barley, needed to convert into finished products. By establishing these input ratios, I created a baseline for estimating the land requirements for different categories of alcohol and fuel production. I then collected information on recent production volumes in both the United States and globally, drawing from agricultural reports, industry statistics, and government data. Using these figures, I calculated the acreage necessary to cultivate sufficient crops to meet current demand for vodka, whiskey, wine, beer, and ethanol. This methodology allowed me to translate production volumes into land-use estimates, highlighting the scale of farmland devoted to nonfood outputs. By combining input requirements with production statistics, the analysis provides a clear picture of the opportunity costs involved in allocating agricultural land to alcohol and fuel rather than food.

Keywords: crowding out, opportunity cost, food supply, ethanol, alcohol, agroeconomics

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The Moral Weight of Every Acre

Imagine standing in the middle of a vast field—soil rich, sun high, the hum of machinery in the distance. You might assume this land is growing food to feed families, stock pantries, or nourish communities. However, often, it is growing something else: corn for fuel, barley for beer, tobacco for cigarettes, or cannabis for getting high. This is not a failure of farming; it is a failure of priorities.

Modern agriculture produces plenty. However, much of what it produces does not feed people at all. From the soil to the silo, vast amounts of land, labor, and money are poured into industries that offer little or no nutritional value. Meanwhile, millions go undernourished, and food prices climb for those who can least afford them. We can quantify how many people can be fed by the number of acres diverted for uses other than agricultural food production. We can then calculate the typical food yield for this acreage.

This article is based on the idea of biblical stewardship, which teaches that land is a gift from God meant to care for creation and show His mercy. Using simple math and real-world data, it shows that if we used the land currently growing crops for E85 ethanol and beer to grow basic foods instead, we could feed over 1.4 billion people every year. The article also suggests changes in policy—such as shifting government subsidies, updating land-use rules, and offering better incentives for growing food rather than nonessential cash crops—emphasizing their economic value while underscoring their lack of necessity for basic nutrition. These ideas support a move toward farming that prioritizes feeding people and caring for the planet. It also includes practical steps that Christian families and churches can take to help reduce the impact of alcohol and E85 fuel use on food availability and prices. It ends by pointing to the Bible's call to use resources with compassion and care. Verses like Genesis 2:15, "The Lord God took the man and put him in the Garden of Eden to work it and take care of it"; Isaiah 58:7, "Is it not to share your food with the hungry"; and Matthew 25:35, "For I was hungry and you gave me something to eat" remind us that how we use land is part of our Christian witness (*New International Version*, n.d.). This article offers a new way to think about farming—one grounded in justice, mercy, and the provision for others.

Methodology

Comparative Estimation Approach

This study employed a comparative estimation approach to evaluate the land required to produce alcohol and ethanol blends. The methodology was designed to quantify the

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opportunity cost of agricultural land devoted to nonfood outputs such as beer, wine, spirits, vodka, whiskey, and ethanol.

Identifying U.S. and Global Production Volumes

I began by identifying the total annual production volumes of beer, wine, vodka, whiskey, and ethanol in both the United States and globally. These figures were drawn from agricultural and industry reports, including statistical releases and land-use surveys from the *U.S. Department of Agriculture* (USDA; 2023, 2024, 2025a, 2025b, 2025c), as well as international production data from the *International Organisation of Vine and Wine* (2024). Establishing these baseline volumes was essential for translating consumption into acreage requirements, since published data typically report overall crop acreage but not acreage devoted to specific products.

Determining Crop Input Requirements by Product

Next, I consulted technical recipes and production guides to determine the average crop input required per gallon of each product:

- Beer (barley): Conversion ratios for barley-to-beer were drawn from Montana State University's Mash Master Brewer Resources, which explains how malted barley starches are converted into fermentable sugars during mashing (Montana State University Barley Breeding Program, n.d.). Hop Growers of America (2023) was also consulted for beer production input requirements.
- Wine (grapes): Grape-to-wine conversion ratios were drawn from Crowe (2011), who provides specific estimates of the number of pounds of grapes required to produce one gallon of wine. To contextualize these ratios, WineMaker Magazine (n.d.) outlines the general winemaking process, explaining how grape sugars are converted into finished wine through fermentation. Together, these sources establish both the technical input requirements and the broader production framework necessary to estimate the land use devoted to wine.
- Vodka (potatoes): Potato-to-vodka conversion ratios were derived from DIY Distilling (2023), which outlines the mash and fermentation process for potato vodka, and supplemented by Mile Hi Distilling (2025), which provides a detailed potato mash recipe.
- Whiskey (corn): Coalition Brewing (n.d.) provides estimates of corn requirements for whiskey production, noting that approximately 8–10 pounds of corn are needed per gallon.
- Ethanol (corn): Shapouri et al. (2002) from the U.S. Department of Agriculture detail corn-to-ethanol conversion factors, offering a technical baseline for ethanol yield per bushel of corn. HowStuffWorks (2025) was also consulted to determine how much corn is required to make one gallon of ethanol.

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Although it is unusual for academic research to rely on recipe-based sources, this step was necessary to approximate the agricultural inputs underlying alcohol and ethanol production. Without these conversion ratios, it would not be possible to quantify the opportunity cost of land devoted to nonfood outputs.

Calculating Total Crop Inputs

Using these input ratios, I multiplied the total production volume in gallons of each product by the crop input per gallon to determine the total crop requirement for the U.S. and global markets. This calculation was performed for beer (barley), wine (grapes), whiskey (corn), vodka (potatoes), and ethanol (corn). Acreage estimates were then cross-referenced with USDA land-use reports and other agricultural statistics (USDA, 2023, 2024, 2025c; Ghosh, 2020). This step allowed me to translate crop inputs into acreage requirements, thereby quantifying the land devoted to alcohol and ethanol production (Karlsson, 2022).

U.S. and Global Acreage Estimates

The methodology accounted for both U.S. and global acreage devoted to alcohol and ethanol crops. In the United States, ethanol is produced primarily from corn, which has relatively high yields per acre. However, in other countries, ethanol is produced from crops such as sugarcane, cassava, or sorghum, which often require more land and produce lower ethanol yields per acre (Sandhu & Guilbert, 2017; Tuck et al., 2025). This shortcoming highlights that global acreage estimates may understate the opportunity cost, since non-corn ethanol crops are less efficient in terms of land use.

Estimating Opportunity Costs

To assess the opportunity cost of this land use, I calculated how much food could theoretically be produced if the same acreage were devoted to staple food crops rather than nonfood and non-feed agricultural products. Using standard yield and caloric conversion data, I estimated the total potential kilocalories that could be generated annually from this land. I then divided this figure by 1,800 calories per day to estimate the number of people who could be fed per year. These calculations were performed for both U.S. and global production volumes.

This methodology highlights the crowding out effect: high-margin alcohol products displace lower-margin food crops, exacerbating food insecurity. As Restaurantware (2025) and Patel (2025) note, alcohol consistently yields higher profit margins than food products derived from the same primary ingredients. Relief food, by contrast, is extremely low margin compared to even basic groceries, underscoring the economic disincentive to prioritize food production for vulnerable populations.

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It is important to emphasize that these figures are estimates rather than precise measurements, intended to illustrate the scale of land use trade-offs and the potential foregone meals that represent an opportunity cost in feeding the hungry.

Moral Question Pertaining to Land Use

In this context, every acre becomes a moral question: Are we cultivating compassion—or crowding it out? The Bible does not treat land as neutral. It treats land as sacred—a gift entrusted to humanity, not for exploitation but for care. Genesis 2:15 calls us to “tend and keep” the garden. Leviticus 25:4 reminds us that even the land itself deserves rest. Moreover, Isaiah 58:7 asks plainly: “Is it not to share your bread with the hungry?” (*New International Version*, n.d.). “For I was hungry and you gave Me food; I was thirsty, and you gave Me drink” (*New King James Version* [*NKJV*], 1982, Matthew 25:35).

When farmland is used to grow crops for alcohol, tobacco, and fuel—while millions remain malnourished—we must ask whether we are truly honoring God’s call to stewardship. Because every field holds more than crops, it (a) holds choices, (b) holds consequences, and (c) holds the potential to reflect the mercy and justice of the Kingdom of God. When agricultural inputs are diverted toward alcohol, tobacco, and fuel—while millions remain malnourished—we must ask whether we are honoring God’s call to stewardship. Proverbs 3:9 called us to “Honor the Lord with your possessions, and with the first fruits of all your increase,” and Isaiah 58:7 declared that true worship is “Is it not to share your bread with the hungry, and that you bring to your house the poor who are cast out?” (*NKJV*, 1982). These texts remind us that every bushel of corn or acre of barley holds sacred potential: to nourish, to sustain, to reflect the bounty of God toward others.

To better understand the scope of food insecurity and hunger, both domestically and globally, the following table presents key statistics from leading governmental and humanitarian sources. These figures highlight the persistent and disproportionate impact of food scarcity across various regions and populations.

Table 1: 2025 Food Insecurity and Hunger Statistics: United States and Global Overview

Category	Statistic	Source
U.S. food insecurity in 2023	13.5% of households (18 million) experienced food insecurity	U.S. Department of Agriculture [USDA] (2025a) and USDA, Economic Research Service (2025)

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Category	Statistic	Source
U.S. child food insecurity	17.9% of households with children were food insecure	USDA (2025a)
U.S. very low food security	5.1% of households (6.8 million) had disrupted eating patterns	USDA (2025a)
U.S. total food-insecure people	47.4 million individuals	Feeding America (2025)
Global hunger in 2025	733 million people go hungry daily	Concern Worldwide US (2025)
Global malnutrition deaths	9 million deaths annually from hunger-related causes	Concern Worldwide US (2025)
Global famine conditions	1.33 million people experiencing famine or famine-like conditions	Welthungerhilfe and Concern Worldwide (2025)
Sudan in 2025	Famine confirmed in multiple regions	Welthungerhilfe and Concern Worldwide (2025) and World Food Programme (2025)
Gaza Strip in 2025	500,000 people at risk of famine	Gustafson and Vos (2025), IPC Famine Review Committee (2025), and Integrated Food Security Phase Classification Global Partners (2025)
Global food insecurity in 2024	295.3 million people in 53 countries faced acute food insecurity	Gustafson and Vos (2025) and International Food Policy Research Institute (2025)

The Hidden Cost of Consumption: Rethinking Land Use Through the Economics of Opportunity Costs

Food scarcity is not merely a matter of how much land we farm—it is about what that land is used for. Economists frame this dilemma through the lens of opportunity cost—the benefit forgone when a resource is committed to one use over another. Closely tied to this is the phenomenon of crowding out, in which non-nutritional sectors displace food production and inflate global hunger. The cultivation of luxury crops for nonessential products such as beer, wine, alcohol, tobacco, and E85 ethanol consumes

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hundreds of millions of acres globally, diverting agricultural inputs that could otherwise sustain communities (Roberts, 2021; Tilman et al., 2002). It is not just the consumption of one individual that affects producers' decision-making; it is millions of consumers buying millions of gallons of whiskey, vodka, beer, and ethanol that dramatically affects food scarcity and prices.

Ethanol is among the most striking examples. The United States annually diverts over 15 billion gallons worth of corn to fuel rather than food (Renewable Fuels Association, 2023). That represents nearly 300 million bushels—enough caloric energy to feed hundreds of millions of people per year (S. Li et al., 2024; Searchinger et al., 2008). This diversion is equal to 40% of the annual U.S. corn harvest. Simultaneously, alcohol production drives up the cost of corn, sugar, and barley, distorting food markets through direct competition for inputs. Andreyeva et al. (2010) found that food demand remains inelastic even as prices rise, meaning that the poor suffer disproportionately when nonfood sectors crowd out supply. In other words, inelastic products like food are ones you still have to buy even if food prices are driven up by acreage devoted to alcohol and ethanol.

Blecher and Bertram (2020) argued that tobacco cultivation often displaces food crops, exacerbating food insecurity in low-income regions where arable land is scarce and agricultural labor is limited. This dynamic reinforces the ethical tension between discretionary land use and the imperative to nourish vulnerable populations (Blecher & Bertram, 2020).

Beyond land and price, there is an ecological toll. Water for distilling spirits and brewing beer, fertilizer for tobacco, fuel for barley: each input amplifies environmental stress in regions already facing scarcity. Where urban density or drought challenges traditional agriculture, civil engineering can unlock solutions—such as vertical farming in tower-based systems that mimic ancient agricultural engineering wisdom. Vertical farming is highly efficient. It saves water and land. However, these innovations often require financial engineering before civil engineering. "Seed capital" for microfinance, public investment, or philanthropic capital that bridges the gap between aspiration and implementation is needed to get projects moving (Foley et al., 2011; Mora et al., 2020).

In 2024, more than 295 million people across 53 countries faced acute food insecurity, marking the sixth consecutive year of rising global hunger (Gustafson & Vos, 2025). Of these, nearly 1.9 million individuals were experiencing catastrophic conditions consistent with famine, including confirmed cases in Sudan and imminent risk in Gaza (World Food Programme, 2025). The Food and Agriculture Organization of the United Nations (2025) further reported that 37.7 million children under five suffered from acute malnutrition in 26 crisis-affected countries, underscoring the urgent need for coordinated global action.

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Opportunity Cost, Elasticity, and Crowding Out in Economics

Opportunity cost is a foundational concept in economics. It refers to the value of the next-best alternative forgone when a choice is made (Spiller, 2011; von Wieser, 1927/1914). Whether deciding how to spend money, allocate land, or invest time, individuals and societies regularly face trade-offs.

In consumer choice theory, people aim to maximize satisfaction—referred to as utility—despite limited resources such as money and time. For instance, choosing to purchase ethanol-blended fuel (E85) rather than regular gasoline involves giving up whatever else could have been bought with that money. This trade-off represents the opportunity cost. Everyday expressions like "time is money" reflect how frequently people make such decisions, even outside of economic contexts.

Although economists expect consumers to consider opportunity costs in decision-making, research shows that individuals often overlook them unless explicitly reminded. This tendency can lead to poor choices, especially in markets with limited alternatives (Frederick et al., 2009; Maguire et al., 2023).

Elasticity further enhances the understanding of consumer behavior. It measures how demand responds to price changes. Products are considered elastic if a small price increase leads to a significant drop in demand. For example, higher movie ticket prices may prompt consumers to stay home or opt for cheaper showtimes, such as matinees. Similarly, rising prices for brand-name snacks may cause buyers to switch to generic versions. Conversely, inelastic goods are those for which demand remains relatively unchanged despite price fluctuations. Gasoline and prescription medications are typical examples—consumers often continue purchasing them because they are essential.

Beyond individual behavior, opportunity cost also operates at the societal level through the concept of crowding out. This occurs when limited resources—such as land, labor, or capital—are dedicated to one use at the expense of another. For example, allocating farmland to grow corn for biofuel production reduces the land available for food crops, impacting supply chains and increasing food prices (Mankiw, 2020). Similarly, directing public funds toward biofuel initiatives might crowd out investments in healthcare or social services (Krugman & Wells, 2018). Taken together, opportunity cost, elasticity, and crowding out offer important insights into how choices—both personal and policy-driven—affect resource distribution. These concepts help individuals, businesses, and governments make more informed decisions that better balance economic efficiency with social well-being.

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Producer Crop Choices and Consumer Food Price Impacts

Luxury crops are crops used to produce nonessential products. Corn can be eaten, refined into ethanol, or used to make sour mash whiskey. The nonessential uses make that amount of corn a luxury crop. Producers respond to market signals (price and profits) by allocating land and resources toward luxury crops with higher margins—such as ethanol corn, wine grapes, or tobacco—rather than staple food crops. This behavior reflects rational economic incentives but introduces systemic trade-offs. When land is diverted from food production to non-nutritional outputs, the opportunity cost manifests in reduced caloric availability and increased food prices (Blecher & Bertram, 2020; Searchinger et al., 2008).

Higher margin crops often benefit from subsidies or strong market demand, incentivizing producers to prioritize them. This reallocation can crowd out food crops, especially in regions with limited arable land. As the supply of staple foods tightens, prices rise—disproportionately affecting low-income consumers and amplifying food insecurity (Nguyen et al., 2024).

The Ideas of Consumer Choice and Elasticity

Consumer choice theory states that when prices rise, people usually buy less of that product. However, this depends on elasticity, which is how sensitive people are to price changes. In low-elasticity markets—such as basic foods like cooking oil, cornmeal, rice, and beans—people continue to buy even when prices rise. These are everyday essentials, so most families, especially low-income ones, do not have a choice. They need these foods no matter what, so price increases make life more difficult. On the other hand, products like alcoholic drinks are highly elastic. If prices go up, people often cut back or stop buying them. These are not necessities, so it is easier to walk away. Granted, some nonessential products like tobacco and alcohol are addictive to most people, and they continue to buy these products despite price hikes. The difference in elasticity between luxury crops and food crops poses a problem. When farmers grow crops for luxury items rather than basic food, it can make healthy food more difficult to obtain and increase inequality in society (Mankiw, 2020).

The opportunity cost models presented here illuminate how different products consume resources and displace food. While whiskey, wine, and vodka register modest footprints, beer—produced on over 50 million acres globally—could feed more than 170 million people annually if its land were redirected to staple crops. And E85 ethanol, a fuel additive, stands alone in its magnitude; with caloric input sufficient to nourish over 1.4 billion people worldwide, it represents one of the greatest resource misallocations in agriculture today (OECD, 2024).

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Policy reform is essential. Ethanol and tobacco subsidies distort market signals and reward calorically inefficient production. Redirecting these subsidies toward agroecological transition and nutritional yield incentives could reshape our agricultural priorities. Tools such as land zoning, farm bill reform, and opportunity cost modeling offer pathways toward more equitable, sustainable food systems.

A 7% tax on global consumption of all fuel ethanol (E10, E15, and E85 blends are used in different parts of the world) and beer—without repurposing any agricultural land—could generate approximately $24.3 billion annually based on current market values (Grand View Research, 2024a, 2024b; OECD, 2024). With beer consumption at roughly 50–55 billion gallons and E85 ethanol at 28–31 billion gallons worldwide, and average prices of $6 (beer) per gallon and $1.50 (wholesale Ethanol) per gallon, the combined taxable market exceeds $349 billion. At a modest meal cost of $0.59, this tax revenue could purchase approximately 41 billion meals, which would provide nearly 37.6 million people with three meals a day for a full year. These meals could consist of corn, grains, beans, and soy. This model highlights the humanitarian potential of the sin tax coupled with a modest ethanol tax. This requires a better measure of economic efficiency and ethical stewardship.

From a Christian perspective, land is a sacred trust from the Creator for humanity's stewardship, not extraction. “Then the Lord God took the man and put him in the garden of Eden to tend and keep it” (*NKJV*, 1982, Genesis 2:15). Our choices in how we use the earth reflect our values and our worship. Each acre can bear witness—either to consumption that depletes or to cultivation that blesses.

Let our agricultural policies, like our lives, honor God through mercy and provision. As Proverbs 14:31 declared, “He who oppresses the poor reproaches his Maker, but he who honors Him has mercy on the needy” (*NKJV*, 1982). Moreover, may the final measure of our economics be the measure Jesus gave: “For I was hungry, and you gave Me food” (*NKJV*, 1982, Matthew 25:35).

Understanding Supply and Demand of Low-Margin and High-Volume Products (e.g., E85)

Products like E85 ethanol are typically low-margin but produced in large volumes due to policy mandates (e.g., the Renewable Fuel Standard) and infrastructure investments. From a supply and demand perspective:

- **supply side**: Large-scale production of E85 increases availability, but its low energy density and limited fueling infrastructure constrain consumer uptake. Producers may continue supplying E85 due to regulatory incentives (J. Li & Stock, 2019).

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- **demand side**: Consumer choice is sensitive to price differentials and fuel availability. Studies have shown that E85 demand is highly elastic—motorists will only choose E85 if it is significantly cheaper than gasoline on an energy-equivalent basis (Liao, 2016; Liu & Greene, 2014). When E85 is priced competitively, demand rises; when it is not, consumers revert to gasoline.

This dynamic illustrates how opportunity cost influences consumer behavior: if the perceived benefit of E85 (e.g., lower cost, environmental impact) outweighs the forgone utility of gasoline, consumers will switch. However, if E85 is not sufficiently discounted or accessible, its demand remains suppressed despite the high supply. Therefore, an E85 tax would reduce E85 demand based on the price elasticity of demand.

Opportunity Cost Applied

Opportunity cost explains why we cannot "have it all"—a principle that manifests directly in agricultural land use decisions. When land is allocated to ethanol production, such as E85, it cannot be used to grow food crops. The cost is not merely theoretical; it is measured in calories, protein, and meals not produced. It also explains why people are not fed. In both public policy and personal budgeting, recognizing these trade-offs fosters more transparent and morally accountable choices (Mankiw, 2020).

In agriculture, opportunity cost becomes critical when land is diverted from food and feed crops to non-nutritional outputs such as alcohol, tobacco, ethanol, and marijuana. This reallocation reduces not only food quantity and quality, but also social utility, particularly in regions facing caloric scarcity. Crowding out occurs as finite resources are absorbed by competing uses, with ethanol demand displacing staple crops and contributing to supply constraints. These constraints drive up prices for feed grains, leading to cost inflation across livestock products and broader food categories (Riera-Prunera, 2024).

Ethical Stewardship and Opportunity Cost

From a theological and ethical perspective, the diversion of arable land toward non-nutritional outputs—such as beer, wine, spirits, marijuana, and fuel—raises serious concerns about efficiency, equity, and moral responsibility. This allocation reflects more than economic trade-offs; it represents a forfeiture of nourishment, intensifying global disparities in caloric availability and food security. Within a stewardship-oriented theological framework, such land use decisions may conflict with biblical principles of creation care, justice, and mercy. As Scripture taught, "The earth is the Lord's, and all its fullness" (*NKJV*, 1982, Psalm 24:1), reminding us that every resource entrusted to human hands carries an obligation to honor God's purposes. Opportunity cost, in this context, transcends market calculus—it invites spiritual discernment about whether our agricultural choices serve to provide, protect, and uplift the most vulnerable.

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Table 2 shows the profit incentive that producers receive by producing alcohol instead of food. The profit margin is calculated using the cost, the overhead cost and the retail price. Crowding out of land for food production occurs because of these incentives. Among these product categories, alcohol has profit margins between 55% and 70%, and food has profit margins between 30% and 45%. Crowding out based on the profitability of alcohol with respect to food also makes food more expensive for consumers.

Table 2: Comparison of Alcohol and Food Profit Margins

Product	Retail price	Estimated cost	Profit margin (%)	Primary ingredient
Whiskey (750 ml)	$40.00	$10.00	60–70	Corn
Tortillas (12-pack)	$3.00	$1.50	40–45	Corn
Merlot (750 ml)	$20.00	$7.00	55–65	Grapes
Fresh grapes (per lb)	$3.00	$1.80	30–35	Grapes
Vodka (750 ml bottle)	$30.00	$10.00	60–70	Potatoes
Idahoan mashed potatoes (4 oz pouch)	$1.75	$0.80	35–45	Potatoes

Note. Alcohol products consistently show higher profit margins than food products made from the same primary ingredients. These economic incentives contribute to crowding out, where agricultural resources are shifted toward alcohol production at the expense of food availability. Data obtained from Hines (2023), Patel (2025), Restaurantware (2025), and USDA (2025b).

Arable Land Use

Let us review the basic breakdown of how arable land is used in the United States and globally, as shown in Figures 1–2. We follow this up with graphs showing land use and opportunity cost with respect to the potential number of people that can be fed. See Appendices A and B for tabular information regarding land use and opportunity cost in the United States and globally.

Of the 390 million acres of arable land available in the United States, approximately 206 million acres—over 52%—are committed to agricultural uses that include both nutritional and discretionary outputs. US Feed crops dominate the allocation at 90 million acres, followed by US food crops at 60 million acres. Discretionary sectors reveal notable footprints: E85 ethanol occupies 33.5 million acres, while alcohol crops collectively occupy 21 million acres across beer, wine, and spirits. Additional acreage is used for sugar (1.2 million acres) and tobacco (170,000 acres). The remaining 184.1 million acres represent land that is either fallow, in rotation, or designated for future

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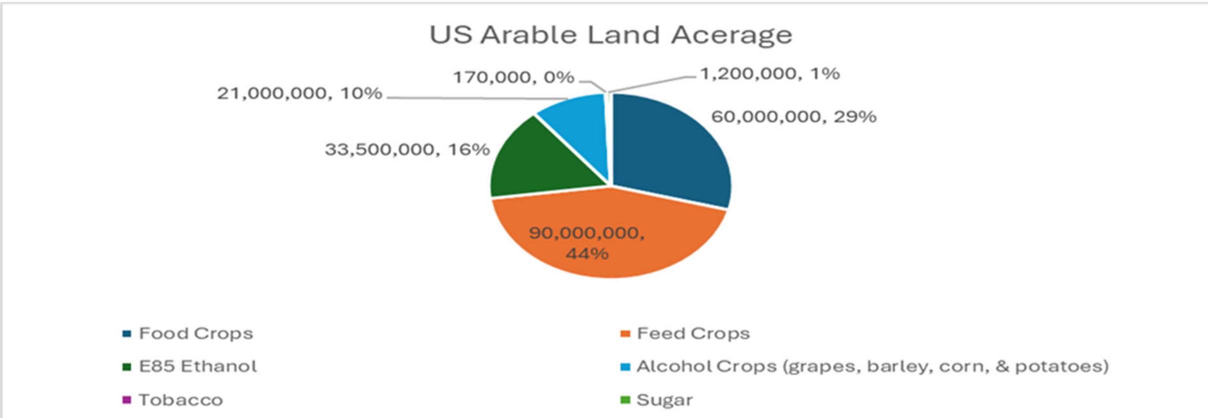
agricultural expansion, offering potential for more ethical or food-directed use. Examination of the graph shows E85 and alcohol take up 53.6 million acres compared to 60 million acres for food crops in the United States.

Figure 1: U.S. Arable Land Allocation



Note. Data obtained from Ghosh (2020), Merrill and Leatherby (2018), and USDA (2024, 2025c).

Globally, arable land reaches 3.41 billion acres, with 3.085 billion already committed—nearly 90% of all usable land. The most significant uses are feed crops at 1.4 billion acres and food crops at 1.1 billion acres, which together comprise the backbone of global agricultural production. However, discretionary consumption commands significant space: E85 ethanol production claims 100–120 million acres, alcohol crops take up 70 million acres, sugar crops consume 200 million acres, and tobacco adds another 15 million acres. These sectors together absorb nearly 18% of committed land, raising critical questions about opportunity cost and stewardship. With only 325 million acres of arable land uncommitted worldwide, Figure 2 illustrates how profoundly global agriculture is embedded in systems that may not directly serve food security.

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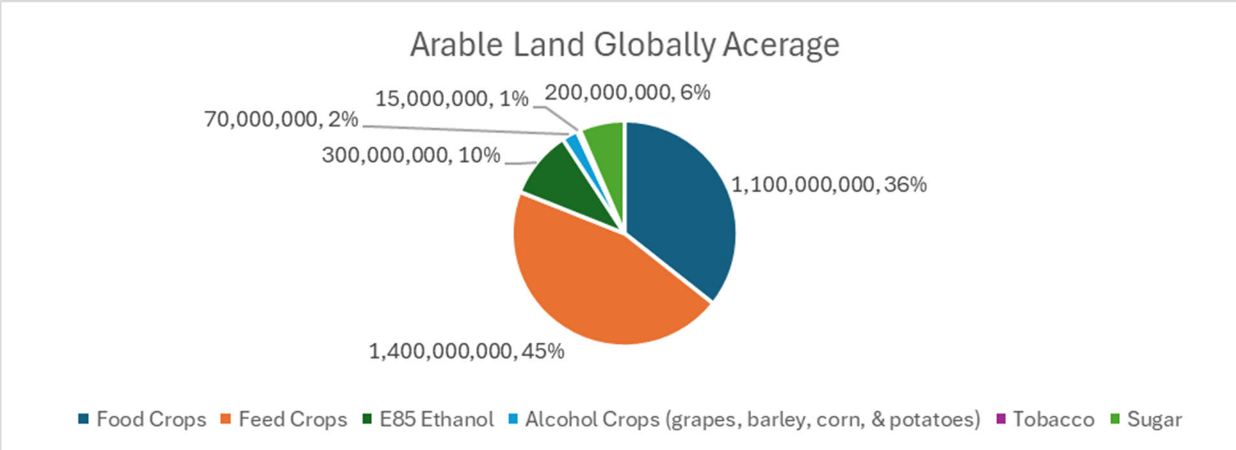
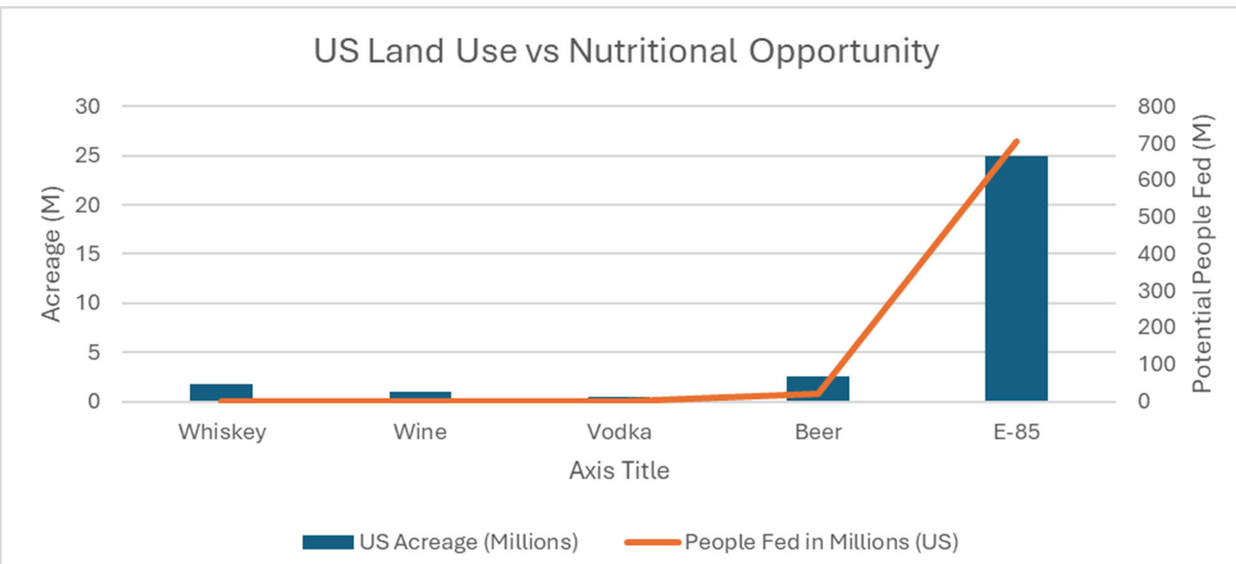
Figure 2: Global Arable Land Allocation



Note. *Data obtained from Food and Agriculture Organization of the United Nations (2022, 2024), Ghosh (2020), Our World in Data (2024), and World Population Review (2025).0*

Figure 3: U.S. Land Use, Caloric Yield, and Nutritional Opportunity by Product



Note. *U.S. and global acreage estimates adapted from Emler (2025), Grand View Research (2024a, 2024b, 2024c, 2024d), International Organisation of Vine and Wine (2024), Lee-Weitz (2022), Tse (2024), USDA (2023), Wilson (2018), and WineAmerica (2019). Caloric yield and opportunity cost estimates based on Roberts (2021) and Trostle et al. (2011). Vodka acreage approximated using production volume and grain sourcing data. See Tables A1, A2, and A3 for information about land use and opportunity cost.*

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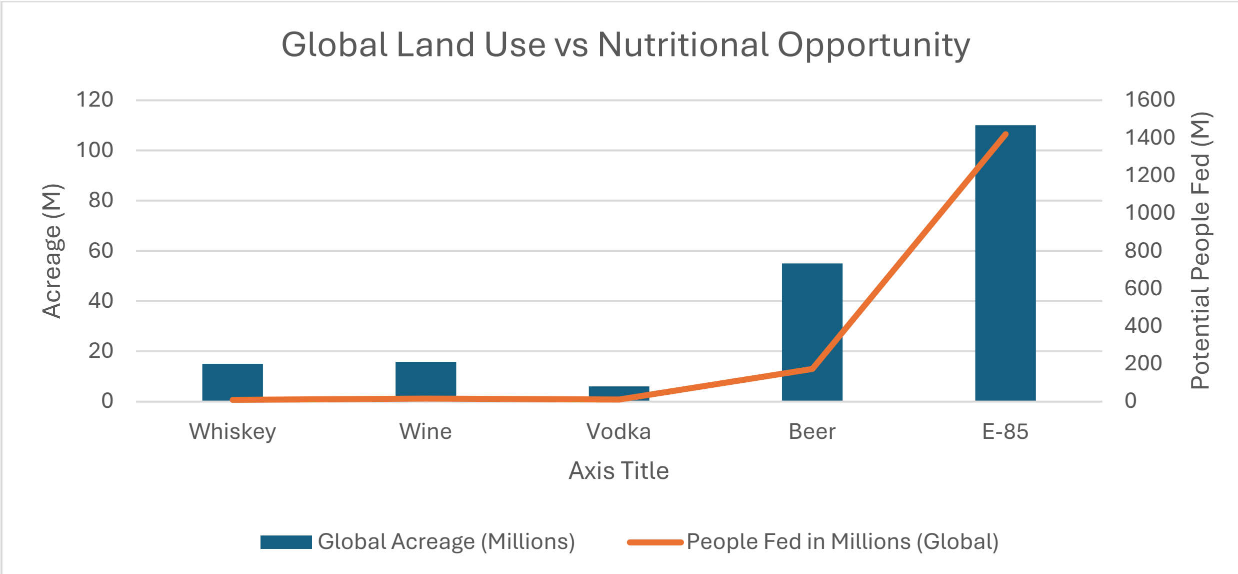
Figure 4: Global Land Use, Caloric Yield, and Nutritional Opportunity by Product



Note. *U.S. and global acreage estimates adapted from Emler (2025), Grand View Research (2024a, 2024b, 2024c, 2024d), International Organisation of Vine and Wine (2024), Lee-Weitz (2022), Tse (2024), USDA (2023), Wilson (2018), and WineAmerica (2019). Caloric yield and opportunity cost estimates based on Roberts (2021) and Trostle et al. (2011). Vodka acreage approximated using production volume and grain sourcing data. See Tables A1, A2, and A3 for information about land use and opportunity cost.*

The following are additional notes for Figures 3 and 4:

- The number of people fed is derived using 657,000 kcal/person per year (based on a 1,800 kcal/day diet).
- E85 delivers zero nutritional value despite massive caloric input, making its opportunity cost the highest.
- These figures illustrate land use diversion from direct nutritional provisioning to alcohol and fuel commodity production.
- Calorie estimates are derived from crop input weights per gallon of product scaled by product volume.
- Beer production uses land capable of feeding over 170 million people worldwide.

In the United States, roughly 31.8 million acres are devoted to the production of alcoholic beverages and E85 ethanol fuel. Globally, this land use expands to an estimated 183–220 million acres. These crops—including corn for ethanol and whiskey, barley for beer, grapes for wine, and sugarcane for spirits—consume vast agricultural space that could otherwise support staple food production. The opportunity cost of this allocation is substantial when measured by caloric yield. Based on average caloric

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outputs per acre—ranging from 344,000 kcal for whiskey to 18.6 million kcal for E85 ethanol—the redirected total represents enough energy to feed approximately 732 million people annually in the United States and over 1.42 billion people globally, assuming a nutritional requirement of 657,000 kcal per person per year (based on a 1,800 kcal/day diet). This misallocation of land reflects both economic inefficiency and moral urgency, as non-nutritional sectors continuously absorb high-yield acreage while hunger persists worldwide. The crowding out of food-grade crops results not only in reduced supply and heightened prices but also in a lost opportunity.

Understanding Biofuel Demand

Bruce Babcock (2013) studied how government rules requiring more biofuel—such as corn-based ethanol—can affect corn prices. He found that if the United States increases how much ethanol it uses, corn prices could go up by about 5–6%, or around 25 cents more per bushel (a bushel is a way to measure crops, a unit of dry volume used in the United States and the United Kingdom, equal to 8 gallons or about 35.24 liters U.S.). This matters to farmers and food producers, but Babcock said we should also consider broader goals, such as energy independence and environmental protection.

Bento et al. (2017, as cited in O'Malley & Searle, 2021) showed that ethanol demand could raise corn prices by as much as 24.5%. That is a much bigger increase, and it shows how different studies can yield different results depending on what they assume—such as how much land is used, how flexible people are with prices (elasticity), and how global markets react. Together, these studies show that making rules about biofuel is not simple. Leaders need to consider both minor effects in the United States and larger effects worldwide before making decisions.

Key Takeaways

These trade-offs are not merely theoretical—they reflect realities in agricultural systems where millions go hungry while vast acreage supports products that offer little or no nutritional value. Whether land is used for ethanol, alcohol, marijuana, or tobacco, the opportunity cost remains significant. Each acre redirected away from food crops carries consequences for global caloric availability, ecological health, and economic equity. E85 ethanol, for example, provides modest environmental gains and supports domestic industry, yet it diverts nutrient-rich corn from the food supply on a staggering scale. While such fuels may aid energy independence, their full costs must be weighed against the ethical imperative to feed the hungry. The full cost is not realized without considering the opportunity cost of ethanol, alcohol, tobacco, and marijuana.

Scripture speaks directly about this tension. Psalm 24:1 affirmed, "The earth is the Lord's, and all its fullness" (*NKJV*, 1982), reminding us that every field and crop is entrusted to us for God's purposes—not for unchecked consumption or profit. Romans

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14:17 recentered priorities around "righteousness and peace and joy in the Holy Spirit" (*NKJV*, 1982), calling believers beyond transactional economics toward sacrificial stewardship. In this light, Christians who partake in wine, whiskey, beer, or vodka might prayerfully consider redirecting a portion of their discretionary spending—perhaps the cost of one or several bottles per month—to purchase food for donation to a local pantry or shelter.

Areas for Further Inquiry

My research primarily engaged with positive economics, analyzing how the prioritization of cash crops affects food supply and contributes to hunger. This approach focused on observable economic relationships and outcomes. However, food insecurity also has profound normative dimensions—impacting human development, health, and mental well-being—which raise questions about what policies should be implemented to improve societal welfare. Future inquiry could extend into psychology, public health, and sociology, as well as policy studies aimed at evaluating and recommending government interventions to address these broader consequences.

Calls to Action

Redirect discretionary spending. Encourage individuals and households in your church family to reallocate their alcohol consumption budgets toward direct food donations to local pantries and shelters. This is a call to discipleship and to show love for your neighbors.

Volunteer regularly. Establish the practice of hands-on service by committing one half-day of volunteer work each month or quarter at a food bank, soup kitchen, or nutritional outreach ministry. Work as a church community to coordinate your efforts so these service organizations have adequate volunteer coverage. Also, consider church action, such as food drives, to stamp out hunger.

Advocate for policy reform. Support public campaigns aimed at redirecting agricultural subsidies from ethanol and tobacco toward staple crop production, agroecological transition, and nutritional equity. Encourage the legislature to impose sin taxes on the production and consumption of alcohol products.

Educate the church on stewardship economics. Host workshops, sermons, or roundtables focused on the opportunity cost of land use and biblical principles of provisioning, with a call to rethink discretionary consumption through the lens of mercy.

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Cultivate ethical consumption habits. Inspire believers to practice sacrificial stewardship by reducing their intake of products derived from high-opportunity-cost crops and using those funds to support food justice initiatives.

Support reputable Christian charities supporting food aid. Several well-established Christian organizations accept monetary donations specifically for food assistance and hunger relief. These charities combine faith-based missions with transparent, effective service delivery:

Samaritan's Purse: A nondenominational evangelical organization known for disaster relief and food distribution programs worldwide. Their feeding programs target vulnerable communities with both emergency and long-term support.

Compassion International: Focused on child development, Compassion provides food aid as part of its holistic care model for children living in poverty. Donations help fund nutrition programs in over 25 countries.

Catholic Relief Services (CRS): CRS operates food security and agricultural development programs across Africa, Asia, and Latin America. They partner with local communities to address both immediate hunger and long-term sustainability.

Food for the Poor: One of the largest international relief organizations in the United States, Food for the Poor delivers food, clean water, and housing to impoverished families in the Caribbean and Latin America.

World Vision: A Christian humanitarian organization that tackles hunger through emergency food aid, school feeding programs, and agricultural training. Donations support their global hunger initiatives.

Lutheran World Relief: This organization provides food assistance and resilience-building programs in disaster-prone regions. Their work is rooted in Lutheran theology and global development expertise.

Operation Blessing: Founded by Pat Robertson in 1978, Operation Blessing is a Christian humanitarian organization dedicated to alleviating hunger and suffering worldwide. Through its hunger relief programs, Operation Blessing distributes millions of pounds of food annually to families in need across the United States and in more than 90 countries. In addition to emergency food aid, the organization invests in long-term solutions, including clean water projects, medical care, and community development initiatives. Donations directly support their mission to provide both immediate relief and sustainable pathways out of poverty.

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These calls to action are more than isolated gestures; they are part of a long-term vision for a just and sustainable food system shaped by biblical principles of generosity, stewardship, and care for the vulnerable. Each donation reflects a commitment to equitable resource sharing and the pursuit of righteousness in economic life. Rooted in scriptures like Isaiah 58 and Matthew 25, these efforts champion both immediate relief and structural transformation. By partnering with trusted faith-based organizations, donors participate in redemptive work that values both body and soul. Together, such giving advances not only hunger relief but a gospel-centered ethic of abundance and justice. Finally, pray about the best course of action for you and your family to help address food security issues.

Choosing Mercy Over Margin

Crowding out by alcohol and ethanol crop producers makes food more expensive and increases the cost of feeding the poor and hungry around the world.

1. When people buy alcohol, they create demand for crops used to make it. Since alcohol has a higher profit margin than food, this encourages producers to grow crops for alcohol instead of food.
2. When fewer acres of land are used to grow food, the supply goes down. According to supply and demand, a lower supply leads to higher prices for everyone.
3. People who care about nutrition face limits because of what other consumers choose. Companies often choose to produce alcohol (high profit) or ethanol (high demand) rather than basic food crops. This drives up prices for food and livestock feed, making it harder for everyone to afford.
4. In this system, it is not just about individual choices. What others choose—and what companies are motivated to produce—affects everyone's access to healthy food. Utility is not only about income and preferences; market forces and profit margins shape it.

Choosing not to use alcohol or ethanol—even occasionally—is not a matter of legalism or personal restriction. It is an expression of care. When someone decides to abstain and uses that time or energy to serve others, such as volunteering at a food bank, it reflects a practical commitment to helping those in need. Believers who offer both resources and personal presence demonstrate the Gospel's call to serve. As Matthew 25:35 said, "For I was hungry, and you gave Me food; I was thirsty, and you gave Me drink" (*NKJV*, 1982).

In the end, economic choices about land use should be made not just for profit but for purpose. Opportunity cost is not just what we give up; it is what we could give forward. Donating to Christian charities is not only kind—it is strategic. It supports a

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bigger vision of fairness, stewardship, and care rooted in Scripture. That vision includes feeding more people by reclaiming land currently used for E85 fuel, alcohol, and marijuana crops. Redirecting resources toward growing food honors the call to feed the hungry (Isaiah 58; Matthew 25) and builds stronger, more just communities.

About the Author

Jon Michael Wallace earned his AACSB Accredited Global MBA from the University of Texas at Dallas Jindal School of Management in 2007. He served in the U.S. Military Special Operations Forces Community, where he developed expertise in lifesaving, Signals, Ordnance, and CBRN (Chemical, Biological, Radiological, and Nuclear) Defense. Wallace later applied these skills as a radiation protection officer within the Special Warfare Community. After leaving the U.S. Military, he leveraged his education and experience into a career as an operations officer with the U.S. Government in counterproliferation and counterterrorism.

His professional career path has also included work in government contracting (procurement), retail merchandising, and motorcycle loan underwriting. Currently, Wallace works as an independent consultant, leveraging his broad experience in foreign affairs, special operations, strategy, intelligence, and global security. Guided by his Christian faith, he views his professional and academic pursuits as part of a larger calling to stewardship and service.

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Appendix A: Acreage, Caloric Output, and Crop Yields

Table A1: Land Use and Caloric Input

Food system use	Total acreage (U.S.)	Estimated caloric output	Notes
Food crops (grains, vegetables)	125–130 million	2.5–2.7 quadrillion kcal	Includes corn, wheat, soy, and produce
Livestock ranching (meat/dairy)	150–160 million	1.2–1.3 quadrillion kcal	Includes pasture and forage
Livestock feed crops (nonfood use only)	95–100 million	800 trillion kcal	

Note. Acreage and caloric output estimates adapted from Ghosh (2020), Irwin (2025), USDA (2025b, 2025c), and Zain (2023). Figures reflect U.S. land use for food crops, livestock ranching, and livestock feed production. Caloric outputs based on average crop and livestock conversion yields from USDA and industry sources. Ranges represent upper- and lower-bound variation by source and year.

Table A1 outlines how agricultural land in the United States is distributed among different food system uses and the estimated caloric output associated with each category. Food crops such as grains, vegetables, and staples occupy roughly 125–130 million acres and yield the highest caloric output, estimated at 2.5-2.7 quadrillion kilocalories. Livestock ranching, which includes both meat and dairy production through pasture and forage use, accounts for 150–160 million acres and produces approximately 1.2–1.3 quadrillion kilocalories. Crops grown for feed and nonfood purposes—such as those used for ethanol, industrial livestock feed, or other diversionary outputs—utilize 95–100 million acres and contribute about 800 trillion kilocalories. These data highlight both the efficiency and opportunity cost involved in land allocation decisions across the U.S. food system. Additional notes include the following:

- Food system acreage includes cropland for direct consumption, ranching for meat and dairy, and feed crop acreage.
- Caloric estimates derived from USDA crop yield data, livestock conversion rates, and feed energy coefficients (Babcock, 2013; Trostle et al., 2011).

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Table A2: Total Acres and Caloric Output by Product Category (U.S. Estimates)

Product category	Total acreage (U.S.)	Total calories (U.S.)
E85 ethanol fuel	28–31 million	465 trillion kcal
Beer	2.5 million	13.5 trillion kcal
Wine	1 million	1.08 trillion kcal
Vodka	0.5 million	720 billion kcal
Whiskey	1.8 million	620 billion kcal
Total alcohol and fuel	31–36.8 million	480–481 trillion kcal

Note. *Acreage estimates adapted from Emler (2025), Grand View Research (2024a, 2024b, 2024c, 2024d), International Organisation of Vine and Wine (2024), Karlsson (2022), Tse (2024), USDA (2025c), Wilson (2018), and WineAmerica (2019). Caloric output calculations informed by Roberts (2021), Trostle et al. (2011), and industry yield data.*

These data summarize the estimated acreage and caloric yield of U.S. crops designated for alcohol production and E85 ethanol fuel. Collectively, these products occupy between 31 and 36.8 million acres of farmland and generate roughly 480–481 trillion kilocalories. The largest share is allocated to ethanol fuel, which alone requires 28–31 million acres and yields approximately 465 trillion kilocalories—dwarfing the output of alcohol categories like beer, wine, vodka, and whiskey. Beer accounts for 2.5 million acres and produces 13.5 trillion kilocalories, while the remaining spirits use smaller acreages and result in notably lower caloric returns. This highlights the disproportionate share of land dedicated to nonessential, high-margin products, raising questions about resource allocation and the opportunity cost of diverting agricultural capacity from staple food production.

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Table A3: Land Use, Caloric Yield, and Nutritional Opportunity by Product

Product	Total acreage (U.S.)	Total acreage (global)	Calories per acre	Opportunity cost in people fed U.S. / global
Whiskey	1.8 million	15 million	344,000 kcal	941,000 /8.8 million
Wine	1 million	13.5–18 million	1.08 million kcal	1.42 million /15.9 million
Vodka	0.5 million	5–7 million	1.44 million kcal	1.1 million /10.1 million
Beer	2.5 million	50–60 million	5.4 million kcal	20.5 million /172.5 million
E85 ethanol	28–3 million	100–120 million	18.6 million kcal	707 million /1.42 billion

Note. *U.S. and global acreage estimates adapted from Andrade de Sá et al. (2012), Coalition Brewing (n.d.), Grand View Research (2024a, 2024b, 2024c, 2024d), HowStuffWorks (2025), International Organisation of Vine and Wine (2024), Lee-Weitz (2022), Tse (2024), USDA (2023), Wilson (2018), WineAmerica (2019), and Whisky Invest Direct (n.d.). Caloric yield and opportunity cost estimates based on Roberts (2021) and Trostle et al. (2011). Vodka acreage approximated using production volume and grain sourcing data.*

These data illustrate how land allocated to alcohol and fuel production could, if repurposed, support global food access. Whiskey, wine, vodka, beer, and E85 ethanol collectively occupy tens of millions of U.S. acres—with E85 alone using 28–31 million acres domestically and up to 120 million acres globally. Despite relatively high caloric yields per acre, these crops serve nonessential, discretionary markets. When recalculated in terms of opportunity cost—how many people those calories could feed—the table reveals striking numbers: for example, ethanol's land use could support up to 707 million Americans or 1.42 billion people globally. This comparison highlights the trade-offs inherent in crop allocation decisions, especially when nutritional needs outweigh commercial preferences.

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Appendix B: Applied Perspective: Alcohol Versus Food Production

Land used to grow corn for ethanol, barley for beer, grapes for wine, and sugarcane for spirits could alternatively be used to produce food-grade crops with direct nutritional value. This substitution has implications for food security, feed availability, and price stability—particularly in regions experiencing ecological stress or caloric scarcity.

Table B: Land Use and Nutritional Opportunity Cost (per acre yields)

Crop use	Output for alcohol use	Potential food output
Corn for ethanol	500 gallons of ethanol	10,000 lbs of corn (food/feed)
Barley for beer	1,200 lbs of malt	2,000 lbs of food-grade barley
Grapes for wine	150 gallons of wine	8,000 lbs of table grapes or raisins
Sugarcane for spirits	600 gallons of alcohol/acre	30 tons of sugarcane (food/industrial)
Potatoes for vodka	200 gallons of vodka	45,000 lbs

Note. Yield and conversion estimates adapted from Renewable Fuels Association (2023), Sandhu & Guilbert (2008/2017), Tuck et al. (2025), and WineMaker Magazine (n.d.). Figures represent comparative outputs for alcohol production versus potential food-grade equivalents. Data reflect average estimates and may vary by region and production method.

The Potential food output column quantifies the forgone nutritional yield when land is allocated to either ethanol or alcohol production.:

- **corn for ethanol**: While ethanol yields 500 gallons per acre, the same land could produce 10,000 lbs. of corn suitable for human consumption or livestock feed. This represents a caloric opportunity cost exceeding 15 million kcal per acre (Trostle et al., 2011).
- **barley for beer**: Malted barley used in brewing could alternatively be processed into food-grade barley, which offers higher protein and fiber content per unit.
- **grapes for wine**: Prime viticultural land could yield table grapes or raisins, which are rich in micronutrients and serve broader dietary needs.
- **sugarcane for spirits**: The same acreage could produce sugarcane for food-grade sugar, molasses, or rotational crops that support soil health and food diversity (Swenson, 2013).

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Appendix C: Theoretical Foundation of Opportunity Cost

"Consumers have unlimited wants but limited resources, so satisfying one want means not satisfying another (the opportunity cost). An opportunity cost is 'the evaluation placed on the most highly valued of the rejected alternatives or opportunities.'" Spiller (2011, p. 595).

Whether deciding how to spend a Saturday afternoon or allocating billions to agricultural subsidies, every choice carries a hidden cost—the value of the next-best alternative that was not chosen. von Wieser (1914/1927) first codified the term opportunity cost in his 1914 work Theory of Social Economics, positioning opportunity cost not simply as financial loss but as foregone utility and productivity. It is defined as any real cost measured in terms of what is sacrificed—not only in monetary terms but in labor, time, and resource potential. von Wieser argued that actual cost is not what you pay, but what you sacrifice—whether in time, resources, or utility. His framing shifted economics away from purely monetary calculations and toward a broader understanding of value. It is often said, "time is money," and this is based on the concept of opportunity cost.

Modern scholars have expanded this view. The *Encyclopedia of Quality of Life and Well-Being Research* defined opportunity cost as "the cost of doing something measured in terms of the best alternative forgone … not restricted to monetary cost but [including] any real cost in terms of things forgone—time, output, money, and utility" (Riera-Prunera, 2024, p. 4544). This broader lens is especially relevant in contexts like agriculture, where land, labor, and capital are finite, and choices have long-term consequences.

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