ASSESSING THE MARKET FOR KERNZA® IN CALIFORNIA:

Values and Perspectives from Bakers, Beverage Makers and other Grain-Using Businesses



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June 2026

UC Sustainable Agriculture Research & Education Program
University of California
Agriculture & Natural Resources

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KernzaCAP is supported by the Agricultural and Food Research Initiative Sustainable Agricultural Systems grant no. 2020-68012-31934 from the USDA National Institute of Food and Agriculture. Any opinions, findings, conclusions or recommendations expressed in this publication are those of the author(s) and should not be construed to represent any official USDA or U.S. Government determination or policy.

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The University of California Sustainable Agriculture Research and Education Program (UC SAREP), a program of UC Agriculture and Natural Resources, works across the food supply chain, supporting agriculture and food systems that are economically viable, conserving natural resources and biodiversity, and enhancing the quality of life and equity in California's urban, rural and Tribal communities.

Report design by Kristen Farrar, UC SAREP Communications Coordinator.

Thank you to our reviewers who graciously contributed their time and expertise to this publication:

Katharine Chute, Forever Green Initiative
Hana Fancher, The Land Institute
Jen Mayer, The Land Institute
Lexie Wilson, UC ANR Organic Agriculture Institute

An additional thank you to the businesses that participated in this study and to the California grain community.



INTRODUCTION



Kernza® (*Thinopyrum intermedium*) is a versatile grain used in products including beers, crackers, pasta, and baked goods. As a perennial, it presents an alternative to production systems which require annual tillage and shows potential for increasing soil health while reducing soil erosion and nitrate leaching.

KernzaCAP affiliates, Forever Green Institute and The Land Institute (TLI), have conducted market studies to describe the landscape for Kernza products, and identify challenges, needs and successes around current Kernza product markets and business development. Up to this point, no Kernza market assessments have been conducted with a focus on California, which lies outside of the center of Kernza commercialization and supply chain development efforts in the Midwest.

This report presents findings from surveys and interviews conducted with California grain-using businesses (beverage makers, bakers, consumer packaged goods (CPG) manufacturers and millers) between 2023 and 2024. The objectives of this assessment, focused on California grain-using businesses, are:

1. Describe the awareness and experience with Kernza among California grain-using businesses.
2. Outline the values and factors that influence their grain sourcing decisions.
3. Summarize corresponding enablers and barriers to the adoption of Kernza as an ingredient among California grain-using businesses.

This report reflects perspectives from a sample of businesses that engage with the specialty grain supply chain. There were a relatively small number of participants in this study and the participating businesses skewed to small in size. A small proportion of participants had experience using Kernza, and most had experimented or used Kernza as an ingredient between 2017 and 2022. Since that time, Kernza quality has improved through breeding programs, the supply chain has developed, with more licensed suppliers and more acreage in production, and the Kernza community has produced technical guides and other resources for bakers, brewers, and other Kernza-curious food producers and manufacturers. The findings of the study surface barriers and enablers for the adoption of Kernza in California around topics including purchasing values, grain quality and supply, pricing, and customer engagement. We suggest there is an opportunity to re-engage California bakers, beverage makers, and other grain-using businesses with Kernza with these new educational resources and grain samples.



KERNZA COMMERCIALIZATION AND ALTERNATIVE FOOD NETWORKS

Kernza's demonstrated environmental benefits, such as soil health-building characteristics and ability to improve water quality, position it within alternative food networks and supply chains, which are rooted in sustainability values (Gutknecht et al., 2026; Gori and Castellini, 2023). Alternative food networks are typically characterized by local production and short supply chains, in contrast to conventional and industrial agricultural systems (Gori and Castellini, 2023). Much of Kernza commercialization has focused on the Midwest, with the nexus of research and market development taking place in Minnesota. Cureton et al. (2023) describe the regional commercialization of Kernza through the lens of innovation systems, or the "interlinked sets of people, processes, assets, and social institutions that enable the introduction and scaling of new ideas, products, services, and solutions capable of facilitating impact" (Thiele et al., 2022, p. 561). Hergesheimer and Wittman (2012) describe social relations as key in the development of a small grain supply chain in British Columbia, where social exchange networks based on proximity and trust represent key components of an alternative food network. Commercialization and market development staff, such as those based at the University of Minnesota and The Land Institute, play core roles as intermediaries and innovation brokers in advancing the commercialization of Kernza, facilitating coordination and connection between actors throughout the grain supply chain. Alternative food networks, alongside innovation systems, provide a framework for understanding how values and social networks influence decision-making in the grain supply chain and adoption of new products.

METHODS

The assessment of Kernza awareness and market potential was conducted using surveys and interviews. The survey targeted an audience of California-based, grain-using businesses (bakers, beverage makers, CPG manufacturers, and restaurants) and received 23 valid responses. Additionally, 19 interviews were conducted with bakers, beverage makers, and CPG manufacturers, with an addition of millers—viewed as key actors in the grain supply chain— and two grain industry professionals, included to provide a broader context of the California grain supply chain. Of 19 interviewees, between 8 and 11 also completed the anonymous survey.[1] This report integrates findings from both methods, while exploring meaningful differences between the two. A more detailed explanation of methods is included in the appendix of this report.

FINDINGS

The major findings from surveys and interviews provide insight into the research objectives and are organized around participant characteristics, familiarity and experience with Kernza, and values and factors influencing purchasing decisions.

[1] Since survey participants had the option of anonymity, the number of survey respondents who also participated in an interview cannot be determined precisely.

PARTICIPANT CHARACTERISTICS

All survey respondents qualified as a small business according to U.S. Small Business Administration standards, with under 500 employees (US SBA, 2024). Of all 23 respondents, 11 (48%) selected 10 to 49 employees, 10 (43%) 0 to 9 employees, and 2 (9%) 150 to 249 employees. Interview participants were not asked directly what size business they operated. Between a description of their employee structure (with several identifying as one-person businesses) and a cursory Google search, it can be inferred that all interviewees also qualify as small businesses.

Most survey respondents identified themselves as beverage makers (14 or 61%), followed by bakers (8 or 35%), and a CPG manufacturer (1 or 4%). In comparison, bakers made up the highest proportion of interview participants (7 or 41%), followed by beverage makers (5 or 29%), millers (4 or 24%), grain industry professionals (2 or 11%) and CPG manufacturers (1 or 6%) (table 1).



Photo credit: University of Minnesota

Table 1. Participants by business type and research method

Business Type	Number of Survey Respondents	Number of Interview Participants
Beverage maker	14	5
Baker	8	7
CPG manufacturer	1	1
Miller	0	4
Grain industry professional	0	2
Total	**23**	**19**

KERNZA AWARENESS

Overall, most respondents were aware of Kernza before participating in the study, but the majority of participants had never used Kernza. Participants who had previous awareness of Kernza most frequently heard about it through industry associations such as Craft Brewers Associations, media, and direct industry contacts, including The Land Institute, Patagonia, and the Washington State University (WSU) BreadLab. Several participants noted hearing about Kernza from direct contacts at one of the mentioned organizations, including Wes Jackson (The Land Institute) and Steve Jones (WSU BreadLab).

Survey respondents were segmented by their level of experience with Kernza: never used (no experience using Kernza), formerly used (experimented with Kernza or used Kernza in a product, but discontinued use), and currently using (using Kernza in their products at the time of participation in the study). While most reported *awareness* of Kernza, the majority of respondents had never *used* Kernza. Of those survey respondents who had some experience with Kernza (n = 5), there were slightly more former users than current users. Among survey respondents, a higher proportion of bakers (1/4 or 25%) than beverage makers (1/7 or 14%) had experience using Kernza (figure 1). The one participating CPG manufacturer was a current Kernza user.

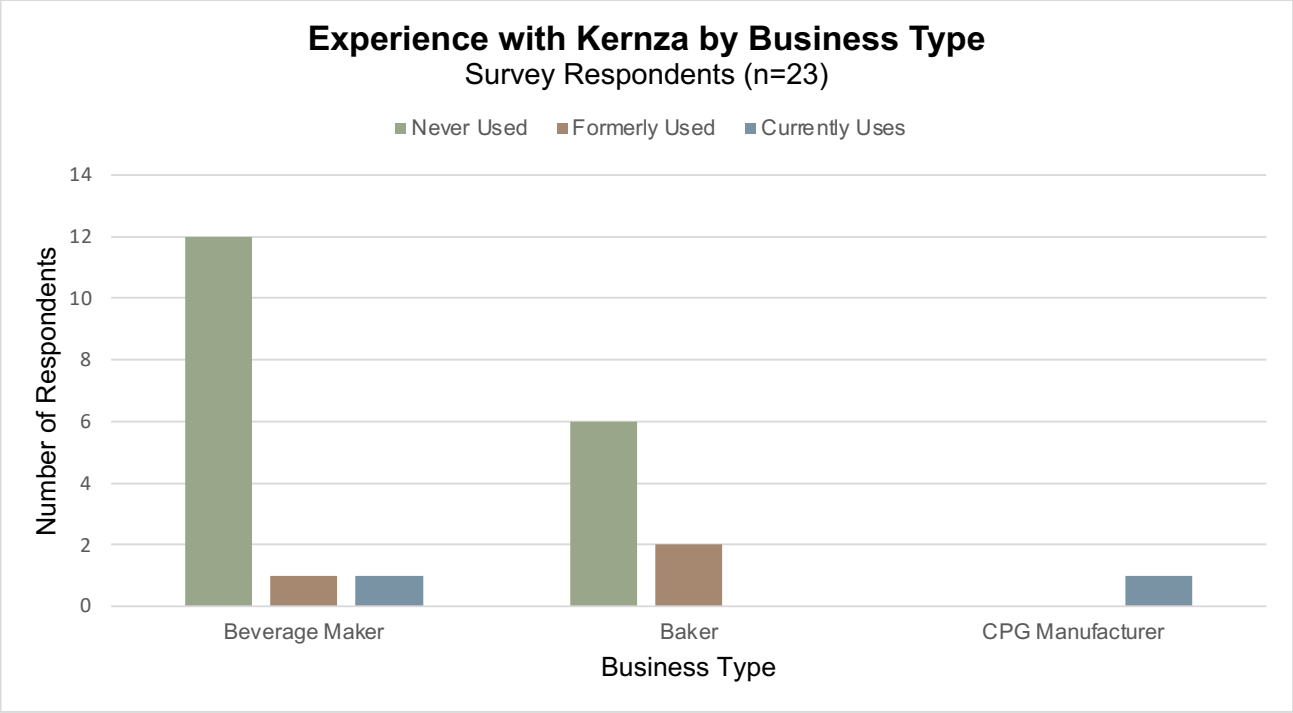


Figure 1. Experience with Kernza by business type among survey respondents, showing how many respondents of each business type (beverage makers, bakers, and CPG manufacturers) never used Kernza, formerly used Kernza, and currently use Kernza.

A slightly greater number of interviewees (n = 7) had experience with Kernza, though only two reported using it currently (figure 2). The CPG manufacturer was a current Kernza user, along with one beverage maker. An equal number of participating millers had never used Kernza (n = 2) and formerly used Kernza (n = 2). In contrast to the survey results, a higher proportion of beverage makers had experience with Kernza (2/5 or 40%) compared to bakers (2/7 or 29%). The grain industry professional interviewees (n = 2) were not included in this analysis, since they are not product manufacturers.

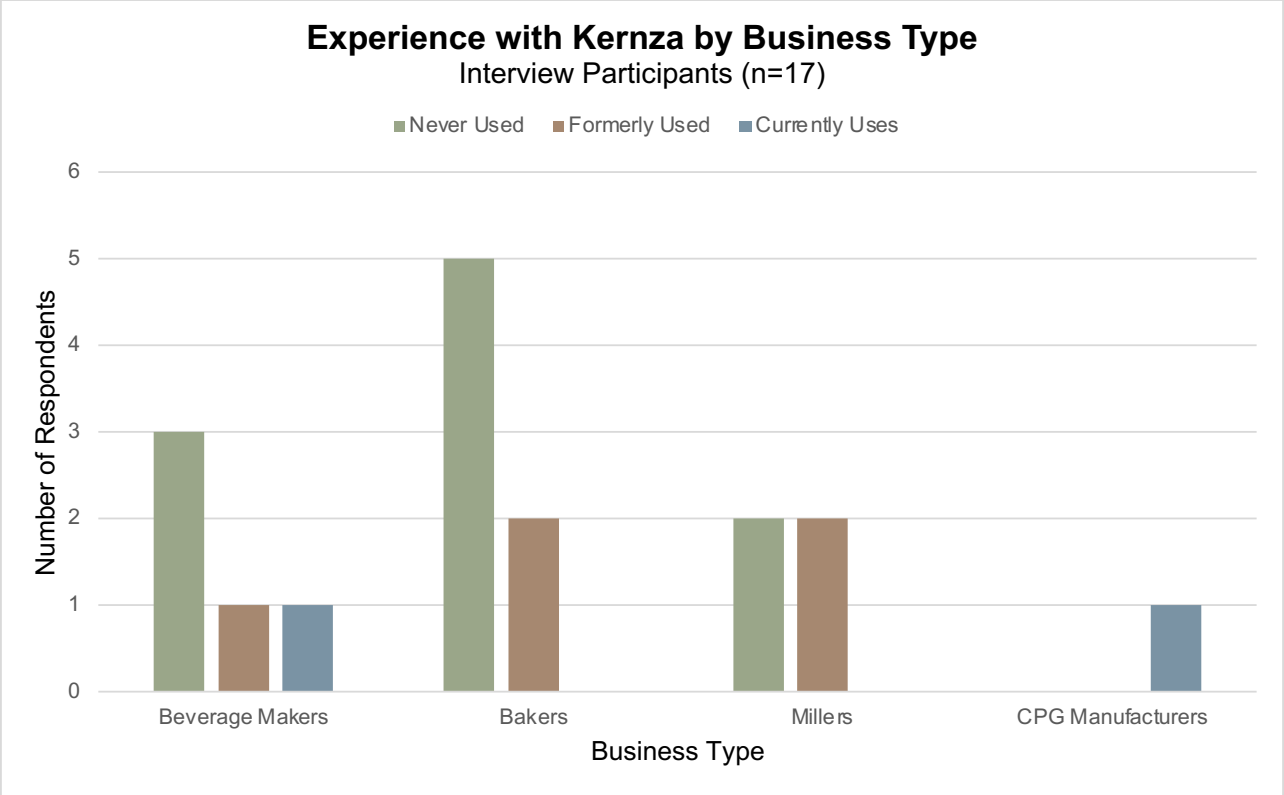


Figure 2. Experience with Kernza by business type (interview), showing how many respondents of each business type (beverage makers, bakers, millers, and CPG manufacturers) never used Kernza, formerly used Kernza, and are currently using Kernza. Between 8 and 11 of the interview participants completed a survey and are also reflected in Figure 1.

EXPERIENCE USING KERNZA

Current and former Kernza users shared both positive and negative feedback about Kernza, mentioning performance, quality, flavor, characteristics, and supply. Commonly cited motivations for using Kernza were 1) a recommendation from an industry contact and 2) because their values aligned with Kernza's ecological messaging.

Several interviewees reported experimenting with Kernza between 2017 and 2022. Notably, all bakers and millers with Kernza experience had used it within this time frame. Though interviewees did not indicate which variety they used, the varieties in use during this time were likely early versions of UMN-Clearwater and TLI-C3, TLI-C4, and TLI-C5, according to The Land Institute's Kernza databases. Newer varieties of Kernza have since been developed, bred for characteristics including larger seed size, reduced shattering, and improved threshability (Stoll et al., 2024).

Among those interview participants who had former experience using Kernza (n = 5), two said they wanted to use Kernza again, one did not indicate whether or not they had intentions to use Kernza in the future, and two responded with caveats. One caveat shared by a respondent was that they would not experiment with Kernza until someone made a delicious bread with a high percentage of Kernza; the other caveat shared was that the respondent would be more likely to use Kernza if it could be grown locally.



Two bakers noted that Kernza performed like rye when baking. One baker noted a specific challenge with performance, saying that Kernza is "not strong enough to make sourdough bread with yet." Two bakers shared that in their business models, they prefer using a high percentage of a single type of grain in bread loaves in order to highlight its unique flavor, but felt that Kernza fell short in that regard:

> *"What I really enjoy is taking a grain and letting people taste it and determine what that grain is like. I'll do 100% Khorasan. I'll do 100% Einkorn. Someday, it'd be nice to do 100% Kernza if that's ever possible, but it doesn't seem that's possible just yet." - Baker*

One miller cited challenges with Kernza due to its moisture level being too high, which caused it to gum up and clog their short flow mill. However, that miller had better outcomes using a stone mill to process the Kernza, rather than a roller mill. A CPG manufacturer with more recent experience using Kernza for pasta described how the milling did not fully break up the Kernza kernels, leading to clogging in the pasta manufacturer's equipment. As a solution, the pasta manufacturer added an extra screen to catch the kernel fragments.

Additionally, a miller who had experimented with Kernza around 2022 commented on the small size of Kernza's endosperm, describing it as rice-like, elongated, and oval, and not as plump and round as a typical wheat berry, which meant weaker gluten strength when baking bread. A maltster that received a Kernza sample from Patagonia before 2020 for trial malting noted that the germination of the Kernza was insufficient to do malting.[2] In terms of flavor, two interview participants who had experimented with Kernza, both bakers, reported being unimpressed with Kernza's flavor profile.

[2] In 2025, Colorado Malting Company and Sustain-a-Grain launched the first Kernza malt line with nine specialty malt styles (KernzaCAP, 2026).

Supply challenges emerged as a theme among those who had experience using Kernza. A current Kernza user whose products are Regenerative Organic Certified (ROC) expressed challenges sourcing a sufficient quantity of ROC Kernza and shared that clean out rates— percentage of material removed from raw grain to achieve clean, dehulled grain and meet quality standards— and yields were sometimes different than projected. One miller had sourced Kernza from a farmer in Illinois in 2017 or 2018 and shared that the supply was not reliable, though they did not have a large customer base for Kernza at the time. Additionally, a baker that experimented with Kernza in 2022 shared that it was difficult to find a source of Kernza when searching online. They said they would have been interested in getting Kernza samples from different parts of the country to compare and admitted they may have not been talking to the right people to make that happen.

Notably, the Kernza supply chain has developed and the number of Kernza suppliers has grown since the supply challenges described by the miller and baker above. As of May 2026, there are five licensed Kernza ingredient suppliers in the U.S. In the 2017 to 2018 time range, there were about 785 acres of Kernza planted in the U.S. (according to The Land Institute databases), and as of November 2025, there were about 3,511 acres planted (The Land Institute, 2025).

Despite challenges, several participants expressed interest in experimenting with Kernza again. A baker described this sentiment, particularly committed to continuing to trial Kernza because of its ecological benefits:

> *"I've been keeping my eye on Kernza for decades, hoping that someday it at least approaches regular wheat in functionality. I'm willing to pay more because I believe in the value of developing perennial crops." - Baker*

Many positive comments about Kernza related to its promise as a perennial grain that has attributes in soil health-building and carbon sequestration, rather than its quality or performance. However, one distiller commented on the unique flavor profile Kernza offers in whiskey (grassy and floral), a CPG manufacturer noted the unique flavor that Kernza contributed to pasta, and a baker commented on the savory and cheesy flavor that emerged when experimenting with Kernza. Two bakers commented on the nutritional attributes of Kernza, particularly how a low glycemic load and high protein content may be appealing to customers.

VALUES AND FACTORS THAT INFLUENCE GRAIN PURCHASING

To understand how participants made decisions about grain sourcing, they were asked to describe the values and factors motivating their purchasing choices. Respondents described motivations in relation to farm-direct relationships, an educated and values-driven customer base, differentiation and innovation, reliable and consistent supply, connection to industry networks, and pricing and economics.

Farm-Direct Relationships

Supporting local growers emerged as an important value for interviewees, though the term "local" embodied more than simply "proximity." Participants commonly stressed the importance of a direct farmer relationship, which enabled trust-building through understanding of the grower's farming practices. When speaking about their values related to sourcing Kernza or other specialty grains, interviewees often emphasized the importance of sustainable farming practices that build soil health, sequester carbon, and promote biodiversity. Many referred to sourcing grains from "organic" growers. When asked whether that meant certified organic, participants often responded that their growers did not always grow organically certified grain, rather, they used "responsible farming practices." This discussion revealed that a direct relationship between the grower and grain-using business and an understanding of the farming practices made organic certification less important. This was more often the case for millers and bakers than beverage makers, who were more likely to work with a distributor than purchase grain directly from a grower.





As it pertained to the concept of "local," in some cases, participants were interested in supporting the local economy and building a stronger, vertically integrated and localized grain supply chain. To others, the idea of local represented an anti-commodity, anti-industrial stance, and was equated more to relationship and connection than geographical proximity.

> *"I think the definition of local is expanding into connection … it's connection. It doesn't have to be within a certain radius, but it's understanding who the people are, what they're doing, why they're doing it."*
> *- Grain Industry Professional*

In this way, several participating businesses found direct connection to growers to be as important as proximity. Building on the idea of connection, the bakers that participated in the study often sold their bread directly to customers, either through a storefront bakery or at the farmers market. They described how direct interaction with customers enables storytelling about the source of their grains, including the name of the farmer, their growing practices, and what makes that grain unique. Additionally, some businesses acknowledged the utility of "local" as a marketing tool, for example, bakers educating their customers about a product through conversations at their storefront or farmers markets, or a brewer who incorporated locally-grown barley in their beers and featured the farm names on the label.

Educated and Values-Aligned Customer Base

Many interviewees, particularly bakers and millers, described their customer bases as highly educated, interested in environmental issues, and curious about the origin of the business' ingredients. Additionally, many interview participants were based in metropolitan areas such as Los Angeles and the Bay Area, which have significant populations of affluent and politically liberal customers (Thorman and McConville, 2025; Baldassare et al., 2025). As one interviewee explained, their customers have a level of knowledge about agriculture's impacts on the environment, and a certain savvy around labeling and third-party certifications:

> *"[Having] the ability to have a retail shop where customers can come in and ask questions matters a great deal, because people, they know they want certified organic, but if I tell them that I know the farmer and I know how [that farmer is] amending the soil or treating the soil, how they're harvesting … [it] carries much more weight. I can tell you that California, and everybody in my backyard, they are highly educated consumers … they are educated enough that they understand that an organic sticker on something doesn't always get them what it is that they're trying to support. They want to know that I am doing my due diligence and so are the farmers that I partner with." - Miller*

In this way, the interviewee describes a discerning customer base that expects the business to source from farms that use soil-building, sustainable farming practices that sometimes go beyond third-party certification requirements. Direct interaction with customers supports the business owner's ability to engage in these nuanced conversations about farming practices with their customer base. In sum, interviewees, particularly bakers and millers, described a customer base that is interested in how their food is grown and concerned with environmental issues.

Customer Values Assessment: Marketing Claim Exercise

To assess the values that motivate customers of the grain-using businesses, interview respondents were asked to participate in a marketing claim exercise. In the last section of the interview, participants were asked to rate a list of hypothetical Kernza claims based on how compelling they would be for their customers, using a Likert scale that included: (1) not at all, (2) slightly, (3) moderately, (4) very, or (5) extremely. After rating each claim, participants shared explanations of their choices. The results were analyzed quantitatively, with point averages calculated for each individual claim across 16 interviewees that participated in the exercise (table 2).

Table 2. Responses to hypothetical Kernza marketing claims (n = 16)

Claim	Average Rating (scale of 1 to 5)
As a perennial crop, Kernza helps mitigate climate change.	4.13
As a perennial crop, Kernza improves soil quality.	3.88
Kernza is nutty, sweet, and delicious.	3.75
As a perennial crop, Kernza protects water quality.	3.63
Kernza is highly nutritious.	3.50
As a perennial crop, Kernza is beneficial for wildlife habitat.	3.20
Kernza is nature-positive.	3.19
Kernza is high in fiber and protein.	2.94

Broadly speaking, environmental issues and flavor appeared to hold the most importance. The claims that participants identified as being most compelling related to climate change (4.13), soil quality (3.88), and taste (3.75). Some comments about lower-rated claims included that they suspected their customers would be less compelled by issues related to water quality and wildlife habitat because they are more abstract and difficult to connect to than claims about climate change or soil health when reading a label. Additionally, many interpreted the claim, "Kernza is nature-positive," as green-washing and vague. In terms of the nutrition-related claims, it is possible they would be more appealing to customers of artisanal bakeries and millers, but they were irrelevant for beverage makers like breweries and distillers, who typically do not consider health benefits in their marketing.

Differentiation and Innovation

Many interviewees were bakers or millers who ran small, independently-owned, artisanal businesses and valued incorporating unique, heritage and identity-preserved grains into their products that offered differentiation in terms of aromatics, flavor, color, and nutrition. As small businesses, some had the ability to be nimble and experiment with different grains from small-scale specialty grain growers. They also highlighted the qualities of unique grains in terms of their utility as marketing tools:

> *"I love when things come to market that are different than just a bag of white flour … I would love working with different extraction rates, different blends, different granulations, different varieties of grain … It's a new tool for a baker to use. It offers challenges, and the results of that will give the baker something different to make their product stand out from the other baker down the street. I think this is just one of those tools … that can really help expand the flavor profiles and the texture [of] their bread menu." - Miller*



In addition to emphasizing the value of differentiation, some bakers who had experimented with Kernza between 2017 and 2022 explained that when they used specialty grains, they preferred to bake a bread using that grain at 100% to highlight its unique flavor. Beverage makers, in contrast, reported staying relatively consistent with their ingredient sourcing, due to needs for consistency in kernel size and quality specifications, price constraints, and less flexibility within their systems to experiment because of high production and batch volumes. However, some beverage makers shared scenarios in which experimentation with a new ingredient would be more feasible, including using a smaller pilot production system, incorporating a new ingredient at a low percentage, or producing a limited release beverage.

Reliable and Consistent Supply

Participants often emphasized the importance of reliability and consistency in both supply and quality of the grain they purchased. A brewer pointed to the importance of a fairly consistent kernel size to make the milling process easier. A maltster described the importance of receiving grain with the appropriate specifications:

> *"[I]f their protein level is too high, we can't buy it. If their RVA is too low, which is an indication of pre-harvest sprouting, we can't take it. We need viable, whole healthy kernels that don't have too much protein. It's a lot to ask for in today's more commodity type farming. It's definitely a little more specialized … we need to start with good grain to be able to make good malt." - Maltster*

Another element of consistent quality identified by a miller was proper handling and storage, meaning a cleaned grain product without the presence of pests such as wheat weevils.

Many participants expressed reservations about integrating specialty or novel grains into their products because of the challenge of accessing a consistent supply year to year. There was a concern for farmers investing in production of a new grain when there is not a consistent market, particularly given the high cost of production and land security issues in California.



Photo credit: Mette Nielsen

Industry Networks

In addition to relationships with their growers, participants were embedded in close-knit professional networks where information was exchanged both formally and informally. When asked how they find information about best practices for making their products, many interview participants responded that they call an industry friend or professional contact, and in some cases reference industry associations and guilds.

To understand the connections between participants and their professional networks, organizations mentioned in interviews were coded, and the number of interview participants that mentioned each organization was then counted. The most frequently named organizations, including the number of interview participants that named them, were: University of California, Davis (n = 8), Central Milling (n = 7), WSU BreadLab (n = 5), The Land Institute (n = 5), California Wheat Commission (n = 5), and Patagonia (n = 4). Notably, mentions of UC Davis were in reference to several programs, including the Master Brewer's Program, Small Grains Program, and seed breeding program, and mention of Central Milling included their bakery supply arm and baking center. The named entities played important roles in sharing new industry information, facilitating knowledge-exchange and networking between different supply chain actors, and influencing the use of particular grains, including Kernza.

Pricing and Economics

Many interviewees reported a tension between balancing values and economics when making purchasing decisions. While many emphasized a preference for sourcing from local and organic growers, cost constraints were a common counterpoint. For one business using Kernza, they pointed to the costs incurred in a long grain supply chain, including research and development, processing, packaging, and freight. They speculated that there will be limited Kernza adoption until yields increase and the price comes down.

> *"The price has to come down in order for more companies to get on board, and for the supply, for the demand to really be there … Our margins are lower on products we make using Kernza. And to most companies, it wouldn't be a satisfactory margin to be honest." - CPG Manufacturer*

Others pointed to challenges with cashflow and mounting pressures with pricing being influenced by global politics and economics, climate change, inflation, and the rising cost of freight. Seeking out better prices sometimes came at the expense of purchasing high quality malt or prioritizing a lower price over social and environmental values.

> *"Our biggest issue is cost usually … with rising inflation, [it] has been a major contributing factor to reasons why we're shifting around grains. Sadly, as it's less and less about quality and more about price and just trying to find the same quality at a better price at times … The pitfalls are the supply, the waiting, or the things you got to do to get the best price that you can do, because right now we're on a high lead time for a well-priced malt, but it is taking a bit more time, and so we've had to come up with different ways of continuing production while we wait for that better price malt to come in." - Brewer*

While some participants articulated challenges balancing values and economics, others described the pressure of the growing cost of transportation and materials, as well as the lack of infrastructure for the small-scale grain supply chain.

> *"[A]n additional 10 to 15 cents a pound, it matters for me. That's what it sells for on the commodity market, bagged and delivered to the big corporate people. My fixed costs, my transportation costs, packaging, same for the farmers, they've all pretty much doubled. We deal with an incredible lack of infrastructure for small-scale grain handling and storage. All of that pushes price point and availability. It stresses those two things the most." - Miller*

With growing costs, participants explained the difficulty in offering a competitive price point for their products. One business explained that they would buy from higher priced local producers occasionally, but do not have cash flow to buy it consistently. In other cases, interviewees explained that they were willing to accept higher prices from some growers because they offer a unique grain that cannot be found elsewhere.



Price Sensitivity: van Westendorp Exercise

In the survey, participants were asked to respond to a van Westendorp-style question to understand their price sensitivity for grains in flour and whole grain form (Chhabra, 2015). Those without Kernza experience were prompted to indicate price sensitivity in terms of specialty grains, while current and former Kernza users were prompted to respond for Kernza specifically. All respondents were prompted to answer the questions for whole grain and/or flour, based on what form they use. All current and former Kernza users only responded to the whole grain prompt, and their responses are combined. The following metrics were used to measure price sensitivity:

- Too expensive: so expensive that you would not consider purchasing it
- Expensive/high side: expensive to the point that you would have hesitation about purchasing it
- Cheap/good value: a great purchase
- Too cheap: so low that you would question its quality

By asking about price per pound ranging from too expensive to too cheap, results from the van Westendorp questions provide upper and lower price boundaries to consider for Kernza and specialty grains (table 3).

Table 3. Results of van Westendorp Survey Question

Price Sensitivity	Specialty grain FLOUR No Kernza experience (n = 7)	Specialty WHOLE grain No Kernza experience (n = 15)	KERNZA WHOLE grain Current and former Kernza experience (n = 5)
Too expensive	$2.95/lb	$3.08/lb	$3.29/lb
Expensive/high side	$2.21/lb	$2.28/lb	$2.77/lb
Cheap/good value	$1.41/lb	$1.50/lb	$1.32/lb
Too cheap	$1.15/lb	$0.73/lb	$0.66/lb

Based on the averages represented by this industry segment, a preferable price range for a specialty grain flour is between $1.41 and $2.21 per pound; for specialty whole grain between $1.50 and $2.28 per pound; and for Kernza whole grain between $1.32 and $2.77 per pound.

In a comparison of price sensitivity between bakers and beverage makers without Kernza experience, a preferable price range for specialty whole grains for bakers is between $1.66 and $2.62, and for beverage makers, $1.44 and $2.16, showing that beverage makers may be more price sensitive than bakers (table 4).

Table 4. Van Westendorp, comparing specialty whole grains price sensitivity between bakers and beverage makers

Price Sensitivity Metric for Specialty Whole Grain	Bakers without Kernza Experience (n = 4)	Beverage Makers without Kernza Experience (n = 11)
Too expensive	$3.80	$2.82
Expensive/high side	$2.62	$2.16
Cheap/good value	$1.66	$1.44
Too cheap	$0.51	$0.81

BARRIERS AND ENABLERS FOR KERNZA ADOPTION



The grain-using businesses that participated in this study represent a mix of bakers, beverage makers, millers, and CPG manufacturers that are mostly operating on a small scale and engaging with specialty grains. The purchasing values described by participating businesses reflected principles of alternative food networks, characterized by geographic, economic, and social proximity and a distinction between industrial and localized supply chains (Gori and Castellini, 2023). Many businesses emphasized the importance of a direct relationship with grain growers as an assurance of sustainable farming practices, and communicated this value to their customers, who were often educated about and engaged with environmental issues. This ethos represents an enabler for Kernza adoption among this subset of California grain-using businesses, particularly in terms of its appeal as a soil-building perennial grain.

Additionally, participating businesses were generally connected to grain industry networks, as demonstrated by mentions of organizations in common. These organizations typically either played a role in introducing Kernza or in supporting knowledge and information exchange within their industries. Many research participants also described how they lean on industry peers and associations for new ideas and information, reflecting ideas from Hergesheimer and Wittman (2012) that social exchange networks can support the development of an alternative grain supply chain.

Moreover, the organizations cited by several participants as playing a role in introducing them to Kernza (The Land Institute, Patagonia, WSU BreadLab, and industry associations) can be thought of as knowledge intermediaries for the role they play in facilitating the exchange and dissemination of new ideas and information, as well as building connections between different actors in the supply chain (Kivimaa et al., 2019). This approach has the potential to lead to new collaborations and influence adoption. The role that these organizations and networks play as intermediaries reflects some elements of innovation systems that have been used to frame Kernza commercialization by KernzaCAP researchers, signaling an enabling factor for Kernza adoption among this industry segment in California.

Participating businesses, particularly bakers and millers, often expressed an inclination towards innovation and experimentation, with an openness and practice of using unique specialty grains in their products to differentiate themselves from conventional producers. Using specialty grains grown by local farmers supported their ability to leverage storytelling and present a unique flavor to their customer bases. The idea of locality was also described by interviewees as a counterpoint to industrial production systems, representing a characteristic of alternative food networks focused on values-based distribution (Gori & Castellini, 2023).

While participating businesses described alignment with Kernza values, there are several ideas expressed by these industry segments that could present challenges to Kernza adoption in California. The absence of Kernza production in the state is at odds with the preferences of participants in the research, many of whom expressed a desire to work with growers within geographic proximity to be able to support the local economy and have confidence in their using sustainable farming practices. Currently, California is lacking in some other elements of a Kernza innovation system as outlined by Cureton et al. (2023), such as consistent strategic communication and coordination, and intentional investment into a regional network. California stands in contrast to other states where Kernza is grown that have

teams, programs, and resources supporting its market development and commercialization. In California, a more comprehensive approach to developing Kernza could include sustained engagement, outreach, and information-sharing to growers, processors, grain-using businesses, and consumers, as well as investment and partnership with farmers to conduct growing trials and research. As mentioned earlier, it is not yet clear whether Kernza can be grown in California with consideration to the climate and economic viability. Participants expressed a desire to limit their carbon footprint and cost of transportation by sourcing grain from California or west coast growers as much as possible. With increasing economic pressures such as inflation and global conflicts leading to higher costs for freight and goods, price sensitivity noted by the participants appears to be a significant factor in purchasing decisions.

Notably, those who had experimented with Kernza and experienced challenges with performance and quality for processing did so between four to nine years ago and several expressed interest in experimenting with Kernza again. Many participants noted the importance of consistency in both quality and supply of grain products. The development of new Kernza grain varieties, maturation of the Kernza supply chain, and availability of new technical guides for brewing and baking present an opportunity to improve the experience for this segment of businesses. Businesses with flexibility and nimbleness around research and development of new food and beverage products may be more willing to work with Kernza as the quality and consistency of supply continue to develop.

Based on findings from this study about the values and motivators of grain-using businesses and their experiences with Kernza and specialty grains, we have identified the following barriers and enablers towards the adoption of Kernza in California.

BARRIERS TO ADOPTION

Barriers to Kernza adoption in California center around challenges with pricing, locality of production, grain quality, flavor, and performance, and supply. Survey respondents currently using Kernza (n = 2) were asked to identify the biggest challenges they have experienced working with Kernza, and former Kernza users (n = 3) were asked why they no longer used Kernza. Respondents could select up to three options. When combining responses from participants with current and former Kernza experience, the most common barriers were the high price of Kernza (n = 3) and difficulty working with Kernza (n = 3) (figure 3).

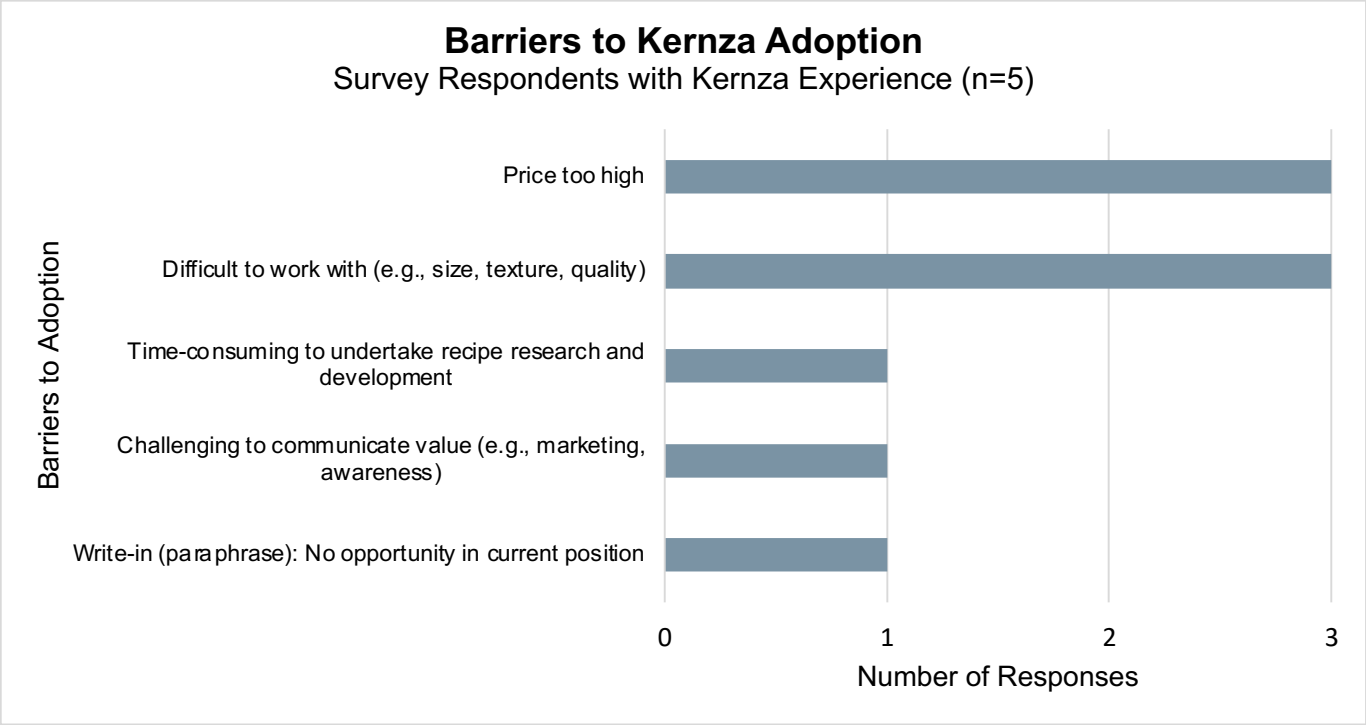


Figure 3. Barriers to Kernza grain adoption among survey respondents with Kernza experience (n = 5).

Similarly, survey respondents without Kernza experience (n = 18) were asked to identify the biggest barriers to incorporating a new specialty grain into their products, with the ability to choose up to three options. The question was worded generally and participants were not asked to respond in reference to a specific type of grain. The most frequently chosen barriers were that the price is too high (n = 13), they are unable to find a local supply (n = 9), and specialty grains are too difficult to work with (n = 7) (figure 4).

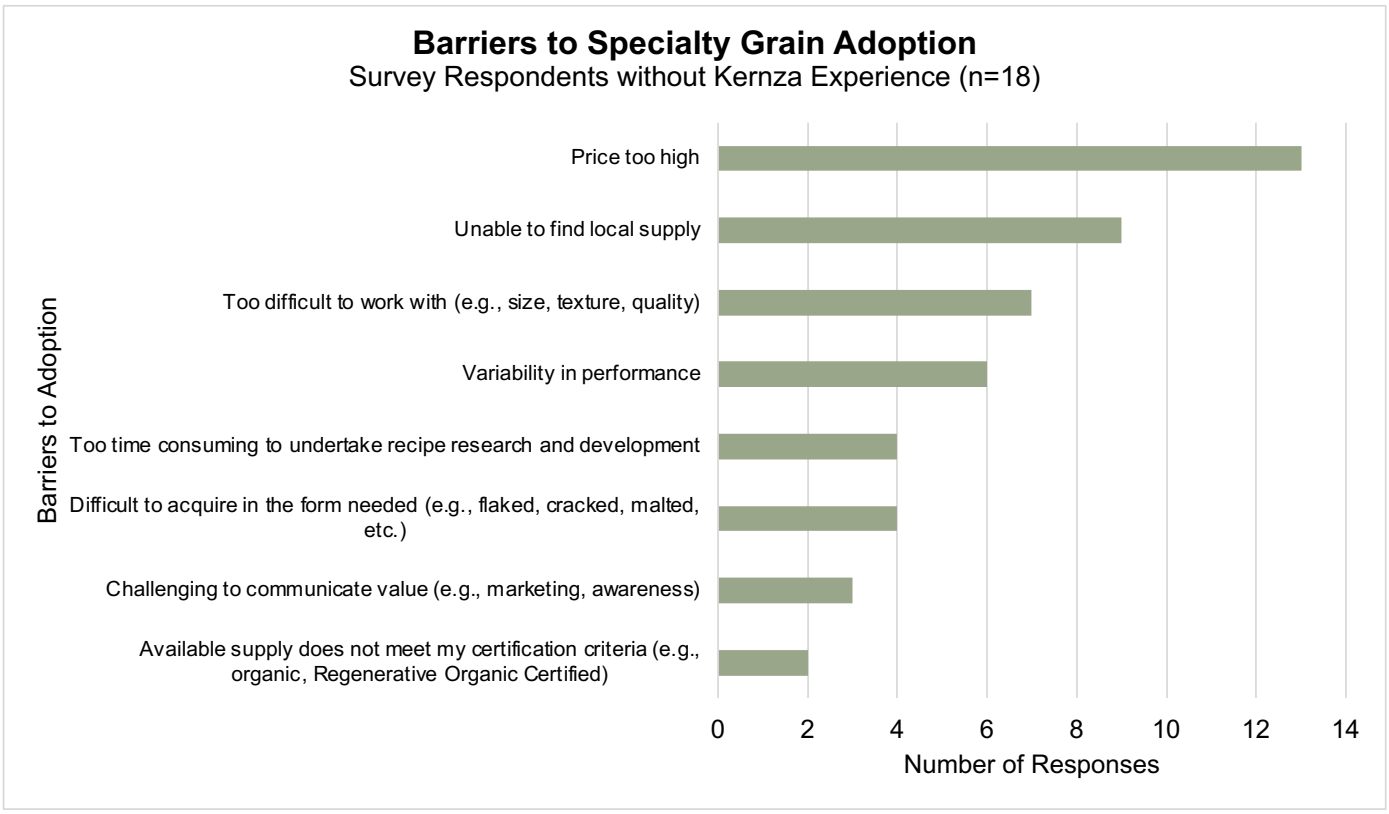


Figure 4. Barriers to use of a new specialty grain among survey respondents without Kernza experience (n = 18).



The following barriers represent a summary of survey and interview responses, also based on the values and factors that influence grain purchasing decisions, outlined previously in the report.

Price sensitivity. Businesses noted that because the grain supply chain can be complex due to the required processing steps, they are generally price-conscious, in spite of wanting to make purchasing decisions in alignment with their environmental and social values. Participants interviewed in 2024 expressed concerns and limitations due to the rising cost of freight along with inflation, which could present a challenge to the feasibility of purchasing Kernza as an ingredient. A current Kernza user noted their margins are lower on their Kernza products and posited that the price of Kernza will need to come down for more businesses to adopt it. Data from the van Westendorp survey question suggests that beverage makers may be more price sensitive than bakers.

Lack of California-local production. Many participants valued sourcing grain from a local grower to have connection and to support the local and regional economy. For those without Kernza experience, one of the most frequently cited barriers to specialty grain adoption was being unable to find a local supply of that grain. At the writing of this report, Kernza is currently not being grown commercially in California and it is unclear whether Kernza can be viably grown in California from a climate and economic perspective.



Photo credit: Ben Robinson

Concerns with quality, flavor, and performance. Businesses expressed that a main barrier of using Kernza and specialty grains is that it is too difficult to work with. Participants with experience using Kernza cited challenges that led to clogging of processing equipment for pasta manufacturing and milling, weaker gluten strength for baking, and insufficient germination for malting. Some bakers and millers who had experimented with Kernza between 2017 and 2018 explained that it did not perform well in the baking context. Performance was especially a challenge for those who wanted to offer a 100% Kernza bread to highlight its flavor and texture profile, rather than incorporating a smaller percentage of Kernza alongside another grain. Two former Kernza users did not find the flavor appealing enough to continue using it beyond experimentation. As noted earlier in the report, new and better varieties of Kernza have been developed since many participants experimented with Kernza.

Concerns with supply. Participating businesses cited concerns about consistent supply when incorporating a novel or specialty grain as an ingredient in their products. Many interviewees expressed reservations about integrating specialty or novel grains into their products because of the challenge of accessing a consistent supply year to year. There was a concern for farmers investing in production of a new grain when there is not a consistent market, particularly given the high cost of production and risk assumed by the grower. Interviewees further commented on land security as a challenge faced by California farmers, with impacts on specialty grain supply, and cited concerns about the lack of right size harvesting equipment and processing and storage infrastructure for grain production and processing on a small scale. Some respondents with Kernza experience between 2017 and 2022 did not have a consistent or reliable supply or had difficulty finding a source for Kernza when searching online, however, as described earlier in this report, the Kernza supply chain has developed since that time.

ENABLERS FOR ADOPTION

We have identified several enablers that could be conducive to the adoption of Kernza in California among the types of grain-using businesses that participated in this study. By "enablers," we mean values held by businesses that inform grain purchasing decisions, and characteristics of the industry segments in California included in this study. The enablers for the adoption of Kernza are focused on sustainable farming practices, educated and engaged customer bases, and openness and capacity for experimentation. We conclude this section by recommending renewed engagement with California bakers and beverage makers through existing networks and new technical guides and resources developed by the Kernza community.

Survey respondents were asked to select up to three responses for what would be most helpful in supporting their ability to develop and/or sell products with Kernza perennial grain (for those with Kernza experience) or a new specialty grain (for those without Kernza experience). For respondents with Kernza experience (n = 5), the most frequently chosen responses were: more knowledge about specific performance criteria/grain chemistry (e.g. gluten, baking analysis, flavor, etc.) (n = 2), direct relationship with distributor (n = 2), and reduction in price (n = 2) (figure 5).



Photo credit: Mette Nielsen

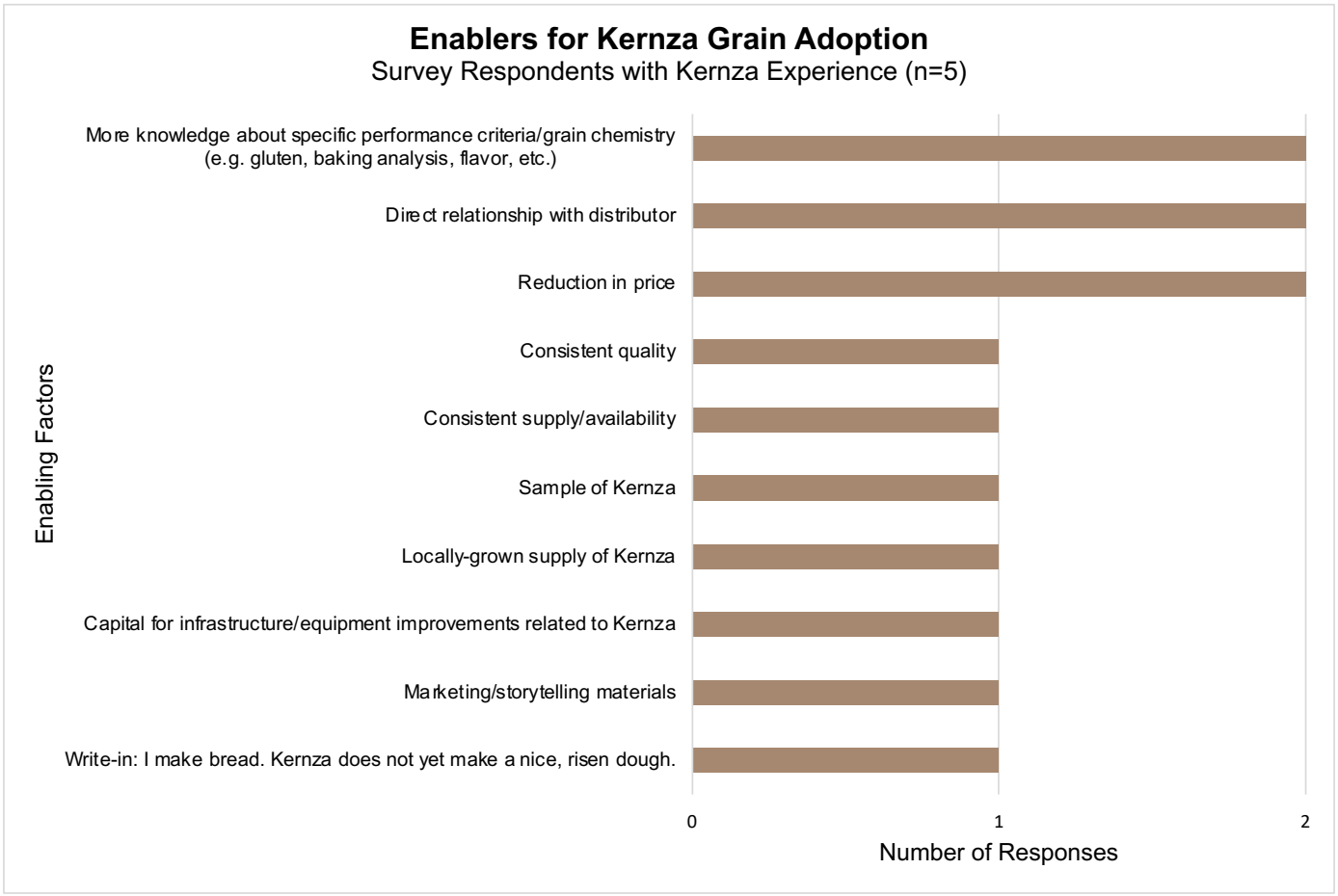


Figure 5. Enablers for Kernza grain adoption among survey respondents with Kernza experience (n = 5).

For those without Kernza experience (n = 18), the most frequently selected responses that would support adoption of a new specialty grain were consistent quality (n = 13), consistent supply/availability (n = 13), and sample of the new grain (n = 6) (figure 6).

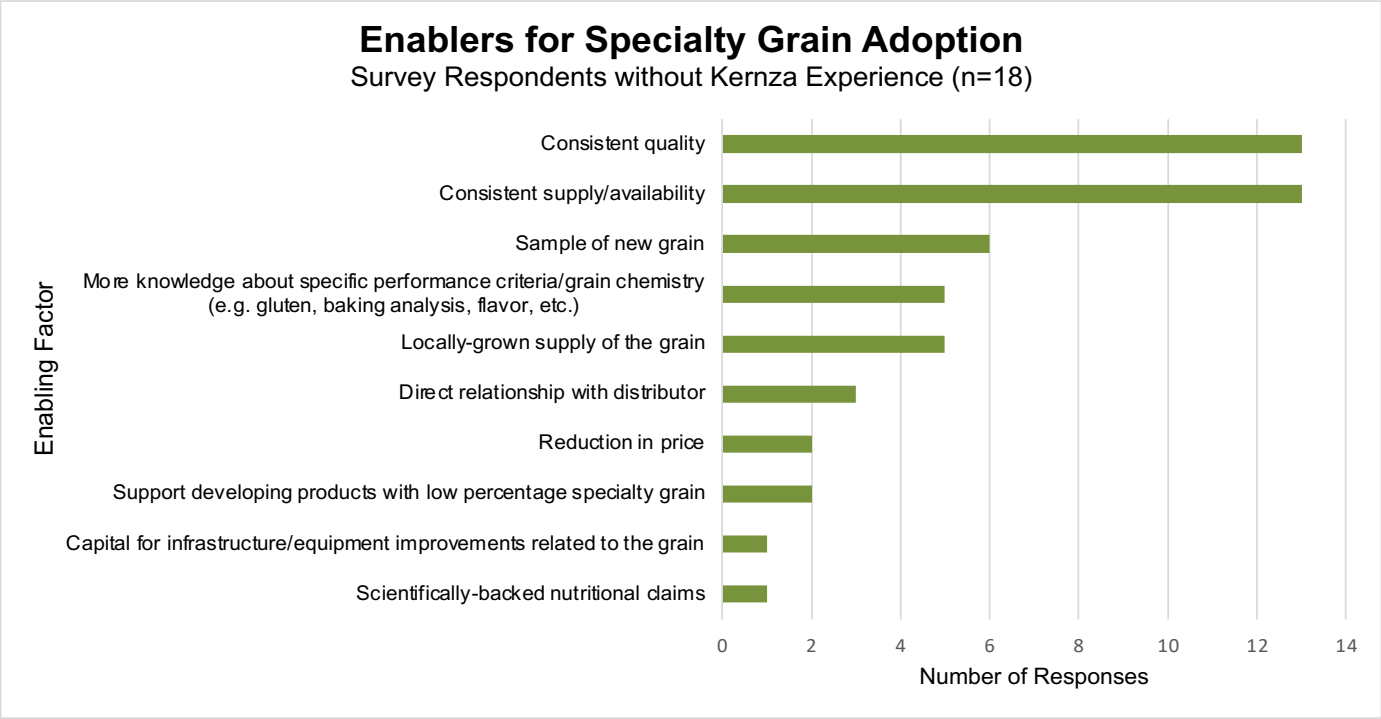


Figure 6. Enablers for use of a new specialty grain adoption among survey respondents without Kernza experience (n = 18).

Businesses value sustainable farming practices. When describing the values that motivate their purchasing decisions, many participants emphasized the importance of sustainable farming practices that incorporate no or low till methods with consideration to soil health-building and carbon sequestration. Notably, businesses familiar with Kernza were particularly compelled by its environmental benefits and story as a perennial grain. Businesses emphasized the importance of direct relationships with growers to better understand their farming practices. While Kernza is not currently grown in California, building relationships between current Kernza growers in other parts of the country and grain-using businesses in California could encourage the adoption of Kernza as an ingredient.

California customer base educated and invested in environmental issues. The participants in this research, particularly those located around metropolitan areas of California, described a customer base that is highly educated and concerned with environmental issues. Many customers understood that lacking organic certification does not necessarily mean that a grower does not use organic farming practices. These customers were more interested in a relational understanding of the farming practices used by a grower than relying on third party certification in lieu of a direct grower relationship as evidence of organic practices. Some participants shared that their customers would be compelled by the environmental claims validated through Kernza research. The Kernza story, including its environmental benefits and the practices of the farmers who grow it, would be a valuable marketing tool for California businesses using Kernza as an ingredient.

Openness and capacity for experimentation. Research participants, particularly small-scale bakers and millers with the ability to be nimble, described an affinity for experimenting with grains that have unique flavor profiles and textures and can be used as a storytelling marketing device. Brewers noted potential pathways for incorporating new grains into their beverages, including through small batches produced in a pilot system and limited release beers. Participants that experimented with Kernza have not done so since between four to nine years before the writing of this report, and in its current form, Kernza may now perform differently.

Recommendation: Targeted Engagement with California Bakers and Beverage Makers

Research findings point to an opportunity for renewed engagement with Kernza among California bakers and beverage makers. Since the most recent experiences with Kernza reported by several participants around 2017 to 2022, Kernza commercialization and supply chain development has progressed significantly, and there is an opportunity for updated information to be shared with these industries in California. Kernza affiliates recently produced technical guides for baking and brewing with Kernza, grounded in experiences from businesses using Kernza in their recipes. More bakers and beverage makers have developed Kernza best practices, for example, improved applications in sourdough bread with a smaller percentage of Kernza. Renewed engagement could also include communicating clear and accurate expectations for those interested in using Kernza, which is not meant to be a direct substitute for wheat. Kernza marketing materials are also now available and have the potential to aid storytelling to customers. Organizations already engaged with participants, such as The Land Institute, WSU BreadLab, Patagonia, and Brewers Associations, could support information dissemination, knowledge-sharing, and targeted technical assistance efforts with California grain-using businesses interested in experimenting with Kernza.

Photo credit: Carmen Fernholz

CONCLUSION

This report summarizes findings from a mixed-methods assessment conducted with California grain-using businesses, including beverage makers, bakers, CPG manufacturers, millers, and grain industry professionals between 2023 and 2024, to assess their awareness of and experience with Kernza, and the values and factors that influence their purchasing. Given the relatively small number of research participants and, more importantly, the skew towards a small business size, findings should be interpreted through the lens of a specific set of small-scale grain-using businesses, rather than representing California grain-using businesses at large. Participating businesses have different levels of experience with Kernza, ranging from current use in their food and beverage products and past experimentation, to no use or experience. The shared values and preferences of these businesses point to several enablers and barriers to their adoption of Kernza perennial grain as an ingredient. Among the businesses, sourcing grains in alignment with social and environmental values, including locally-grown, was cited as important, but was sometimes in tension with economic pressures, limiting their ability to consistently source grains according to their values. However, some businesses described their customers as engaged with and educated on environmental issues, which influences the purchasing decisions of small, artisanal, customer-facing makers in particular. Additionally, many participating businesses are part of overlapping networks that facilitate information exchange between industry professionals and associations, and organizations active in the Kernza commercialization space. Notably, many businesses articulated the need for consistency in the quality and supply of grains used in their products. A lack of California-grown Kernza and price sensitivity among California grain-using businesses present challenges to Kernza adoption. However, the continued development of the Kernza perennial grain supply chain, creation of educational resources and technical guides, and cultivation of relationships to current Kernza growers have the potential to support increased adoption among California businesses with purchasing values influenced by environmental principles and product differentiation.

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APPENDIX

METHODS

This assessment of Kernza awareness and market potential was conducted using surveys and interviews. This report integrates findings from both methods, while exploring meaningful differences between the two. The research protocol was reviewed by the Institutional Review Board and designated as exempt (#2107441-1).

Surveys

The survey targeted respondents from a mix of California-based, grain-using businesses: bakers, beverage makers, consumer packaged goods (CPG) manufacturers, and restaurants. Researchers used a reference database to generate a list of contacts from these industries, filtering California businesses by Standard Industrial Classification (SIC) code. This process generated 678 results; however, some businesses had permanently closed or were from a different industry, and email addresses were not available for all eligible businesses, even through a Google search. This led to a list of 353 eligible businesses of the original 678 that were identified, including the addition of 14 pre-existing industry contacts. Through this process, accounting for bounced email addresses and duplicates, 305 businesses received the survey via one introduction email and three follow-up emails. The survey was also shared with the Craft Maltsters Guild and Bread Bakers Guild of America, who emailed it to their California membership (70 and 200 businesses, respectively). Lastly, partners at The Land Institute shared a survey QR code with attendees of the Natural Products Expo West in March 2024.

The survey was launched in Qualtrics in December 2023. To participate in the survey, respondents met the following criteria, as filtered through the first questions in the survey:

1. Identify as a baker, beverage maker, CPG manufacturer, or restaurant
2. Operate their business in California
3. Use or express interest in using specialty grain in their products

The survey began with basic questions about the business, and then branched into separate sets of questions, based on how the participant responded to the question, "Have you used Kernza in your products?" The options for this branching question were (1) currently using, (2) used but no longer, and (3) never used. A segmenting approach allowed for tailored questions based on the business's experience with Kernza.

The survey was closed in June 2024, with 23 valid survey responses. Survey results were analyzed using Microsoft Excel.

Interviews

A total of 19 Kernza interviews were conducted between April and August 2024, representing bakers, beverage makers, CPG manufacturers, or restaurants, with an addition of millers, viewed as key actors in the grain supply chain. Outreach was conducted to 17 millers, compiled via a search of millers in the reference database, referrals from the California Wheat Commission, and from the researchers' pre-existing contacts, resulting in five millers participating in an interview. Larger milling businesses found in the reference database tended to have a long list of employees, making it difficult to identify and reach the appropriate individual to participate in the research and cold calls or emails were often not returned. For the other interview participants, eight were survey respondents who expressed interest

in participating in an interview through a survey question, four were referred by other participants or project partners, and two were identified to provide context for the broader California grain supply chain. Of 19 interviewees, between 8 and 11 also completed a survey. Because the survey was anonymous, it cannot be determined precisely how many interviewees also completed a survey.

All interviews were conducted and recorded over Zoom. The first two interviews were transcribed internally and the remaining by a transcription company. Interviews were coded in Nvivo using a reflexive thematic analysis method. Researchers developed a codebook based on the research questions and a preliminary review of transcripts for major themes. Two researchers then conducted an inter-coder reliability test, individually coding two interviews selected at random to compare consistency in coding. The codebook was then modified accordingly before one researcher individually coded all transcripts. Once the coding was completed, the transcripts and codes were reviewed iteratively to identify major themes responding to the research questions.



