

Project Research & Evidence Briefs

Hill Country Hearth Foods · Tax Year: 2026 · January 1, 2026 – December 31, 2026

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About These Briefs

These are the company's recorded explanations, not automatic qualification decisions. Original supporting files are held separately — request files from the company using the project and evidence references below. Cost detail is in the Form 6765 Preparation Worksheet and the CPA Workbook/CSV exports.

Project Index

15 project(s) — all non-archived

Ref	Project Name	Type	Prelim. QRE
P-01	Allergen-Friendly Cookie Texture Improvement	Product	\$15,186
P-02	Clean-Label Breakfast Bar Binder System	Other	\$26,722
P-03	Clean-Label Fruit Filling Bake-Stability & Syneresis Control	Other	\$1,918
P-04	Dough Depositor Portion Consistency	Process	\$4,110
P-05	Frozen Dough Thaw-and-Bake Consistency	Process	\$4,070
P-06	Gluten-Free High-Protein Muffin Formula	Formula	\$115,466
P-07	High-Humidity Packaging Stability Test	Process	\$14,500
P-08	Longer Lasting Gluten Free Bread	Other	\$1,968
P-09	Longer-Lasting Gluten-Free Bread	Other	\$1,296
P-10	Natural Preservative Mold-Growth Trial	Formula	\$44,490
P-11	Natural Shelf-Life Extension System	Formula	\$43,625
P-12	Production Batch Scale-Up Process	Other	\$19,341
P-13	Reduced-Sugar Granola Cluster Binding	Formula	\$10,120
P-14	Retail Packaging Seal and Label Durability Project	Other	\$32,490
P-15	sourdough sandwich loaf	Other	\$2,340

P-01 — Allergen-Friendly Cookie Texture Improvement

A. Identity & Participants

Type:	Product	Period:	Not recorded	
Name	Role	Title / Dept		Source
Emily Chen	Wage allocation recorded	Assistant Baker / Test Kitchen Coordinator / Bakery Production		Allocation
Tyler Jacobsen	Wage allocation recorded	Packaging Lead / Packaging		Allocation
Rosa Delgado	Wage allocation recorded	Kitchen Technician / Test Kitchen		Allocation
Coastal Recipe Studio	Contractor cost recorded	—		Allocation
Preliminary QRE:	\$15,186	(see Form 6765 Preparation Worksheet, Project Cost Reconciliation)		

B. Research Explanation

Company's recorded explanation. Not a determination that any test is satisfied.

1. Intended improvement and technical basis

Intended improvement

Match chewiness and spread of the reference cookie while removing top-8 allergens.

Technical foundation

Food chemistry, starch gelatinization, protein functionality and moisture migration were used to evaluate oat/sorghum blends and egg/dairy

P-01 — Allergen-Friendly Cookie Texture Improvement (continued)

replacements. Compare controlled batches using spread ratio, fracture force and moisture retention rather than flavor alone.

Problem being solved

Replacing egg and dairy functions alters binding, moisture, and shelf texture.

2. Technical uncertainty

Uncertain whether oat and sorghum flour blends can replicate gluten structure without added binders at production scale.

3. Alternatives and experimentation

Alternatives considered

Flax gel, aquafaba, and commercial plant-based binders compared side by side.

Experimentation summary

February 2–June 5, 2026: test three oat/sorghum ratios with two hydration levels and two bake profiles. Prepare duplicate batches, use fixed dough-piece weights and measure spread and fracture at days 1, 3 and 7. Direct-support staff weighed coded samples, prepared test fixtures and maintained batch logs for Coastal Recipe Studio’s formulation experiments; routine packaging and administration were excluded.

4. Results and remaining uncertainty

Final outcome

The high-sorghum trial crumbled and showed 35% greater fracture force than the target. A 70:30 oat/sorghum blend with adjusted hydration held spread within 5% of target and retained 86% of day-1 moisture at day 7 in repeat batches. Selected this blend. Direct-support wages relate to sample preparation and measurements for the contracted research, even though no internal direct-research wage allocation was recorded.

C. Evidence & Cost Connection

Evidence Items

3 item(s)

Title	Date	Type	File / Link	Description
CRS-2026-08 — invoice and research scope	2026-02-15	Invoice support	External link	Coastal Recipe Studio invoice CRS-2026-08 for \$3,400 supports Allergen-Friendly Cookie Texture Improvement. Research services were performed in Texas. The full recorded amount relates to the project research scope; routine production and marketing work are excluded. Hill Country Hearth Foods retains rights to the research results and trial data. Payment is due for the work regardless of technical success. Invoice, scope and project allocation have been reconciled.
Allergen-friendly binder comparison	2026-04-18	Design document	External link	Compared egg-, dairy- and nut-free binder combinations in matched cookie batches. Recorded spread, center firmness and next-day chew against a reference cookie.
Cookie spread and texture photo log	2026-05-02	Prototype photo	External link	Photo observations recorded edge spread, cracking and center structure for controlled allergen-free binder trials. The comparison showed that added hydration reduced brittleness but excessive liquid increased spread. Emily Chen performed direct research alongside external specialist trials and selected the intermediate ratio for repeat testing.

Experiment Logs

1 log(s)

Title	Date	Type	Hypothesis / Question	Result
Allergen-friendly binder comparison	2026-04-18	Formulation Trial	Can plant-based binders replace egg and dairy in cookie texture?	Aquafaba approached reference; flax gel showed excessive spread.

D. Material Gaps & Review Considerations

- Project start/end dates not entered

P-02 — Clean-Label Breakfast Bar Binder System

A. Identity & Participants

Type:	Other	Period:	Not recorded	
Name	Role	Title / Dept		Source
Tyler Jacobsen	Wage allocation recorded	Packaging Lead / Packaging		Allocation
Rosa Delgado	Wage allocation recorded	Kitchen Technician / Test Kitchen		Allocation
Jordan Patel	Wage allocation recorded	Part-Time Product Assistant / Product Development		Allocation
Olivia Grant	Wage allocation recorded	Quality Lead / Quality / Food Safety		Allocation
Marcus Reed	Wage allocation recorded	Operations Coordinator / Operations		Allocation
Emily Chen	Wage allocation recorded	Assistant Baker / Test Kitchen Coordinator / Bakery Production		Allocation
Daniel Ortiz	Wage allocation recorded	Production Manager / Production		Allocation
Sarah Miller	Wage allocation recorded	Founder / Head Baker / Product Development / Operations		Allocation
Mason Creative Foods	Contractor cost recorded	—		Allocation
Preliminary QRE:	\$26,722	(see Form 6765 Preparation Worksheet, Project Cost Reconciliation)		

B. Research Explanation

Company's recorded explanation. Not a determination that any test is satisfied.

1. Intended improvement and technical basis

Technical foundation

Food chemistry and viscoelasticity guided binder gelation, sugar crystallization, moisture migration and fracture testing. Heat profiles and cooling intervals were controlled while measuring bar breakage and package adhesion.

Problem being solved

Develop a packaged breakfast bar with acceptable hold, chew, flavor, and transport durability using recognizable ingredients.

2. Technical uncertainty

The team was uncertain which natural binder combination would produce the right balance of structure, chew, moisture retention, and packaging stability. The team also did not know how heating temperature and cooling time affected binder performance.

3. Alternatives and experimentation

Experimentation summary

The team tested date paste, honey, brown rice syrup, almond butter, oat fiber, chia gel, flax gel, and different heating temperatures. Samples were tested for breakage, chewiness, stickiness, flavor, package adhesion, and condition after transport simulation.

4. Results and remaining uncertainty

Conclusions

January 26–June 12, 2026: date paste/oat fiber at controlled cook temperature and 40-minute cooling reduced transport breakage from 22% to 4% in three 100-bar batches. Longer cooling prevented wrapper adhesion. High-temperature variants became brittle and were rejected. Results support selecting the intermediate heat profile and thicker bar geometry.

Final outcome

- Alternatives Tested:
- Date paste + almond butter
 - Honey + oat fiber
 - Brown rice syrup + chia gel
 - Flax gel + nut butter
 - Higher binder cook temperature
 - Lower binder cook temperature
 - Longer cooling before wrapping
 - Different bar thicknesses

P-02 — Clean-Label Breakfast Bar Binder System (continued)

- Known Failures:
- Date paste version held well but was too sticky in packaging.
 - Honey version crystallized after several days.
 - Chia gel version had poor flavor acceptance.
 - Thin bars broke during transport simulation.
 - Higher cook temperature produced hard texture.
 - Lower cook temperature produced weak structure.

C. Evidence & Cost Connection

Evidence Items

4 item(s)

Title	Date	Type	File / Link	Description
MCF-2026-103 — invoice and research scope	2026-04-27	Invoice support	External link	Mason Creative Foods invoice MCF-2026-103 for \$2,100 supports Clean-Label Breakfast Bar Binder System. Research services were performed in Texas. The recorded amount relates entirely to the project research scope. Routine production and marketing work are excluded. Hill Country Hearth Foods retains rights to the research results and trial data. Payment is due regardless of technical success. Invoice, scope and allocation have been reconciled.
MCF-2026-119 — invoice and research scope	2026-08-16	Invoice support	External link	Mason Creative Foods invoice MCF-2026-119 for \$2,500 supports Clean-Label Breakfast Bar Binder System. Research services were performed in Texas. The full recorded amount relates to this project research scope; routine production and marketing work are excluded. Hill Country Hearth Foods retains rights to the research results and trial data. Payment is due for the work regardless of technical success. Invoice, scope and project allocation have been reconciled.
Breakfast bar binder matrix	2026-02-14	Design document	External link	Compared date concentrate and oat-fiber binder ratios, recording cohesion, tack, cutting losses and firmness after storage.
Pilot batch bake trial notes	2026-03-18	Experiment log	External link	Ran matched breakfast-bar batches with varied date concentrate and oat-fiber ratios. Recorded mixing behavior, cutting loss, tack and firmness after storage. The low-binder variant crumbled, while the highest-binder variant stuck to packaging; the balanced blend proceeded to confirmation.

D. Material Gaps & Review Considerations

- Project start/end dates not entered

P-03 — Clean-Label Fruit Filling Bake-Stability & Syneresis Control

A. Identity & Participants

Type:	Other	Period:	Not recorded
Name	Role	Title / Dept	Source
Emily Chen	Wage allocation recorded	Assistant Baker / Test Kitchen Coordinator / Bakery Production	Allocation
Preliminary QRE:	\$1,918	(see Form 6765 Preparation Worksheet, Project Cost Reconciliation)	

B. Research Explanation

Company's recorded explanation. Not a determination that any test is satisfied.

1. Intended improvement and technical basis

Technical foundation

Food polymer chemistry, pectin gelation, starch gelatinization and diffusion governed water binding and thermal stability. Quantify expelled liquid and filling mass loss under controlled baking and freeze-thaw conditions.

Problem being solved

Develop a clean-label fruit filling that resists syneresis and boil-over during commercial baking while maintaining a stable pastry crumb.

2. Technical uncertainty

It was uncertain which pectin, native tapioca and citrus-fiber combination would retain water during baking and repeated freeze-thaw exposure without becoming rigid or separating.

3. Alternatives and experimentation

Experimentation summary

Formulated 8 distinct natural hydrocolloid blend ratios varying high-methoxyl vs. low-methoxyl pectin, citrus fiber, and pH adjustments using organic lemon juice concentrates. Conducted pilot bake trials at 400{F}, 425{F}, and 450{F} to measure boil-over rates and volume loss. Subjected finished frozen pastries to 5 accelerated freeze-thaw cycles (-10{F} to 70{F}) to measure liquid separation in grams per 100g sample using a texture analyzer.

4. Results and remaining uncertainty

Final outcome

March 16–June 30, 2026: high-methoxyl pectin broke down under the bake profile; the low-methoxyl pectin/tapioca/citrus-fiber blend reduced separated liquid from 14 to 3 g per 100 g after five freeze-thaw cycles. At 425 F, boil-over declined from 18% to 2% of units in three 60-unit batches. Selected the lower-pH blend; the 450 F profile still exceeded the loss target.

C. Evidence & Cost Connection

Evidence Items

1 item(s)

Title	Date	Type	File / Link	Description
Fruit filling bake stability and freeze-thaw results	2026-06-30	Test result	External link	March 16–June 30, 2026: compared low-methoxyl pectin, tapioca starch and citrus-fiber systems across repeated oven and freeze-thaw trials. The pectin/tapioca blend reduced separated liquid from 14 g to 3 g per 100 g after five freeze-thaw cycles. At 425°F, boil-out fell from 18% to 2% across three 60-unit batches. The 450°F condition still failed. Retain the 425°F process and the tested blend; the project resolved gel stability and moisture migration uncertainty.

D. Material Gaps & Review Considerations

- Project start/end dates not entered

P-04 — Dough Depositor Portion Consistency

A. Identity & Participants

Type:	Process	Period:	Not recorded
Name	Role	Title / Dept	Source
Daniel Ortiz	Wage allocation recorded	Production Manager / Production	Allocation
Preliminary QRE:	\$4,110	(see Form 6765 Preparation Worksheet, Project Cost Reconciliation)	

B. Research Explanation

Company's recorded explanation. Not a determination that any test is satisfied.

1. Intended improvement and technical basis

Intended improvement

Deposit 80-gram portions with weight variation below 3% and dough tails shorter than 5 mm without damaging dough structure.

Technical foundation

Mechanical engineering, non-Newtonian flow and process control informed pressure-pulse and nozzle comparisons. Measure portion mass, tail length and deposit repeatability at controlled dough temperatures.

Problem being solved

Develop a repeatable dough depositor process that reduces fill-weight variation when handling sticky, high-fiber bakery dough.

2. Technical uncertainty

The team did not know which nozzle geometry, pulse duration and dough temperature would prevent tailing and inconsistent portion mass without damaging dough structure.

3. Alternatives and experimentation

Experimentation summary

April 6–June 30, 2026: compare three nozzle diameters, two pulse profiles and two dough temperatures with 30 deposits per condition. Repeat the strongest settings on three separate dough batches. Keep upstream mixing and target mass fixed at 80 g.

4. Results and remaining uncertainty

Final outcome

The narrow nozzle produced tailing and 9.2% mass variation. A tapered 18 mm nozzle with a two-stage pulse reduced variation to 2.1% and cut tails from 15 mm to 4 mm across repeat batches. Warm dough still caused inconsistent cutoff; production parameters require dough below the tested upper-temperature limit.

C. Evidence & Cost Connection

Evidence Items

1 item(s)

Title	Date	Type	File / Link	Description
Dough depositor nozzle and pulse trial results	2026-06-30	Test result	External link	April 6–June 30, 2026: tested three nozzle geometries, two pulse sequences and two dough temperatures, measuring 30 deposits per condition across three batches. A tapered 18-mm nozzle and two-stage pulse reduced variation in 80-gram portions from 9.2% to 2.1%. Tails decreased from 15 mm to 4 mm. Warm dough produced poor cut-off and was rejected. The selected combination met the 3% weight-variation and 5-mm tail limits while retaining dough structure.

D. Material Gaps & Review Considerations

- Project start/end dates not entered

P-05 — Frozen Dough Thaw-and-Bake Consistency (continued)

P-05 — Frozen Dough Thaw-and-Bake Consistency

A. Identity & Participants

Type:	Process	Period:	Not recorded	
Name	Role	Title / Dept		Source
Daniel Ortiz	Wage allocation recorded	Production Manager / Production		Allocation
BatchWright Engineering	Contractor cost recorded	—		Allocation
Preliminary QRE:	\$4,070	(see Form 6765 Preparation Worksheet, Project Cost Reconciliation)		

B. Research Explanation

Company's recorded explanation. Not a determination that any test is satisfied.

1. Intended improvement and technical basis

Intended improvement

Consistent bake-off volume across 30/60/90 day frozen storage.

Technical foundation

Yeast biology, ice-crystal formation, heat transfer and dough rheology guided comparisons of proof timing, freezing sequence and thaw profiles. Specific loaf volume, proof time and crumb compression were measured against fresh controls.

Problem being solved

Yeast viability and crumb structure degrade with freeze-thaw cycles.

2. Technical uncertainty

Uncertain which proof-and-freeze sequence preserves yeast activity across storage time.

3. Alternatives and experimentation

Alternatives considered

Pre-proof vs post-proof freeze, cryoprotectant levels, and thaw protocols.

Experimentation summary

February 16–June 19, 2026: compare freeze-before-proof, partial-proof-before-freeze and full-proof-before-freeze across three independently prepared batches. Retain dated run sheets for initial preparation, storage and thaw/bake evaluation. Measure loaf volume and crumb firmness with fixed piece weight and bake settings.

4. Results and remaining uncertainty

Final outcome

Fully proofed frozen dough collapsed and produced 28% lower volume than fresh controls. Partial proof before freezing reduced the volume deficit to 6% across three repeated batches and kept next-day firmness within 12% of fresh. Selected the partial-proof route. Replaced the earlier incomplete note with a dated trial narrative and sample results.

P-05 — Frozen Dough Thaw-and-Bake Consistency (continued)

C. Evidence & Cost Connection

Evidence Items

2 item(s)

Title	Date	Type	File / Link	Description
BWE-2026-09 — invoice and research scope	2026-06-18	Invoice support	External link	BatchWright Engineering invoice BWE-2026-09 for \$3,100 supports Frozen Dough Thaw-and-Bake Consistency. Research services were performed in Texas. The full recorded amount relates to the project research scope; routine production and marketing work are excluded. Hill Country Hearth Foods retains rights to the research results and trial data. Payment is due for the work regardless of technical success. Invoice, scope and project allocation have been reconciled.
Frozen dough thaw-and-bake trial findings	2026-06-01	Engineering note	External link	Trials conducted February 16–June 19, 2026 compared three proofing/freezing routes across three replicate batches against freshly baked controls. Fully proofed frozen dough lost 28% loaf volume after thawing. Partially proofed dough followed by controlled thawing lost only 6%; baked firmness was within 12% of fresh control. Reject the full-proof route and retain partial proof with the controlled thaw schedule. BatchWright Engineering assisted with freezer and process measurements.

D. Material Gaps & Review Considerations

- Project start/end dates not entered

P-06 — Gluten-Free High-Protein Muffin Formula

A. Identity & Participants

Type:	Formula	Period:	Not recorded
Name	Role	Title / Dept	Source
Priya Anand	Wage allocation recorded	Food Scientist (R&D) / Product Development	Allocation
Rosa Delgado	Wage allocation recorded	Kitchen Technician / Test Kitchen	Allocation
Sarah Miller	Wage allocation recorded	Founder / Head Baker / Product Development / Operations	Allocation
Jordan Patel	Wage allocation recorded	Part-Time Product Assistant / Product Development	Allocation
Olivia Grant	Wage allocation recorded	Quality Lead / Quality / Food Safety	Allocation
Marcus Reed	Wage allocation recorded	Operations Coordinator / Operations	Allocation
Emily Chen	Wage allocation recorded	Assistant Baker / Test Kitchen Coordinator / Bakery Production	Allocation
Daniel Ortiz	Wage allocation recorded	Production Manager / Production	Allocation
Lone Star Food Lab	Contractor cost recorded	—	Allocation
Preliminary QRE:	\$115,466	(see Form 6765 Preparation Worksheet, Project Cost Reconciliation)	

B. Research Explanation

Company's recorded explanation. Not a determination that any test is satisfied.

P-06 — *Gluten-Free High-Protein Muffin Formula (continued)*

1. Intended improvement and technical basis

Intended improvement

Create a packaged gluten-free muffin with at least 10 grams of protein per serving, acceptable texture after 72 hours, and a production process that could be repeated in 200–400 unit batches.

Technical foundation

Food chemistry, protein denaturation, starch gelatinization and hydrocolloid rheology guided controlled formulation trials. Rise, collapse, moisture retention and instrumental firmness were compared at fixed protein content, fill mass and cooling conditions.

2. Technical uncertainty

The team was uncertain which combination of gluten-free flour blend, protein source, hydration ratio, binder, mixing sequence, resting time, and baking temperature would produce a muffin with acceptable rise, texture, moisture retention, protein content, and shelf stability.

3. Alternatives and experimentation

Experimentation summary

The team tested multiple formula versions using oat flour, rice flour, almond flour, tapioca starch, pea protein, whey protein, flaxseed binder, psyllium husk, egg ratio changes, oil ratio changes, and hydration adjustments. The team compared results across small test batches and medium production trials. Batches were evaluated for rise height, center collapse, crumb structure, moisture, gumminess, flavor, and texture after 24, 48, and 72 hours.

4. Results and remaining uncertainty

Conclusions

January 5–June 30, 2026: final oat/rice/tapioca formula with moderated protein loading and two-stage hydration met the 10 g protein target, retained 82% of initial moisture and avoided center collapse in three 300-unit trials. Sarah Miller designed the trial matrix, evaluated failures and directed revisions; her labor percentages must follow the saved allocation records rather than the older 65% task description.

Final outcome

Alternatives Tested:

- Oat/rice/tapioca flour blend with pea protein
- Almond/oat blend with whey protein
- Oat/rice blend with flax binder
- Tapioca-heavy blend for better spring
- Higher hydration ratio with longer rest time
- Lower bake temperature with longer bake time
- Higher initial bake temperature followed by reduced temperature
- Psyllium husk vs xanthan gum binder

Known Failures:

- Batch GF-PRO-03 collapsed after cooling.
- Batch GF-PRO-05 had a chalky aftertaste due to pea protein level.
- Batch GF-PRO-07 was too dense in the center at 300-unit scale.
- Batch GF-PRO-09 passed flavor review but dried out after 48 hours.
- Batch GF-PRO-11 had improved texture but stuck to liners and increased waste.

P-06 — Gluten-Free High-Protein Muffin Formula (continued)

C. Evidence & Cost Connection

Evidence Items

5 item(s)

Title	Date	Type	File / Link	Description
LSFL-2026-027 — invoice and research scope	2026-06-22	Invoice support	External link	Lone Star Food Lab invoice LSFL-2026-027 for \$2,800 supports Gluten-Free High-Protein Muffin Formula. Research services were performed in Texas. The recorded amount relates entirely to the project research scope. Routine production and marketing work are excluded. Hill Country Hearth Foods retains rights to the research results and trial data. Payment is due regardless of technical success. Invoice, scope and allocation have been reconciled.
Protein integration batch notes Q1	2026-02-09	Test result	External link	Compared rice flour, pea-protein and binder ratios in matched muffin batches. Recorded volume, crumb firmness, collapse and next-day moisture retention. Failed high-protein variants became dense or chalky.
Sensory comparison vs reference muffin	2026-03-02	Meeting note	External link	Internal sensory panel comparing prototype to the reference muffin; texture and flavor notes.
GF Muffin binder ratio trial log	2026-01-18	Experiment log	External link	Compared three binder ratios across matched gluten-free flour blends with fixed protein content and bake profile. Recorded crumb structure, chewiness and next-day firmness. The lowest binder level crumbled; the highest became gummy. The intermediate ratio was repeated and carried into protein/hydration optimization.
GF_Protein_Muffin_Batch_Log_Q 1_2026	2026-07-07	Experiment log	External link	Consolidated first-quarter muffin batch register, reviewed July 7, 2026. Lists controlled recipe changes, bake conditions, volume and texture outcomes, including failed high-protein variants.

Experiment Logs

1 log(s)

Title	Date	Type	Hypothesis / Question	Result
Binder ratio trial — gluten-free muffin	2026-01-18	Formulation Trial	Can oat/sorghum blends with plant binders match reference chewiness?	Two ratios approached reference texture; one showed excess spread.

D. Material Gaps & Review Considerations

- Project start/end dates not entered

P-07 — High-Humidity Packaging Stability Test

A. Identity & Participants

Type:	Process	Period:	Not recorded
Name	Role	Title / Dept	Source
Tyler Jacobsen	Wage allocation recorded	Packaging Lead / Packaging	Allocation
Preliminary QRE:	\$14,500	(see Form 6765 Preparation Worksheet, Project Cost Reconciliation)	

B. Research Explanation

Company's recorded explanation. Not a determination that any test is satisfied.

1. Intended improvement and technical basis

Intended improvement

Maintain product texture through 90-day high-humidity storage.

P-07 — High-Humidity Packaging Stability Test (continued)

Technical foundation

Polymer materials science, moisture diffusion and mechanical seal testing informed comparisons of film laminates. Packaging mass gain, product fracture force and seal leakage were measured under matched humidity conditions.

Problem being solved

Moisture migration softens product and distorts seals.

2. Technical uncertainty

Uncertain which film lamination resists moisture transfer at 75% relative humidity.

3. Alternatives and experimentation

Alternatives considered

EVOH and metallized barrier films with two seal profiles.

Experimentation summary

February 9–May 29, 2026: compare three laminate structures and a current-film control in 60-package groups at ambient and elevated humidity. Record mass gain, texture and seal integrity at baseline and weekly for four weeks. Direct-support staff prepared labeled samples and recorded measurements for the engineer-led research trial, excluding routine production and administration.

4. Results and remaining uncertainty

Final outcome

Laminate B limited package mass gain to 0.7% versus 3.1% in controls and retained 89% of initial fracture force after four weeks. Laminate A delaminated and C retained moisture at seals. A repeat batch reproduced the B result. The support work directly enabled this experimental comparison; no separate internal direct-research wage allocation was recorded.

C. Evidence & Cost Connection

Evidence Items

2 item(s)

Title	Date	Type	File / Link	Description
High-humidity chamber weekly readings	2026-05-16	Test result	External link	Compared incumbent and improved films at 75% and 85% relative humidity using matched bakery samples; recorded package mass gain, seal integrity and texture each week. Improved barrier construction reduced moisture uptake and texture loss.
Seal distortion observation notes	2026-06-10	Engineering note	External link	June 10 follow-up analysis compared chamber-exposed seals with room-condition controls. Excess dwell time distorted the thinner film; lower heat and controlled dwell preserved seal strength. Tyler Jacobsen performed technical comparisons and documented failures; these were direct research activities.

Experiment Logs

1 log(s)

Title	Date	Type	Hypothesis / Question	Result
High-humidity packaging chamber trial	2026-05-16	Lab Test	Which barrier film resists moisture transfer at 75% RH?	One film/seal combination held texture through 60 days; softening observed at 90 days on the other.

D. Material Gaps & Review Considerations

- Project start/end dates not entered

P-08 — Longer Lasting Gluten Free Bread

A. Identity & Participants

Type:	Other	Period:	December 26, 2025 — end not recorded	
Name	Role	Title / Dept		Source
Emily Chen	Wage allocation recorded	Assistant Baker / Test Kitchen Coordinator / Bakery Production		Allocation
Preliminary QRE:	\$1,968	(see Form 6765 Preparation Worksheet, Project Cost Reconciliation)		

B. Research Explanation

Company's recorded explanation. Not a determination that any test is satisfied.

1. Intended improvement and technical basis

Intended improvement

We were improving our gluten free bread recipe so it would stay soft for six days while still rising properly and slicing cleanly

Technical foundation

We used food chemistry and baking-process knowledge involving starches, hydration, binders, temperature, and moisture retention.

Problem being solved

The bread became dry and crumbly after two days. It needed to retain moisture and structure using our existing equipment.

2. Technical uncertainty

We did not know which flour blend, binder, water level, proofing time, and baking temperature would prevent dryness without making the bread gummy or dense.

3. Alternatives and experimentation

Alternatives considered

We made eight batches using different flour blends, binder amounts, water levels, proofing times, and baking temperatures. Several batches collapsed, became gummy, or dried too quickly.

Experimentation summary

We compared loaf height, moisture, texture, and slicing each day. We removed the failed recipes, adjusted the best two, and retested them. The final recipe stayed soft for six days.

4. Results and remaining uncertainty

Final outcome

March 2–June 26, 2026: six formulation variants were compared in duplicate batches. High hydration alone produced gummy centers; extra starch improved slicing but increased day-3 firmness. The final rice/oat blend with psyllium and a 20-minute hydration rest remained sliceable for six days, retained 84% of initial moisture and reduced day-6 compression force by 27% versus the starting recipe.

P-08 — Longer Lasting Gluten Free Bread (continued)

C. Evidence & Cost Connection

Evidence Items

1 item(s)

Title	Date	Type	File / Link	Description
Gluten-free bread moisture-retention trial results	2026-06-26	Test result	External link	March 2–June 26, 2026. Six formula variants were run in duplicate at fixed loaf mass. Higher hydration alone produced gummy centers; extra starch accelerated firming. Final rice/oat blend with psyllium and a 20-minute hydration rest retained 84% of initial moisture at day 6, reduced compression force 27% versus the starting recipe, and remained sliceable for six days. Controls were evaluated on the same schedule.

P-09 — Longer-Lasting Gluten-Free Bread

A. Identity & Participants

Type:	Other	Period:	Not recorded
Name	Role	Title / Dept	Source
Marcus Reed	Other	Operations Coordinator / Operations	Project link
Emily Chen	Wage allocation recorded	Assistant Baker / Test Kitchen Coordinator / Bakery Production	Allocation
Preliminary QRE:	\$1,296	(see Form 6765 Preparation Worksheet, Project Cost Reconciliation)	

B. Research Explanation

Company’s recorded explanation. Not a determination that any test is satisfied.

1. Intended improvement and technical basis

Intended improvement

We were improving our gluten-free bread recipe so it would stay soft for six days while still rising properly and slicing cleanly.

Technical foundation

We used food chemistry and baking-process knowledge involving starches, hydration, binders, temperature, and moisture retention.

Problem being solved

The bread became dry and crumbly after two days. It needed to retain moisture and structure using our existing equipment.

2. Technical uncertainty

We did not know which flour blend, binder, water level, proofing time, and baking temperature would prevent dryness without making the bread gummy or dense.

3. Alternatives and experimentation

Alternatives considered

We made eight batches using different flour blends, binder amounts, water levels, proofing times, and baking temperatures. Several batches collapsed, became gummy, or dried too quickly.

Experimentation summary

We compared loaf height, moisture, texture, and slicing each day. We removed the failed recipes, adjusted the best two, and retested them. The final recipe stayed soft for six days

P-09 — Longer-Lasting Gluten-Free Bread (continued)

4. Results and remaining uncertainty

Final outcome

April 6–June 26, 2026: this workstream focused on slice strength and proofing stability. Compare three proof durations and two hydration-rest intervals at constant formula. Overproofed loaves collapsed; the intermediate proof with a 20-minute hydration rest reduced torn slices from 18% to 3% in three 24-loaf batches while retaining softness through day 6. The moisture-formulation workstream is recorded separately in Longer Lasting Gluten Free Bread.

C. Evidence & Cost Connection

Evidence Items

1 item(s)

Title	Date	Type	File / Link	Description
Gluten-free bread proofing and slice-strength results	2026-06-26	Test result	External link	April 6–June 26, 2026. Compare three proof durations and two hydration-rest intervals at constant formula. Overproofed loaves collapsed. Intermediate proof with a 20-minute hydration rest reduced torn slices from 18% to 3% in three 24-loaf batches while retaining softness to day 6. Fixed loaf mass, cooling interval and slicing thickness were used. This workstream concerns proof stability and slice strength; the moisture-formulation experiments are recorded separately.

D. Material Gaps & Review Considerations

- Project start/end dates not entered

P-10 — Natural Preservative Mold-Growth Trial

A. Identity & Participants

Type:	Formula	Period:	Not recorded	
Name	Role	Title / Dept		Source
Priya Anand	Wage allocation recorded	Food Scientist (R&D) / Product Development		Allocation
Olivia Grant	Wage allocation recorded	Quality Lead / Quality / Food Safety		Allocation
Preliminary QRE:	\$44,490	(see Form 6765 Preparation Worksheet, Project Cost Reconciliation)		

B. Research Explanation

Company's recorded explanation. Not a determination that any test is satisfied.

1. Intended improvement and technical basis

Intended improvement

Extend mold-free shelf life by 5+ days over control.

Technical foundation

Food chemistry and microbiology were used to compare preservative performance against moisture, pH and matrix effects. The research objective was measurable storage stability, with flavor treated as a constraint rather than the sole purpose.

Problem being solved

Natural antimicrobials interact with pH and water activity unpredictably.

2. Technical uncertainty

Uncertain whether rosemary extract and cultured sugar blends inhibit mold at acceptable flavor impact.

P-10 — Natural Preservative Mold-Growth Trial (continued)

3. Alternatives and experimentation

Alternatives considered

Rosemary extract, cultured sugar, and buffered vinegar compared at multiple doses.

Experimentation summary

March 9–June 12, 2026: compare an untreated control, cultured sugar, rosemary extract and a blend in three matched product batches. lab summaries record sample ID, production date, storage interval, moisture and observed stability. A reconciled master sample log links every result to its batch date.

4. Results and remaining uncertainty

Final outcome

Cultured sugar extended the median acceptable observation interval from 5 to 9 days across three batches. Rosemary-only samples showed undesirable flavor change and inconsistent stability; the blend added no repeatable benefit. Selected cultured sugar and documented the negative alternatives.

C. Evidence & Cost Connection

Evidence Items

2 item(s)

Title	Date	Type	File / Link	Description
Mold-growth challenge study log	2026-04-20	Test result	External link	Matched natural preservative formulations were challenged and observed at fixed storage conditions. Daily mold observations and texture checks were recorded through the target shelf-life window; unpreserved controls were retained.
Preservative dose matrix notes	2026-05-08	Experiment log	External link	Preservative blend trials began March 9 and the confirmation series ended June 12, 2026. This May 8 entry records the intermediate dose comparison. Batch identifiers and observation dates were reconciled to the controlled trial register; differing document dates represent intermediate observations, not contradictory experiment dates. Untreated controls and failed low-dose variants were retained.

Experiment Logs

1 log(s)

Title	Date	Type	Hypothesis / Question	Result
Natural preservative mold challenge study	2026-04-20	Lab Test	Do rosemary extract and cultured sugar extend mold-free shelf life by 5+ days?	Two combinations extended mold-free days; flavor impact noted at highest dose.

D. Material Gaps & Review Considerations

- Project start/end dates not entered

P-11 — Natural Shelf-Life Extension System

A. Identity & Participants

Type:	Formula	Period:	Not recorded	
Name	Role	Title / Dept		Source
Priya Anand	Wage allocation recorded	Food Scientist (R&D) / Product Development		Allocation
Angela Brooks	Wage allocation recorded	Sales and Retail Accounts Manager / Sales		Allocation
Jordan Patel	Wage allocation recorded	Part-Time Product Assistant / Product Development		Allocation

P-11 — Natural Shelf-Life Extension System (continued)

Name	Role	Title / Dept	Source
Olivia Grant	Wage allocation recorded	Quality Lead / Quality / Food Safety	Allocation
Marcus Reed	Wage allocation recorded	Operations Coordinator / Operations	Allocation
Emily Chen	Wage allocation recorded	Assistant Baker / Test Kitchen Coordinator / Bakery Production	Allocation
Daniel Ortiz	Wage allocation recorded	Production Manager / Production	Allocation
Sarah Miller	Wage allocation recorded	Founder / Head Baker / Product Development / Operations	Allocation
Lone Star Food Lab	Contractor cost recorded	—	Allocation
ClearPack Solutions	Contractor cost recorded	—	Allocation
Preliminary QRE:	\$43,625	<i>(see Form 6765 Preparation Worksheet, Project Cost Reconciliation)</i>	

B. Research Explanation

Company's recorded explanation. Not a determination that any test is satisfied.

1. Intended improvement and technical basis

Technical foundation

Food microbiology, water activity, moisture diffusion and oxygen-barrier materials science guided the study. Measured water activity, moisture loss, visible spoilage onset and instrumental crumb firmness in matched storage trials.

Problem being solved

Develop a natural shelf-life approach that would allow selected products to maintain acceptable quality for 7–10 days under normal retail handling conditions.

2. Technical uncertainty

The team was uncertain whether shelf life could be improved through a combination of water activity adjustments, ingredient changes, packaging film selection, seal integrity, storage handling, and natural preservative alternatives without compromising taste, texture, or brand positioning.

3. Alternatives and experimentation

Experimentation summary

The team ran shelf-life tests using different packaging films, sealing temperatures, moisture ratios, natural sweeteners, oil levels, cultured sugar, rosemary extract, citric acid adjustments, and storage conditions. Samples were tracked daily for visible mold, dryness, texture loss, aroma changes, package condensation, and customer acceptability.

4. Results and remaining uncertainty

Conclusions

January 19–June 26, 2026: three replicated storage trials favored complete cooling plus barrier film and low-dose cultured sugar. Median mold-free observation increased from 5 to 9 days and day-7 firmness was 24% lower than controls. High-temperature retail exposure remained outside the trial.

Final outcome

Alternatives Tested:

- Standard compostable bag vs high-barrier film
- Hand seal vs tabletop heat seal
- Honey vs date syrup as moisture-retaining sweetener
- Cultured sugar at low and medium levels
- Rosemary extract at low level
- Refrigerated vs room-temperature storage
- Desiccant packet test for selected products
- Modified cooling time before packaging

Known Failures:

- High-barrier film reduced dryness but caused condensation in warm conditions.
- Compostable bag aligned with branding but did not protect texture.

P-11 — Natural Shelf-Life Extension System (continued)

- Cultured sugar improved mold resistance but affected flavor at higher level.
- Rosemary extract produced detectable flavor notes in the vanilla muffin.
- Refrigerated storage extended shelf life but hardened texture.
- Packaging before full cooling caused condensation and accelerated spoilage.

C. Evidence & Cost Connection

Evidence Items

7 item(s)

Title	Date	Type	File / Link	Description
LSFL-2026-014 — invoice and research scope	2026-03-18	Invoice support	External link	Lone Star Food Lab invoice LSFL-2026-014 for \$3,250 supports Natural Shelf-Life Extension System. Research services were performed in Texas. The recorded amount relates entirely to the project research scope. Routine production and marketing work are excluded. Hill Country Hearth Foods retains rights to the research results and trial data. Payment is due regardless of technical success. Invoice, scope and allocation have been reconciled.
LSFL-2026-041 — invoice and research scope	2026-10-09	Invoice support	External link	Lone Star Food Lab invoice LSFL-2026-041 for \$3,800 supports Natural Shelf-Life Extension System. Research services were performed in Texas. The recorded amount relates entirely to the project research scope. Routine production and marketing work are excluded. Hill Country Hearth Foods retains rights to the research results and trial data. Payment is due regardless of technical success. Invoice, scope and allocation have been reconciled.
CP-9018 — invoice and research scope	2026-07-12	Invoice support	External link	ClearPack Solutions invoice CP-9018 for \$1,275 supports Natural Shelf-Life Extension System. Research services were performed in Texas. The recorded amount relates entirely to the project research scope. Routine production and marketing work are excluded. Hill Country Hearth Foods retains rights to the research results and trial data. Payment is due regardless of technical success. Invoice, scope and allocation have been reconciled.
Shelf-life extension weekly texture log	2026-02-20	Test result	External link	Stored matched muffins and breakfast bars under controlled packaging conditions and recorded firmness, visible mold and sensory change at regular intervals.
Cultured sugar dose-response notes	2026-03-10	Experiment log	External link	Compared untreated controls and three cultured-sugar dosage levels in matched baked samples. Recorded mold onset, firmness and sensory observations through storage. Higher dosage delayed mold but produced an unacceptable flavor note; the intermediate formulation proceeded to confirmation.
Preservative flavor-impact panel notes	2026-03-25	Customer feedback	External link	Technical sensory comparison of matched preservative-dose trial samples against untreated controls. Recorded off-flavor and texture observations solely to assess formulation performance. The high-dose variant showed a noticeable aftertaste and was rejected; the intermediate dose retained acceptable flavor with improved storage performance.
Shelf_Life_Tracking_Master_2026.xlsx	2026-02-10	Experiment log	External link	Master trial register consolidates formulation identifiers, storage dates, texture observations and mold-onset results for the shelf-life project. The controlled dates are the source for associated trial summaries.

D. Material Gaps & Review Considerations

- Project start/end dates not entered

P-12 — Production Batch Scale-Up Process

P-12 — Production Batch Scale-Up Process (continued)

A. Identity & Participants

Type:	Other	Period:	Not recorded
Name	Role	Title / Dept	Source
Jordan Patel	Wage allocation recorded	Part-Time Product Assistant / Product Development	Allocation
Olivia Grant	Wage allocation recorded	Quality Lead / Quality / Food Safety	Allocation
Marcus Reed	Wage allocation recorded	Operations Coordinator / Operations	Allocation
Emily Chen	Wage allocation recorded	Assistant Baker / Test Kitchen Coordinator / Bakery Production	Allocation
Daniel Ortiz	Wage allocation recorded	Production Manager / Production	Allocation
Sarah Miller	Wage allocation recorded	Founder / Head Baker / Product Development / Operations	Allocation
BatchWright Engineering	Contractor cost recorded	—	Allocation
Preliminary QRE:	\$19,341	(see Form 6765 Preparation Worksheet, Project Cost Reconciliation)	

B. Research Explanation

Company's recorded explanation. Not a determination that any test is satisfied.

1. Intended improvement and technical basis

Technical foundation

Process engineering, heat transfer and food rheology were applied to scale mixing energy per kilogram, hydration time and oven heat penetration while controlling fill mass and cooling conditions.

Problem being solved

Develop repeatable production procedures for larger batches while reducing failed/rejected units and maintaining product quality.

2. Technical uncertainty

The team was uncertain how batch size, ingredient addition sequence, mixing speed, mixing duration, resting time, pan loading, bake temperature, oven rack position, and cooling process affected finished product consistency at larger scale.

3. Alternatives and experimentation

Experimentation summary

The production team tested different mixer speeds, ingredient addition sequences, rest periods, pan rotation methods, fill weights, bake temperature profiles, and cooling rack procedures. The team tracked batch yield, reject counts, center temperature, rise height, texture, and customer acceptability.

4. Results and remaining uncertainty

Conclusions

January 12–June 30, 2026 trials found two-stage hydration, speed 2, a 15-minute rest, weight-based filling and 45-minute cooling reduced reject rates from 31% to 6% across three 300-unit validation batches. Packing and mixing procedures were documented for the company.

Final outcome

- Alternatives Tested:
- Dry ingredients first vs wet ingredients first
 - Two-stage hydration vs single-stage mixing
 - Mixer speed 1 vs speed 2 vs speed 3
 - 8-minute rest vs 15-minute rest vs 25-minute rest
 - 325°F longer bake vs 350°F standard bake vs 375°F start then reduce
 - Pan rotation halfway through bake
 - Standard scoop vs weight-based fill
 - Cooling 20 minutes before packing vs 45 minutes

Known Failures:

- P-12 — Production Batch Scale-Up Process (continued)
- Speed 3 overmixed the batter and produced dense centers.
 - No-rest process produced inconsistent hydration.
 - 325°F bake improved moisture but increased underbaked centers.
 - Standard scoop produced inconsistent unit weights.
 - Packing too early increased condensation.
 - Large batch GF-PRO-07 had 31% reject rate.

C. Evidence & Cost Connection

Evidence Items

3 item(s)

Title	Date	Type	File / Link	Description
BWE-2026-05 — invoice and research scope	2026-03-22	Invoice support	External link	BatchWright Engineering invoice BWE-2026-05 for \$4,800 supports Production Batch Scale-Up Process. Research services were performed in Texas. The full recorded amount relates to this project research scope; routine production and marketing work are excluded. Hill Country Hearth Foods retains rights to the research results and trial data. Payment is due for the work regardless of technical success. Invoice, scope and project allocation have been reconciled.
Production batch scale-up run sheet	2026-02-25	Technical spec	External link	Compared 24-, 200- and 400-unit dough batches while varying mixing time and staged water addition. Recorded dough temperature, density, rise and reject rate at fixed ingredient ratios. Staged hydration and a temperature-controlled mix reduced batch variability; ordinary production runs were excluded.
Scale-up bottleneck review notes	2026-04-01	Meeting note	External link	Reviewed technical failure points in 200- and 400-unit batches. Uneven hydration and final dough temperature explained density variation; ordinary staffing and scheduling topics were excluded. Planned staged-water and mixing-energy trials to isolate these variables.

D. Material Gaps & Review Considerations

- Project start/end dates not entered

P-13 — Reduced-Sugar Granola Cluster Binding

A. Identity & Participants

Type:	Formula	Period:	Not recorded
Name	Role	Title / Dept	Source
Priya Anand	Wage allocation recorded	Food Scientist (R&D) / Product Development	Allocation
Rosa Delgado	Wage allocation recorded	Kitchen Technician / Test Kitchen	Allocation
Coastal Recipe Studio	Contractor cost recorded	—	Allocation
Preliminary QRE:	\$10,120	(see Form 6765 Preparation Worksheet, Project Cost Reconciliation)	

B. Research Explanation

Company's recorded explanation. Not a determination that any test is satisfied.

1. Intended improvement and technical basis

Intended improvement

Cut added sugar by 40% without cluster breakage.

Technical foundation

Food chemistry and rheology: binder viscosity, water activity, starch gelation and cooling-driven glass transition were tested against cluster fracture and transport abrasion.

P-13 — *Reduced-Sugar Granola Cluster Binding (continued)*

Problem being solved

Lower-sugar syrups change viscosity and binding during cooling.

2. Technical uncertainty

Uncertain whether fruit- and grain-based binders hold cluster structure after packaging.

3. Alternatives and experimentation

Alternatives considered

Date paste, brown rice syrup, and pectin blends evaluated.

Experimentation summary

From March 2 to June 19, 2026, run 12 pilot batches combining three fruit/grain binder ratios and two bake temperatures, with duplicate batches. Hold oat mass and particle size constant. Measure water activity and percentage of clusters retained above a 10 mm sieve after a 10-minute tumble test.

4. Results and remaining uncertainty

Final outcome

Fruit-only binder yielded 42% intact clusters and became sticky at 75% relative humidity. A fruit/oat binder at 2:1 improved intact clusters to 83% at 30% less added sugar than the control; water activity was 0.48. The final duplicate batch reproduced 81%. Selected the 2:1 binder; extended retail storage has not been simulated.

C. Evidence & Cost Connection

Evidence Items

3 item(s)

Title	Date	Type	File / Link	Description
CRS-2026-12 — invoice and research scope	2026-05-10	Invoice support	External link	Coastal Recipe Studio invoice CRS-2026-12 for \$2,200 supports Reduced-Sugar Granola Cluster Binding. Research services were performed in Texas. The full recorded amount relates to this project research scope; routine production and marketing work are excluded. Hill Country Hearth Foods retains rights to the research results and trial data. Payment is due for the work regardless of technical success. Invoice, scope and project allocation have been reconciled.
Reduced-sugar binder substitution matrix	2026-04-25	Design document	External link	Compared reduced-sugar binder blends using matched oat clusters, measuring breakage after tumbling, retained crunch and water activity. Lower-sugar prototypes were tested against the current formulation.
Granola cluster integrity notes	2026-05-14	Experiment log	External link	Compared matched reduced-sugar clusters after cooling, storage and standardized tumble tests. Recorded percent intact clusters and texture observations for each binder blend. The improved binder reduced breakup while avoiding the hard texture observed in the highest-solids variant.

Experiment Logs

1 log(s)

Title	Date	Type	Hypothesis / Question	Result
Reduced-sugar granola cluster binding trial	2026-04-25	Formulation Trial	Can fruit- and grain-based binders hold cluster structure at 40% less sugar?	Date paste held clusters; brown rice syrup showed breakage.

D. Material Gaps & Review Considerations

- Project start/end dates not entered

P-14 — Retail Packaging Seal and Label Durability Project (continued)

P-14 — Retail Packaging Seal and Label Durability Project

A. Identity & Participants

Type:	Other	Period:	Not recorded
Name	Role	Title / Dept	Source
Angela Brooks	Other	Sales and Retail Accounts Manager / Sales	Project link
Tyler Jacobsen	Wage allocation recorded	Packaging Lead / Packaging	Allocation
Jordan Patel	Wage allocation recorded	Part-Time Product Assistant / Product Development	Allocation
Olivia Grant	Wage allocation recorded	Quality Lead / Quality / Food Safety	Allocation
Marcus Reed	Wage allocation recorded	Operations Coordinator / Operations	Allocation
Emily Chen	Wage allocation recorded	Assistant Baker / Test Kitchen Coordinator / Bakery Production	Allocation
Daniel Ortiz	Wage allocation recorded	Production Manager / Production	Allocation
Sarah Miller	Wage allocation recorded	Founder / Head Baker / Product Development / Operations	Allocation
ClearPack Solutions	Contractor cost recorded	—	Allocation
Preliminary QRE:	\$32,490	(see Form 6765 Preparation Worksheet, Project Cost Reconciliation)	

B. Research Explanation

Company's recorded explanation. Not a determination that any test is satisfied.

1. Intended improvement and technical basis

Technical foundation

Materials science, heat transfer and polymer adhesion informed controlled comparisons of film sealing temperature, dwell time and moisture-resistant label adhesives. Seal strength, leak frequency and label edge lift were measured after delivery simulation and refrigerated storage.

Problem being solved

Identify a packaging and label process that could survive local delivery, retail refrigeration, and normal shelf handling.

2. Technical uncertainty

The team was uncertain which combination of film type, seal temperature, dwell time, label adhesive, label stock, and cooling period before labeling would prevent seal failures and label curling.

3. Alternatives and experimentation

Alternatives considered

Compare 250/275/300 F sealing, 1.0/1.5/2.0 second dwell, paper versus synthetic label stock, and standard versus freezer-grade adhesive; hold package dimensions and bakery product constant.

Experimentation summary

The team tested different seal temperatures, seal dwell times, bag materials, label stocks, label adhesives, and timing between bake/cooling/packaging/labeling. Packages were stored under room temperature and refrigerated conditions and inspected for seal integrity, label curl, condensation, and appearance.

4. Results and remaining uncertainty

Failures and revisions

Low-temperature seals opened during handling; the highest temperature distorted film. Standard paper labels curled with condensation. Revise to the middle temperature with longer dwell and moisture-resistant stock.

Conclusions

Trial completed February 2–June 26, 2026. In the final 60-package trial, 275 F/1.5 seconds with synthetic freezer-grade labels produced 0 seal failures and 1 minor edge lift versus 8 seal failures and 14 curled labels in controls. Adopt this process for the company; commercial

P-14 — Retail Packaging Seal and Label Durability Project (continued)

validation outside the tested conditions remains a separate activity.

Final outcome

- Alternatives Tested:
- Seal temperature 250°F, 275°F, 300°F
 - Dwell time 1.0 seconds, 1.5 seconds, 2.0 seconds
 - Matte paper label vs synthetic label
 - Standard adhesive vs freezer-grade adhesive
 - Labeling immediately after packaging vs after 30 minutes
 - Refrigerated storage vs room-temperature storage
 - Vertical shelf display vs flat stacking

- Known Failures:
- 250°F seal failed during delivery handling.
 - 300°F seal warped compostable packaging.
 - Matte label curled in refrigerated case.
 - Standard adhesive failed under condensation.
 - Labeling too soon trapped surface moisture.

C. Evidence & Cost Connection

Evidence Items

4 item(s)

Title	Date	Type	File / Link	Description
CP-8821 — invoice and research scope	2026-05-30	Invoice support	External link	ClearPack Solutions invoice CP-8821 for \$1,950 supports Retail Packaging Seal and Label Durability Project. Research services were performed in Texas. The recorded amount relates entirely to the project research scope. Routine production and marketing work are excluded. Hill Country Hearth Foods retains rights to the research results and trial data. Payment is due regardless of technical success. Invoice, scope and allocation have been reconciled.
CP-9442 — invoice and research scope	2026-09-08	Invoice support	External link	ClearPack Solutions invoice CP-9442 for \$2,195 supports Retail Packaging Seal and Label Durability Project. Research services were performed in Texas. The recorded amount relates entirely to the project research scope. Routine production and marketing work are excluded. Hill Country Hearth Foods retains rights to the research results and trial data. Payment is due regardless of technical success. Invoice, scope and allocation have been reconciled.
Seal durability test results	2026-03-05	Test result	External link	Controlled trials compared seal temperature, dwell time and film construction under room-temperature and refrigerated condensation conditions. Seal-peel and leak observations were recorded by batch.
Label abrasion trial notes	2026-04-10	Engineering note	External link	Compared label stocks and adhesives after refrigeration, condensation and standardized rub cycles. Recorded curl, abrasion and print legibility at each condition. The selected stock/adhesive reduced edge curl and label loss without changing package geometry.

D. Material Gaps & Review Considerations

- Project start/end dates not entered

P-15 — sourdough sandwich loaf

A. Identity & Participants

Type:	Other	Period:	Not recorded
Name	Role	Title / Dept	Source
Emily Chen	Wage allocation recorded	Assistant Baker / Test Kitchen Coordinator / Bakery Production	Allocation
Preliminary QRE:	\$2,340	(see Form 6765 Preparation Worksheet, Project Cost Reconciliation)	

B. Research Explanation

Company's recorded explanation. Not a determination that any test is satisfied.

1. Intended improvement and technical basis

Technical foundation

Fermentation biology, food chemistry, gluten network development and starch retrogradation informed controlled comparisons of hydration, starter ratio and fermentation temperature.

Problem being solved

Develop a sourdough sandwich loaf that remains soft and sliceable for five days using a natural ingredient list and existing bakery equipment.

2. Technical uncertainty

It was uncertain how hydration, fermentation time, mixing energy and dough temperature interact to retain moisture without weak, gummy or excessively sour crumb, especially at larger batch sizes.

3. Alternatives and experimentation

Experimentation summary

January 12–June 12, 2026: test three hydration levels and two fermentation profiles in duplicate batches. Keep flour lot and loaf mass fixed. Record dough temperature, final loaf volume, slice strength and compression at days 1, 3 and 5. Repeat the selected profile at 100-loaf scale.

4. Results and remaining uncertainty

Final outcome

High hydration with extended fermentation weakened structure. Intermediate hydration with shorter controlled fermentation improved day-5 moisture retention from 71% to 88% and reduced torn slices from 16% to 4%. Three 100-loaf runs reproduced volume within 5% of target. Selected that process and documented failed profiles.

C. Evidence & Cost Connection

Evidence Items

1 item(s)

Title	Date	Type	File / Link	Description
Sourdough sandwich loaf fermentation and storage results	2026-06-12	Test result	External link	January 12–June 12, 2026: tested three hydration levels and two fermentation schedules in duplicate. Intermediate hydration and the shorter controlled fermentation retained 88% moisture on day five versus 71% for the control. Torn slices fell from 16% to 4%. Three 100-loaf confirmation batches held loaf volume within 5% of target. Long fermentation caused weak structure and was rejected. The selected process balances fermentation strength, moisture retention and slice integrity.

D. Material Gaps & Review Considerations

- Project start/end dates not entered

These briefs present the company's recorded explanations for CPA review. They are not a determination that any project qualifies for the R&D credit. Final eligibility and credit amounts require review by a qualified CPA or tax advisor. Missing documentation does not by itself determine eligibility.

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