



MATTSON *Webinar*

**EXTRUSION:**

**TRANSFORM TEXTURE,**

**EXPAND PORTFOLIOS &**

**CREATE NEW OCCASIONS**



*Plant-based  
Meats*

**WELCOME!**



**BARB STUCKEY**

**CHIEF INNOVATION &  
MARKETING OFFICER**



# A TEAM OF MULTI-DISCIPLINED, EXPERIENCED INNOVATION PROFESSIONALS



**65**  
employee-owners

From **Strategists**  
to **Scientists**  
to **Scale-up Specialists**

Driven by a  
**passion for food**

Focused on  
**Making a Difference**  
in the world  
and our community

# OUR INNOVATION WORK: 100% SHARE OF STOMACH

## BIG COMPANIES AND START-UPS...



## ... FRESH, CHILLED, FROZEN, AMBIENT



## ... CPG, FOODSERVICE, INGREDIENT



## ... BREAKFAST, LUNCH, DINNER, SNACK, OR ENHANCER



## ... FOOD AND DRINK



## ... FUN AND FUNCTIONAL



# We've Got News!

## Acquisition of Chicago Based Firm



# OUR ROBUST BAY AREA FOOD SCIENCE CROSS-TRAINED CULINARY TEAM IS STILL MAKING MAGIC



# PLEASE MEET OUR NEW CHEF-OPERATOR TEAM IN CHICAGO



Tony Albanese



Matthias Merges



Gale Gand



Joe Frillman



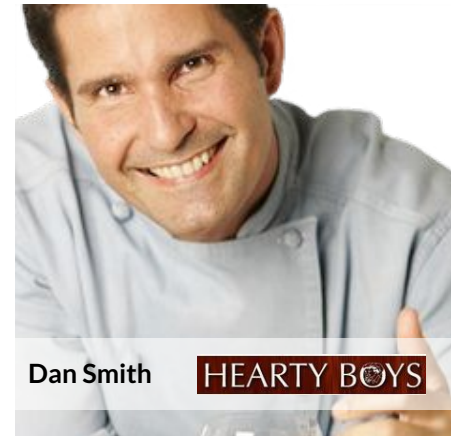
Andrew Lim



Leigh Omilinsky



Jonathan Zaragoza



Dan Smith



# OUR SECRET SAUCE: AI AS POWERFUL THOUGHT PARTNER



 MATTSON / AI



## AI FOR INSIGHTS

Allows us to build initial consumer or customer insights and hypotheses

## AI FOR CONCEPTING

Enhances ProtoThink™ and Food Studio™ ideations for better results, including product and packaging images

## AI FOR OPTIMIZING

Allows us to optimize concepts and products before consumer testing.

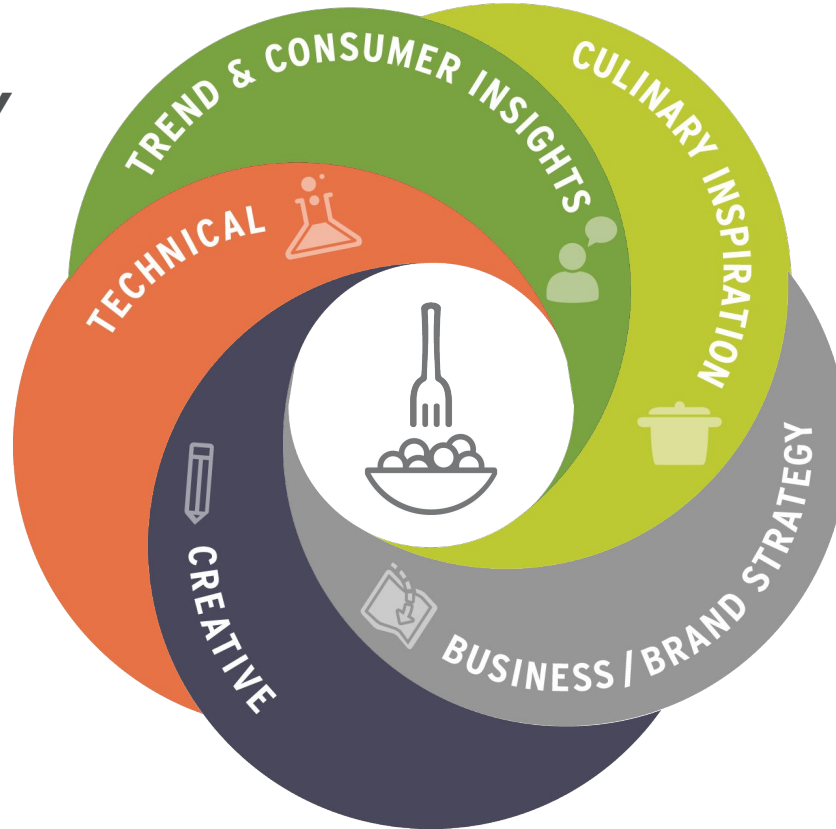
## FORMULATION AI

Accelerates the pace of product development from procurement to PD to commercialization.  
*Used internally at Mattson.*



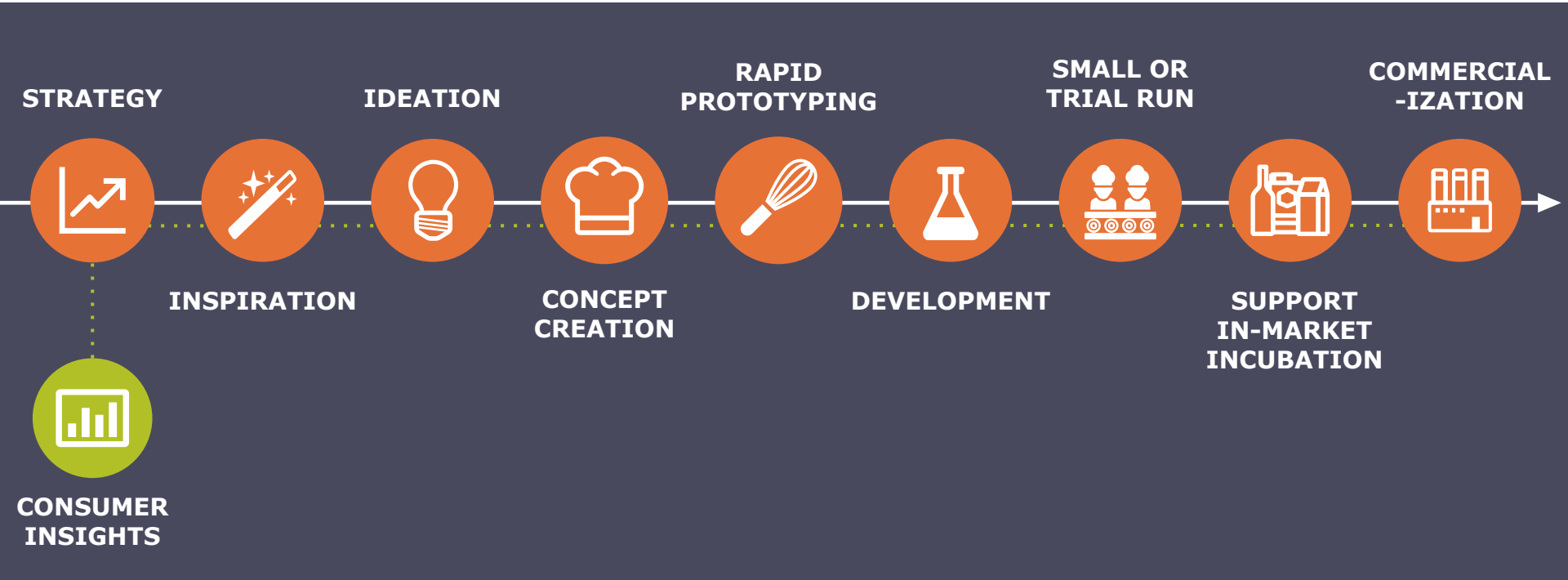
# WE MAKE FOOD HAPPEN THROUGH INTEGRATED INNOVATION SERVICES

**DRIVEN**  
BY STRATEGY



**ENABLED**  
BY INSIGHTS

# WE TAKE YOU FROM WHERE YOU ARE NOW... **TO LAUNCH**



# WE WORK IN 100% SHARE OF STOMACH

## BIG COMPANIES AND START-UPS...



## ... FRESH, CHILLED, FROZEN, AMBIENT



## ... CPG, FOODSERVICE, INGREDIENT



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## ... FOOD AND DRINK



## ... FUN AND FUNCTIONAL



# WE'RE GONNA TALK ABOUT A PIECE OF EQUIPMENT: AN EXTRUDER

LET'S START WITH WHAT IT DOES.

EXTRUSION CREATES  
**UNIQUE TEXTURES**  
OFTEN NOT AVAILABLE THROUGH  
ANY OTHER TECHNIQUE.

**TEXTURE** DRIVES SIGNATURE  
FLAVOR AND LIKING.



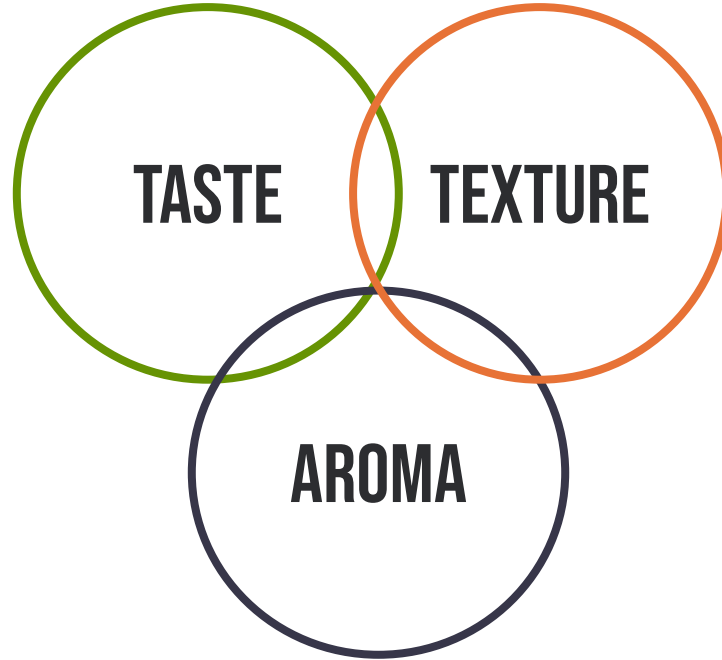


**SENSORY EVOLUTION:  
TEXTURE BECOMING MORE IMPORTANT**

# THERE ARE 3 ELEMENTS TO THE CONCEPT OF FLAVOR



**TASTE & AROMA  
GET ALL THE GLORY**



**TEXTURE IS THE  
MOST UNDERRATED  
SENSE OF THE 3**



# SO MANY PRODUCTS ARE BUILT ON SIGNATURE TEXTURE, BUT DON'T LEVERAGE IT



# TEXTURE PLAYS A BIGGER ROLE IN SOME COUNTRIES THAN THE US

## CHINESE LANGUAGE AS 144 TERMS FOR FOOD TEXTURE

*With clear distinction between them all:*

**cui**, a crispness/resistance to the teeth but yields, cleanly, with a pleasant snappy feeling (celery)

**su**, dry, fragile, fall-apart crispness" (e.g., deep-fried duck skin)

**cui nen**, crisp but tender, like young bamboo shoots and spears of asparagus in spring

**su song**, crisp and loose, like the tangled tendrils of pork simmered, shredded and dried

**su ruan**, brittle, then soft, like pastry that dissolves at the touch



## JAPANESE HAS 400

**kari kari** (crisp bacon)

**shaki shaki** (crisp apple)

**saku saku** (crispness that then melts like butter cookies, pork rinds)

**gari gari** (icy, that taxes the jaw)

**bari bari** (delicate shattering epitomized by a rice cracker)

**pari pari** (thin potato chips)

Source: [Journal of Texture Studies](#) & [NYTimes, 2023](#)



# A PHANTASTIC EXAMPLE OF A BRAND THAT'S REALIZED WHAT TEXTURE MEANS TO ITS FANS



**CASE STUDY EXAMPLES OF HOW  
EXTRUSION CAN TRANSFORM TEXTURE,  
CREATING NEW CONSUMER OCCASIONS.**

# CASE STUDY: PRINGLES

- Pringles abandons the can!
- New form of snacking
- New consumer occasion: shareable, not probable in a can

“This puffy, airy snack not only gives fans a **new way to experience Pringles**, but it’s easy-to-share packaging creates a new way to enjoy their favorite snack with friends and family, **whether munching at home for movie night, at a party or on-the-go.**”

**Mauricio Jenkins,**  
*US marketing lead for Pringles*

## Pringles Is Dropping an All-New Snack, and It's Not in a Can

Get ready for a whole new Pringles experience.



# CASE STUDY: POP CHIPS

- From Popped to Puffed
- Consumers are looking for “real” and “whole” ingredients
- Extrusion utilized peanut flour for protein and flavor
- popchips was able to deliver protein via a **real peanut butter coating**



# CASE STUDY: POP CHIPS



## Ingredients:

PEANUT BUTTER (PEANUTS, CANE SUGAR, SALT), YELLOW CORN (DEGERMED), PEANUT FLOUR.

## Nutrition Facts

4 servings per container  
Serving size 1oz (28g/27 pieces)

Amount per serving  
**Calories 130**

% Daily Value\*

**Total Fat** 7g **9%**

Saturated Fat 1g **5%**

Trans Fat 0g

Polyunsaturated Fat 2g

Monounsaturated Fat 3.5g

**Cholesterol** 0mg **0%**

**Sodium** 80mg **3%**

**Total Carbohydrate** 14g **5%**

Dietary Fiber 2g **7%**

Total Sugars 2g

Includes 1g Added Sugars **2%**

**Protein** 5g

Vitamin D 0mcg 0%

Calcium 30mg 2%

Iron 0.7mg 4%

Potassium 130mg 2%

\*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

# PASTA IS EXTRUDED

## + Traditional (= boring?!)



## + Innovation has been in nutrition



# NEW-TO-THE-WORLD PASTA SHAPE & TEXTURE

+

Optimized  
for eating  
experience  
... not  
nutrition!



+

**Forkability:** The pasta should be easy to pick up with a fork. Functional texture.

**Sauceability:** The pasta should hold sauce well. This is a concept called texture contrast.

**Toothsinkability:** The pasta should have a satisfying texture when bitten into.

# WHAT IS EXTRUSION & WHAT DOES IT DO?



**GIRISH GANJYAL, PH.D**

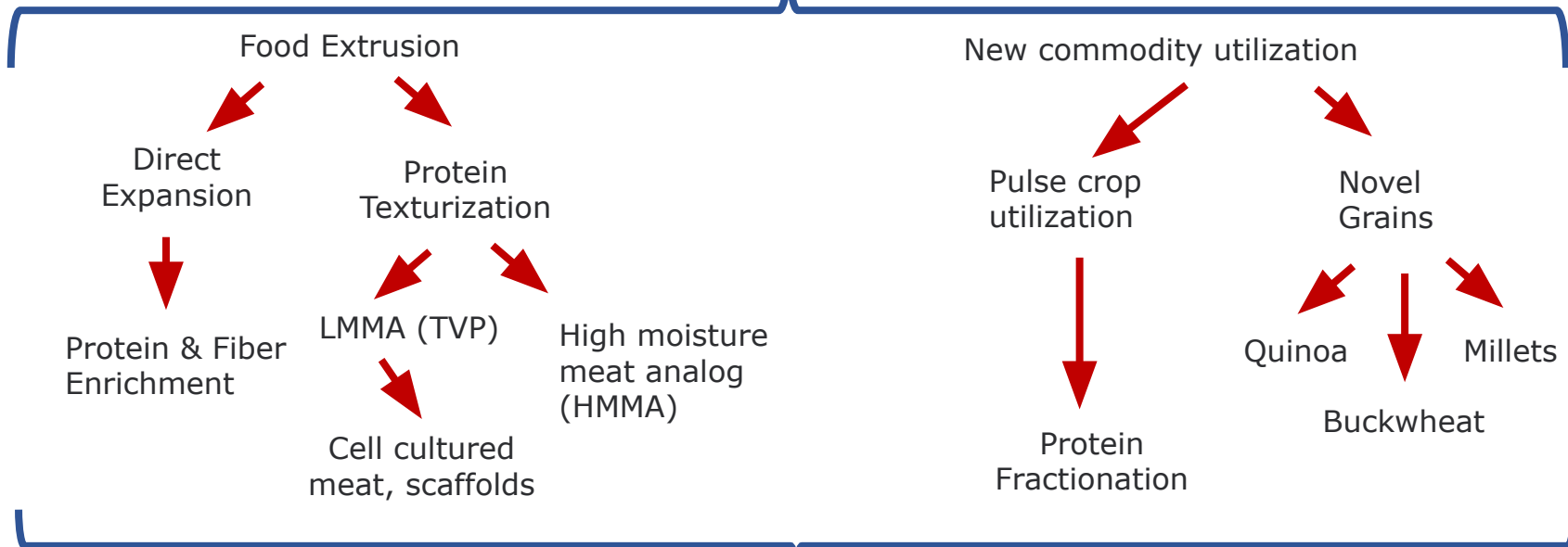
**PROFESSOR &  
FOOD PROCESSING SPECIALIST**



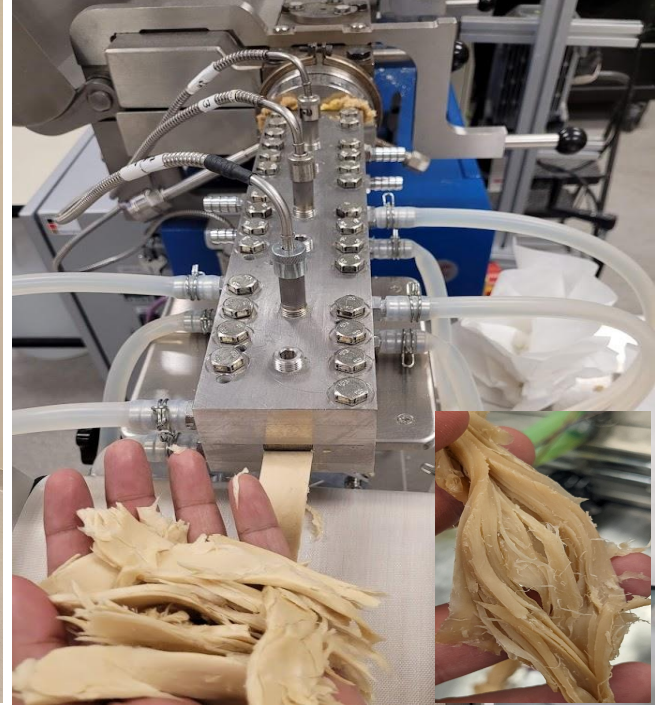
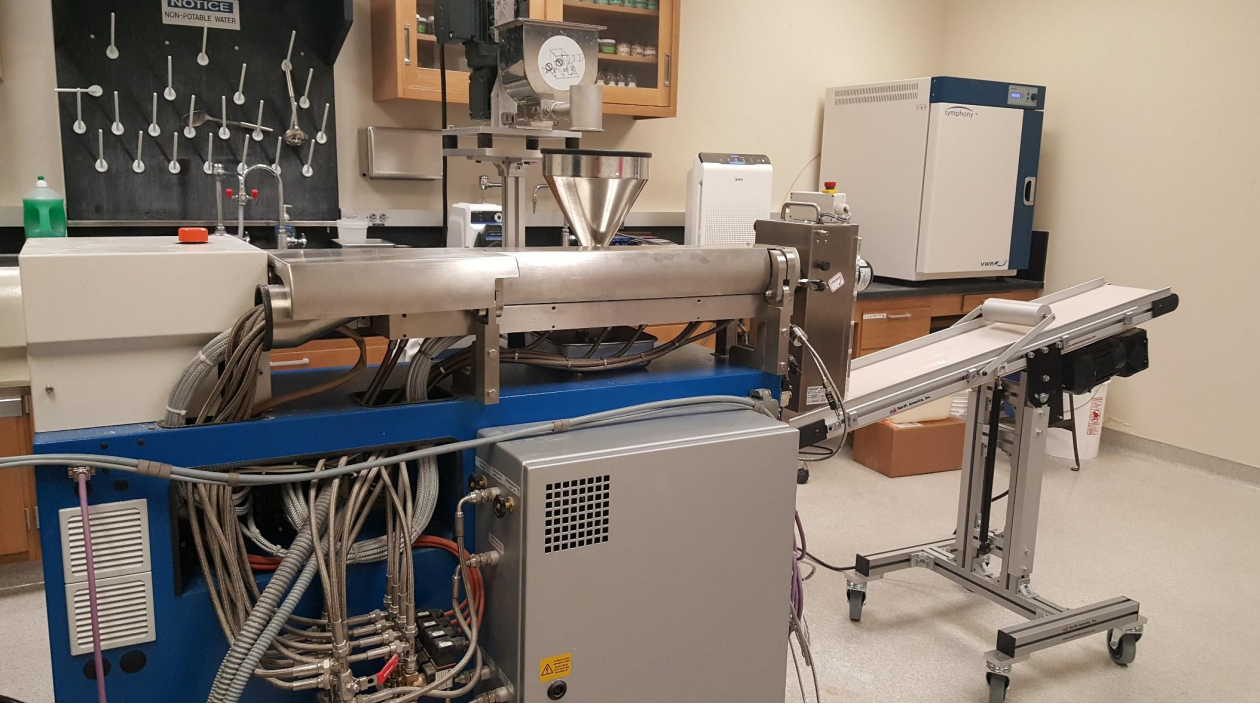
WASHINGTON STATE  
UNIVERSITY



## Research Program



## Food Processing and Safety Extension Services



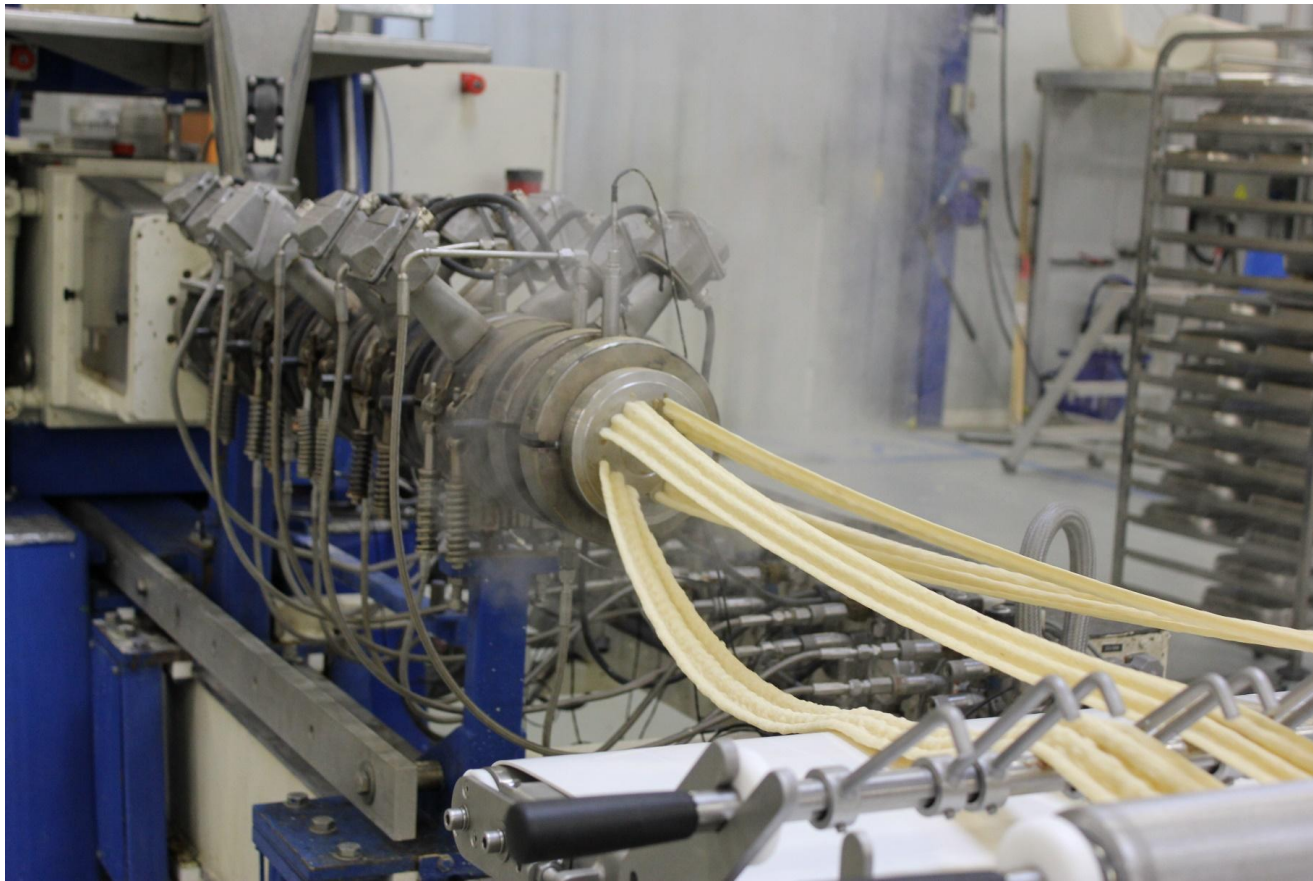
# WSU STATE-OF-ART EXTRUSION LABORATORY



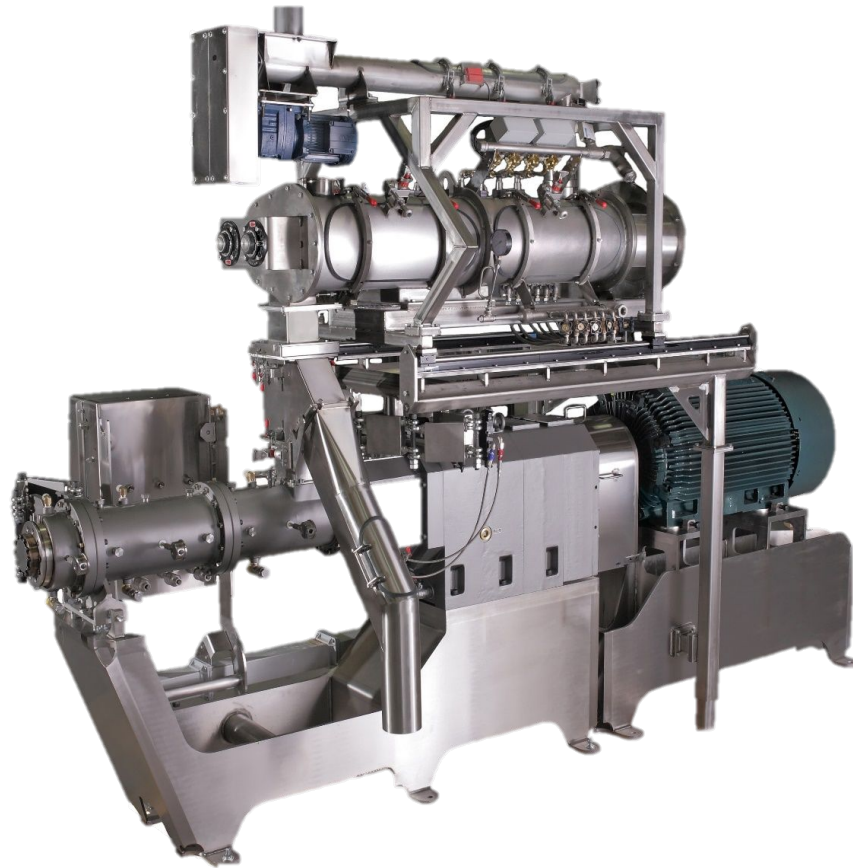
# EXAMPLES OF EXTRUDED PRODUCTS



Ref: Extrusion Cooking, edited by Girish M. Ganjyal, 2020 by Woodhead Publishing, an imprint of Elsevier, Inc. and AACC. All rights reserved.



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# DIRECT EXPANSION PROCESS

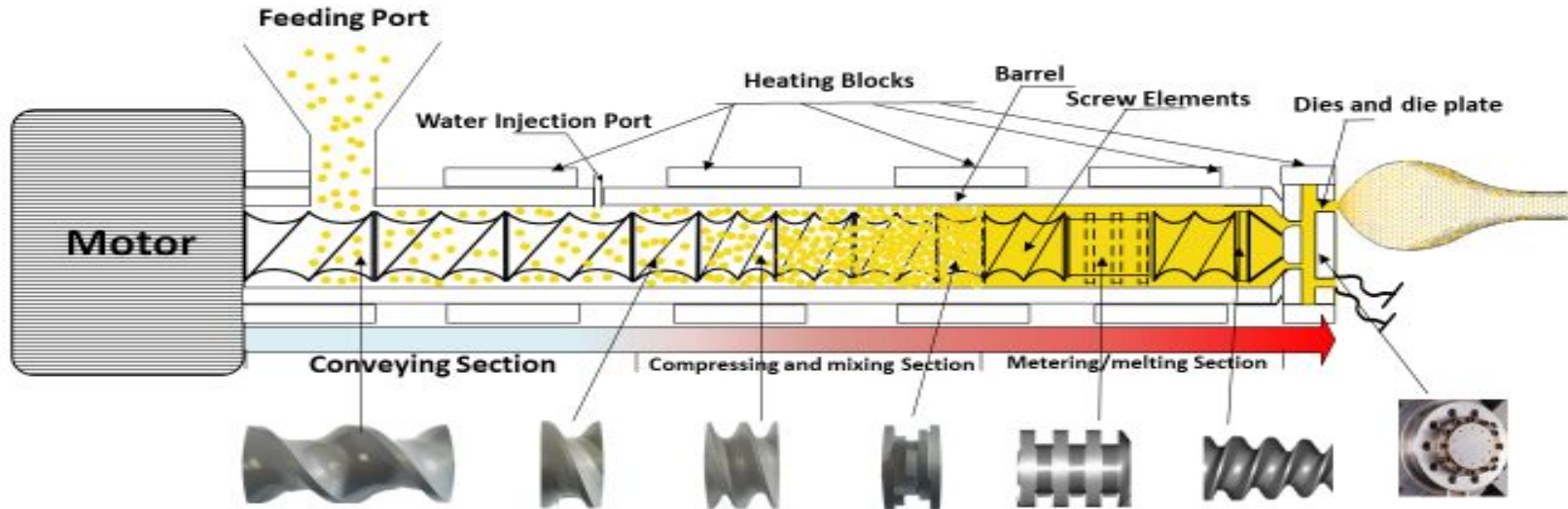
## FOR DIRECT EXPANDED PRODUCTS:

Barrel Temperatures: last 2 zones at 120 to 160°C

Die Pressure: 200 to 1000 psi

Moisture Content: 15 to 25% (w.b.)

Residence Time: less than 45 seconds

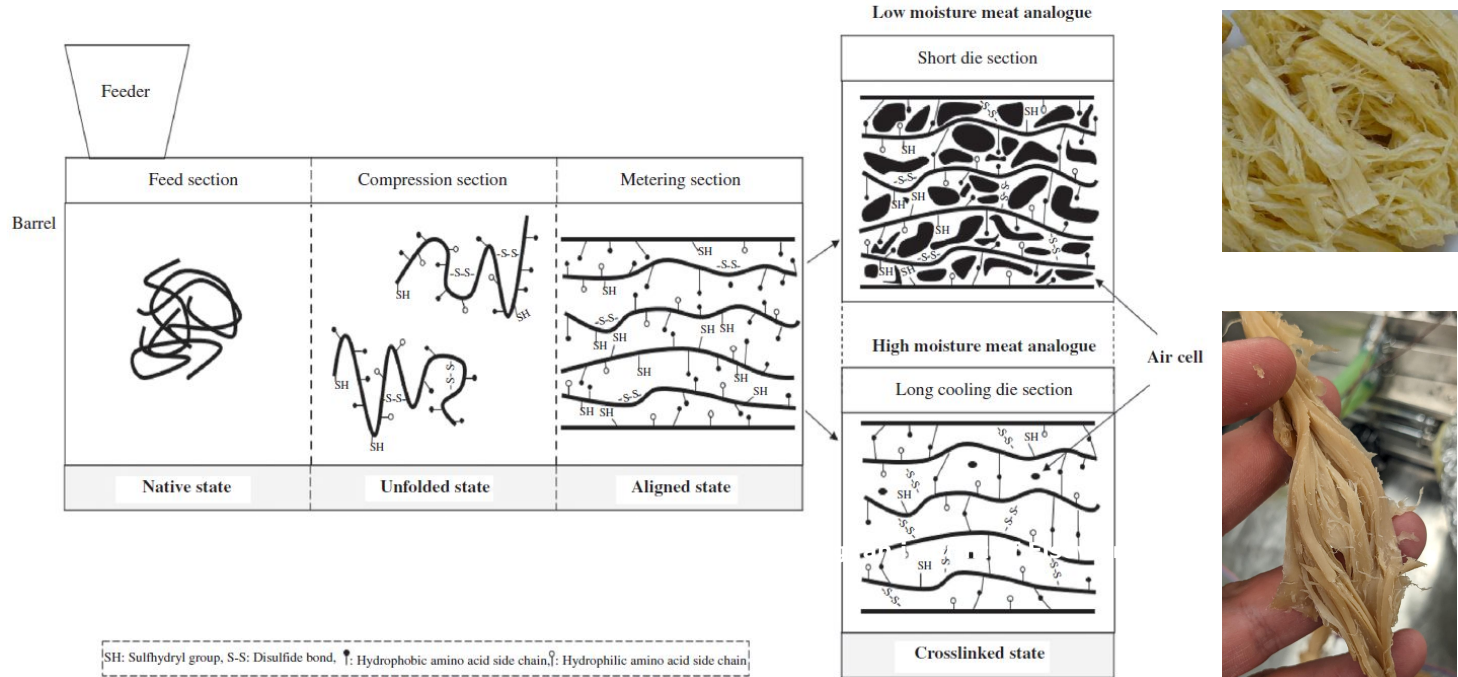


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# WSU EXTRUSION PROCESSING LABORATORY



# TEXTURIZATION PROCESSES LMMA (TVP) AND HMMA



Ryu G. H. (2020). Extrusion cooking of high moisture meat analogue.

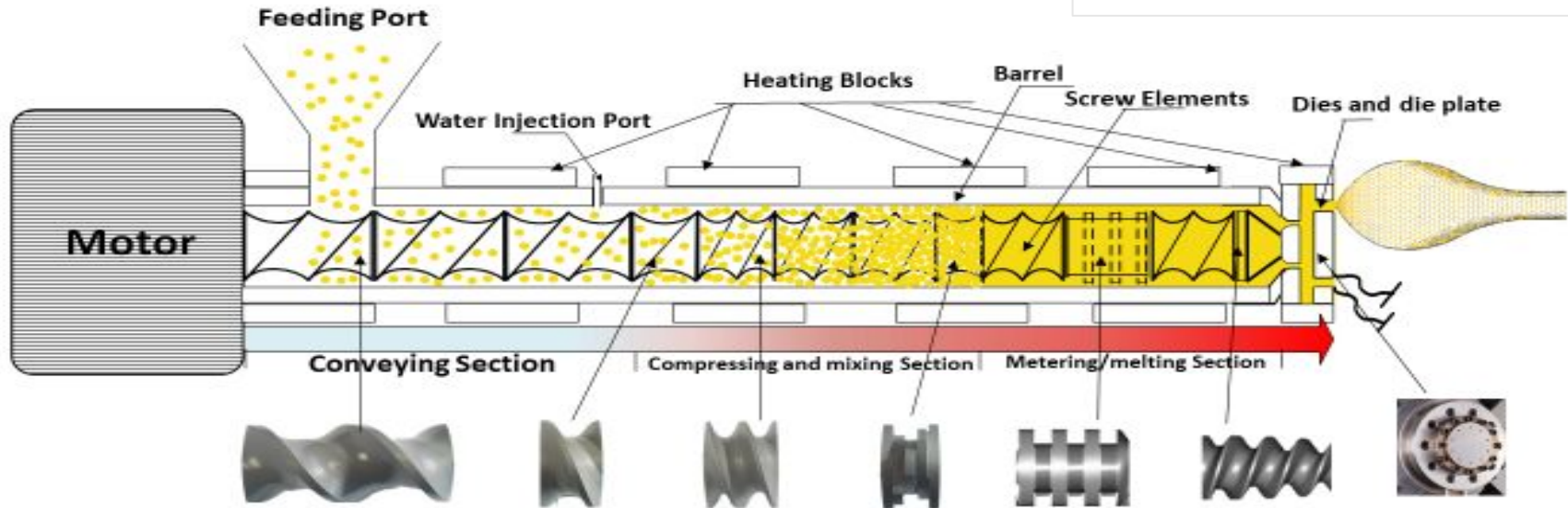
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# Texturization Process (TVP/LMMA)

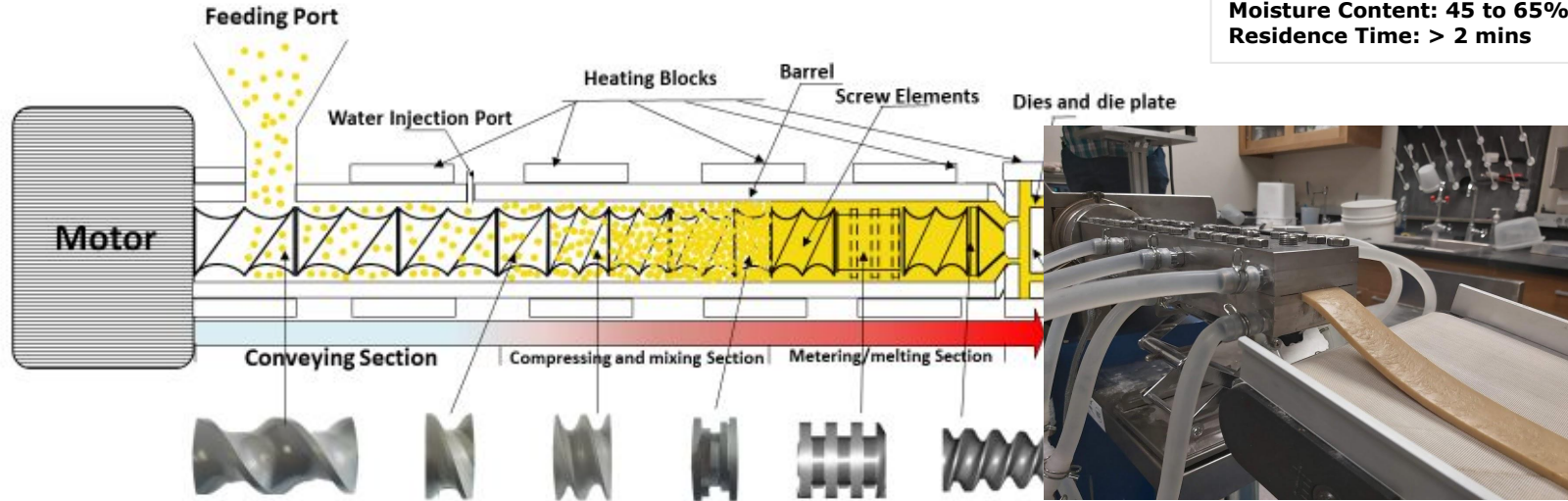
## FOR LMMA PRODUCTS:

Barrel Temperatures: last 2 zones at 120 to 160°C  
Die Pressure: 200 to 1000 psi  
Moisture Content: 30 to 35% (w.b.)  
Residence Time: less than 45 seconds



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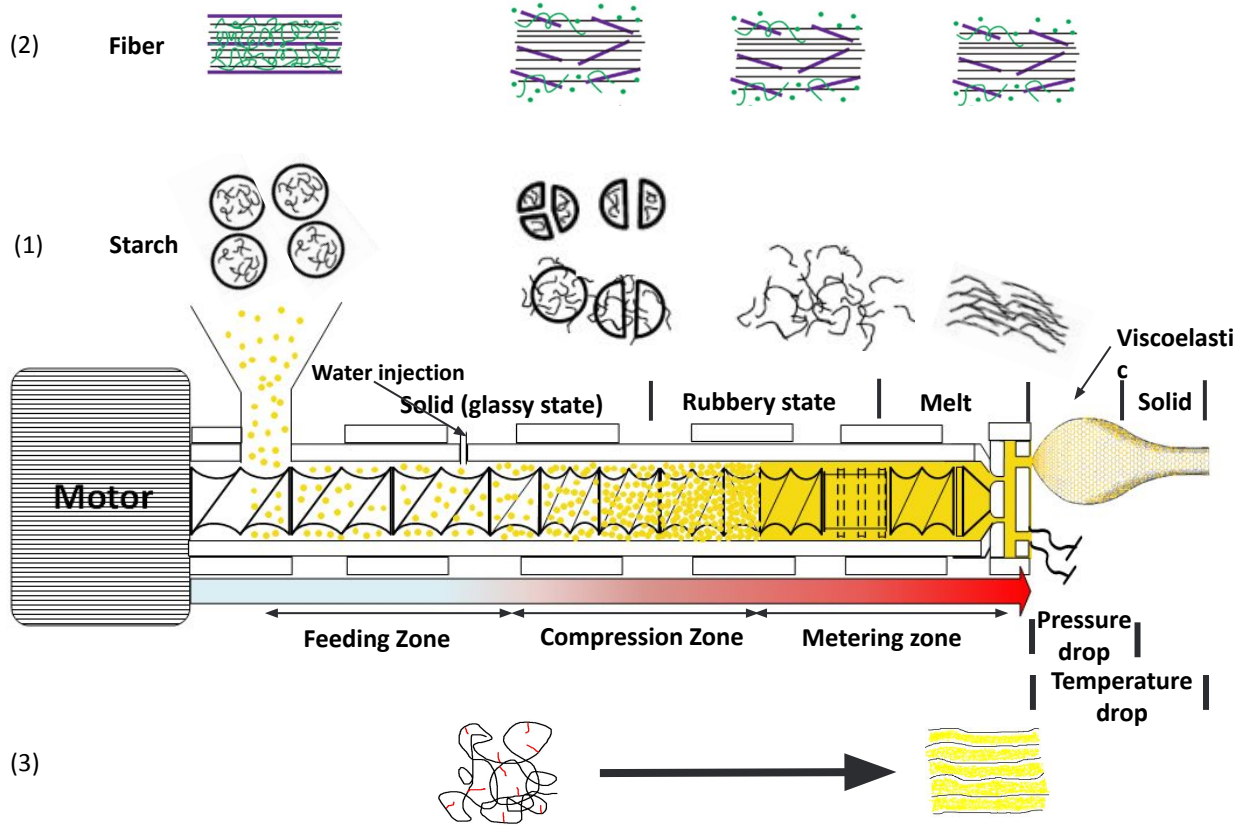
# TEXTURIZATION PROCESS (HMMA)



## FOR HMMA PRODUCTS:

Barrel Temperatures: last 2 zones at 120 to 160°C  
Cooling Die  
Die Pressure: 200 to 1000 psi  
Moisture Content: 45 to 65% (w.b.)  
Residence Time: > 2 mins

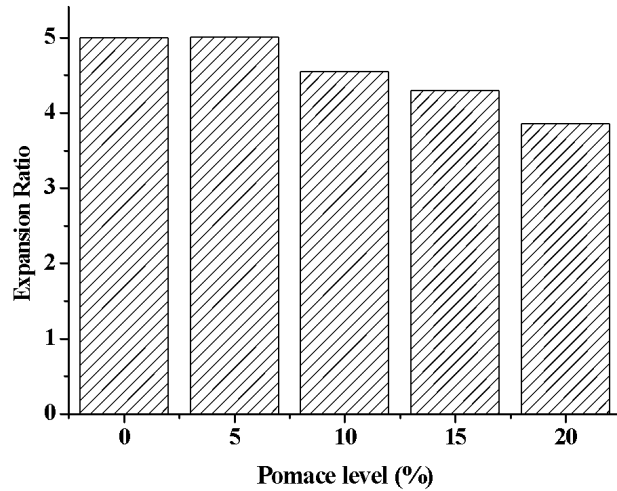
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# CHERRY POMACE INCLUSION IN PUFFS

Temperature: 140°C  
Screw Speed: 250 rpm  
Moisture Content: 16%



$$\text{Expansion Ratio} = \frac{\text{Diameter of extruded product}}{\text{Diameter of die}}$$



Pomace Level	0%	5%	10%	15%	20%
<b>Diameter (mm)</b>	15.01±0.76	15.04±0.45	13.65±0.55	12.89±0.50	11.58±0.62

Ref: Wang S, Kowalski RJ, Kang Y, Kiszonas AM, Zhu M, Ganjyal GM. 2017. <https://doi.org/10.1007/s11947-016-1824-9>

# EXTRUSION RESEARCH AT WSU



**Faba Bean Puff**



**Pinto Bean Puff**



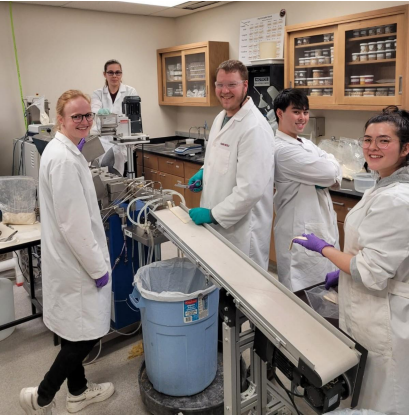
**Lima Bean Puff**



**Red Kidney Bean Puff**

Ref: Gu BJ, Masli MDP, and Ganjyal GM. 2020. <https://doi.org/10.1111/1750-3841.14951>

# WSU FOOD PROCESSING TEAM



**TRANSFORMING  
TEXTURE &  
CREATING NEW  
CONSUMER  
OCCASIONS.**



**JAIME REEVES, PD.H**

**EVP, PRODUCT DEVELOPMENT &  
COMMERCIALIZATION**



# DEVELOPMENT OF PLANT BASED MEAT



**TEXTURIZED  
VEGETABLE  
CRUMBLES**



**HYDRATED  
CRUMBLES &  
FUNCTIONAL  
INGREDIENTS**



**FINAL PRODUCT  
APPLICATION**



**LAUNCHED PRODUCT**



# CREATE MEAT LIKE TEXTURE



**HIGH MOISTURE  
EXTRUSION**



**SHRED**



**SEASON**



**APPLICATION**

# TRANSFORM UPCYCLED INGREDIENTS



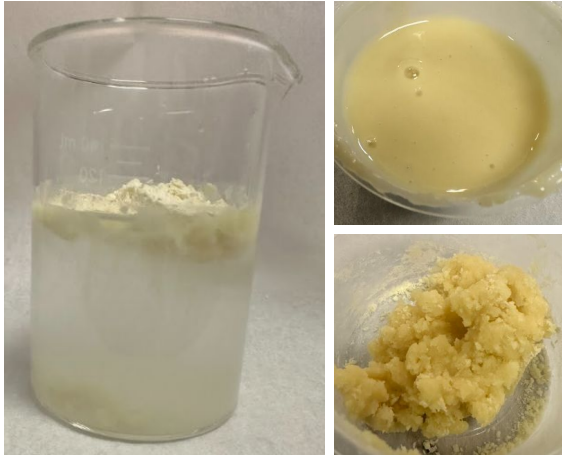
**Spudsy** created extruded puffed snacks to utilize sweet potatoes that would have been discarded in landfills due to imperfections



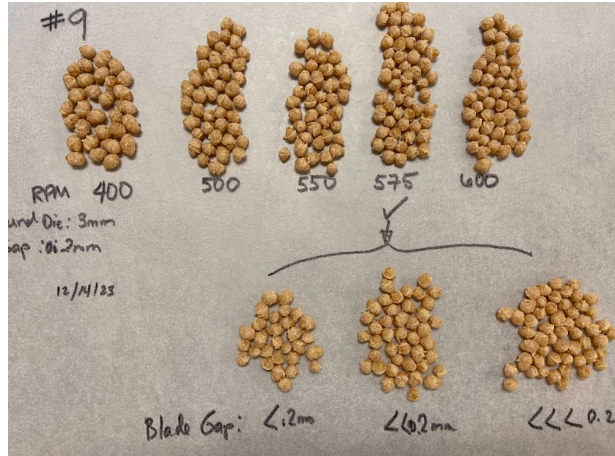
**Seven Sundays** has a line of extruded cereals that utilizes upcycled oats from oat milk production.

# EXPLORE FUNCTIONALITY OF NOVEL INGREDIENTS

## Case study: Novel Protein Testing



**Step 1:** Performed initial benchtop testing on protein



**Step 2:** Conducted series of tests on the extruder to get the right texture



**Step 3:** Used the crisps in a bar application

# EXTRUSION CAN HELP YOU BRING YOUR INGREDIENT TO LIFE....





**THANK YOU!**

**WANT TO DELIGHT CUSTOMERS WITH AMAZING TEXTURES?  
EXPLORE YOUR NOVEL PROTEINS?  
GIVE US A SHOUT.**

**[CONTACT@MATTSONCO.COM](mailto:CONTACT@MATTSONCO.COM)**