



PURDUE
FOOD AND AGRIBUSINESS
EXECUTIVE SUMMIT

OCTOBER 1-3, 2019

PURDUE
FOOD AND AGRIBUSINESS
EXECUTIVE SUMMIT

WELCOME

TABLE OF CONTENTS

General Information.....	4
Schedule	5
The Discussion Group Format	6
Facts about Purdue.....	7
Campus Map.....	9
Restaurant Guide	11
Faculty and Staff Biographies	13
Summit Steering Committee	35
Program Participants.....	37
Controlled Environment Agriculture: Disruption in the California Leafy Greens Industry?.....	45
Cainthus: Disrupting the Face of the Animal Industry.....	67
Compeer Financial: Executing a Segmentation Strategy with Disruptive Service Value.....	97
Mantiqueira: Innovating and Disrupting in the Egg Business.....	115
AgriGold: Disrupting the Seed Industry by Prioritizing Direct Producer Relationships.....	155
Solinftec: Creating a Foothold in the North American Digital Farming Market.....	179
Additional Notes	209

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GENERAL INFORMATION

EVALUATIONS

Please take a moment to complete the session evaluations provided. The Center for Food and Agricultural Business uses your comments to plan future executive seminars and to provide more valuable learning experiences. We appreciate your comments.

FACILITIES

Krannert Center for Executive Research is a dedicated meeting facility operated by the Krannert School of Management.

Classroom - Krannert Center, Room 124

Restrooms - Located in the front lobby and directly above on the second floor.

Security - All rooms will be locked overnight or at times when we are not in the classroom. You are welcome to leave your materials, but please take all valuables with you.

Emergency - In the case of an emergency, sirens will alarm. Indoor sirens indicate the need to evacuate. There are emergency exits near the classroom in the east end of the building. The muster point is outside and across the street in front of the Purdue Memorial Union. Outdoor sirens indicate the need to shelter in place. There is an underground level in the building. Purdue staff will be on hand to escort participants to safety.

INTERNET ACCESS

Free wireless Internet service is available. Please choose AT&T as the network. Open an internet browser to complete the log-in as a guest. A password is not needed.

MEALS

Please let Danielle Latta know if you have any allergies or special diets. Lunch will be served in the Dauch Alumni Center on Wednesday and in the Krannert Center Weiler Lounge on Thursday. A group networking dinner will be held on Tuesday evening in the Krannert Center. On Wednesday evening, a dinner will be held in the Buchanan Club of the Ross-Ade football stadium. Transportation will be provided to dinner and will return you to your hotel following dinner. See your schedule for specific meal times and locations.

WEBSITE ACCESS TO CLASSROOM MATERIALS

Electronic copies of the seminar materials will be distributed following the program. You will receive an email from the Program Manager once the presentations are available. Some presentations are confidential and will not be shared. Contact the Associate Director, Betty Jones-Bliss, if you are looking for something specific.

STAY CONNECTED

Find the latest news and program offerings from the Purdue University Center for Food and Agricultural Business.



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twitter.com/purdueagbiz

SCHEDULE

Tuesday, October 1

- 11:30-1:30 **Registration and Lunch** (Purdue Memorial Union, East Faculty Lounge)
Welcome and Introductions
 Betty Jones-Bliss
- 1:15-1:30 Program Overview (Krannert Center)
 Allan Gray (Purdue University)
- 1:30-3:30 *Disruption in the Protein Marketplace: The investment, the demand, and consumer perception*
 Jayson Lusk (Purdue University)
 Matt Strongin (Sustainable Bioproducts)
 Jay Theiler (Agri Beef Co.)
- 3:45-5:15 Small Group Analysis:
Controlled Environment Agriculture (CEA): Disruption in the California Leafy Greens Industry?
Cainthus: Disrupting the Face of the Animal Industry
- 5:15-6:15 **Dinner** (Krannert Center)
- 6:15-7:45 Case Debrief:
Controlled Environment Agriculture (CEA)
 Don Goodwin (Golden Sun Marketing)
 Joe Messer (Pure Green Farms)
- 7:45-8:45 **Networking Reception** (Weiler Lounge)

Wednesday, October 2

- 7:00 Coffee Available (Weiler Lounge)
- 7:30-9:00 Case Debrief: *Cainthus*
 Aidan Connolly (Cainthus)
 David Hunt (Cainthus)
- 9:15-10:00 Small Group Analysis: *Compeer Financial Executing a Segmentation Strategy with Disruptive Service Value*
- 10:15-11:45 Case Debrief: *Compeer Financial*
 Scott Downey, Brady Brewer (Purdue University)
 Matt Ginder (Compeer Financial)
- 12:00-1:15 **Lunch** (Dauch Alumni Center)
2-Million-Acre Living Lab: Developing the Wabash Heartland as a Global Epicenter of Digital Agriculture
 Johnny Park (WHIN)
- 1:30-3:30 *Blockchain Technology in the Food Supply Chain*
 Allan Gray, Nate DeLay (Purdue University)
 Peter Votkjaer Jorgensen (Maersk Growth)
 Phil Harris (ripe.io)
- 3:45-4:30 Small Group Analysis: *Mantiqueira Innovating and Disrupting in the Egg Business*
- 4:45-6:15 Case Study Debrief: *Mantiqueira*
 Marcos Fava Neves (University of São Paulo)
 Leandro Pinto (Mantiqueira)
- 6:30 **Depart for Dinner** (Ross-Ade Stadium)

Thursday, October 3

- 7:00 Coffee Available (Weiler Lounge)
- 7:30-8:15 Small Group Analysis: *AgriGold: Disrupting the Seed Industry by Prioritizing Direct Producer Relationships*
- 8:30-10:00 Case Debrief: *AgriGold*
 Mike Gunderson (Purdue University)
 Craig Anderson (AgReliant)
- 10:00-10:45 Small Group Analysis: *Solinftec Creating a Foothold in the North American Digital Farming Market*
- 11:00-11:45 **Lunch** (Krannert Center)
- 11:45-1:15 Case Debrief: *Solinftec*
 Luciano Castro (Purdue University)
 Daniel Padrão (Solinftec)
- 1:30-2:30 Strategic Options for the Industry:
 A Facilitated Discussion
 Allan Gray (Purdue University)
- 2:30 Adjourn
- *Agenda subject to change.**

THE DISCUSSION GROUP FORMAT

Small discussion groups meet each day to review cases, which will later be discussed in general sessions with all of the program attendees.

Discussion groups are an integral element of the educational effectiveness of the program. They serve as a forum where participants test and refine their analyses of cases. This small-group setting also provides an opportunity for participants to speak at some length and in greater detail about the case issues, which may not be possible in the general sessions. These discussions may be particularly useful in providing each participant with a sense of his or her increasing expertise in the application of the problem-solving skills and methodologies that are developed by case-method learning.

A leader is designated for each discussion group. It is the leader's responsibility to establish a format for the discussions, which involves all the members and ensures attention to each of the assigned cases. Generally, the format proceeds from identification and analysis of the major problems and issues in each case to participants' specific plans of action for dealing with those problems or issues. It should not be the goal of the group to secure agreement or consensus on a single plan of action, but to identify the alternatives so that in the general session each member is prepared to:

- State the problems and issues in the case;
- Present a course of action that he or she would advise in the particular instance, as well as alternatives;
- Formulate carefully and logically the reasons for the course of action; and
- Defend the analysis and conclusions in open discussion.

Useful analysis must employ facts of the specific instance described in the case. Therefore, thorough case preparation for group and class discussion is essential. A study group session is lost if it must be used simply to digest the facts of the case.

FACTS ABOUT PURDUE



**SINCE IT WAS
FOUNDED IN 1869
PURDUE UNIVERSITY HAS GROWN
FROM 39 STUDENTS
AND 6 FACULTY MEMBERS
TO MORE THAN
74,000 STUDENTS
AND 19,000 FACULTY AND STAFF
ON 5 CAMPUSES ACROSS INDIANA**

ORIGINS OF THE UNIVERSITY

- Established in West Lafayette, Ind., in 1869.
- Began on 100 acres of donated land, with funds primarily obtained by local entrepreneur John Purdue.
- Named the institution Purdue University in his honor.
- Now has more than 18,200 acres over five campuses.

SCHOOL PRIDE

- The Purdue University “All-American” Marching Band is one of the top collegiate marching bands in the nation. It is also home to the “World’s Largest Drum.”
- Purdue has the second highest enrollment of international students among public U.S. universities.
- Nobel Prize recipients from Purdue include two alumni, six former faculty members, one professor emeritus and three current faculty members.
- In 2007 and 2009, Purdue faculty won the World Food Prize, considered the Nobel Prize of Agriculture.

LIBRARIES

- On the West Lafayette campus alone, the library system consists of more than 2.5 million volumes.
- The archive and special collections are home to the exhibit of Collections of Amelia Earhart Papers.

PURDUE ATHLETICS

- Boilermakers have been ranked regularly in the top 25 in the nation.
- Purdue men’s basketball has won a total of 22 Big Ten Championships.
- Two wins at the Alamo Bowl and appearances at the Outback, Sun, and Rose bowls.
- In 2010, the Purdue women’s golf team won the NCAA Championship.
- The Purdue women’s basketball team won the 1999 NCAA championship.

PURDUE IN SPACE

- Purdue boasts a total of 22 graduates who have been selected for the space program.
- Purdue alumni have flown on more than 40 U.S. manned space flights.
- Neil Armstrong, the first person to walk on the moon, and Eugene Cernan, the last to leave it, are both Purdue alumni.

DISTINGUISHED ALUMNI IN AGRICULTURE

Earl L. Butz • A'32, PhD'37, HDR'73
Former U.S. Secretary of Agriculture

James R. Moseley • A'73
U.S. Department of Agriculture Deputy Secretary

Ruth Siems • CFS'53
Creator of Stove Top Stuffing Mix for General Foods

Orville Redenbacher • A'28, HDR'88
Business Leader in Popcorn

Max Armstrong • Hu'75
Agricultural journalist and co-founder and co-host of "This Week in Agribusiness"

BUILDINGS OF INTEREST ON CAMPUS

Purdue Memorial Union • The campus hub for food, arcade games, student and alumni activities, where you can cash a check, watch television, bowl, play billiards, see an art exhibit or stay in one of the Union Club's 195 convenient hotel rooms.

France A. Córdova Recreational Sports Complex • The first complex in the country built solely for students' recreational sports.

Elliott Hall of Music • One of the largest theatres at any educational institution in the United States, with a seating capacity surpassing New York City's Radio City Music Hall. Elliott Hall is also home to the studios of WBAA, Indiana's oldest radio station established in 1922.

Stewart Center • Home to the Humanities, Social Science and Education (HSSE) Library, Hicks Undergraduate Library, University Placement Services, as well as two auditoriums—Fowler Hall and Loeb Playhouse.

The Class of 1948 Bell Tower • Located near Hovde Hall and the Memorial Mall, the bell tower can be heard across campus at the top of every hour.

Dauch Alumni Center • The 67,000-square-foot, state-of-the-art facility showcases the university's points of pride and achievements.

PAO Visual Performing Arts • Home for traditional arts, and a place where art can be merged with the latest technologies in theater sound, textile designs, and industrial design.

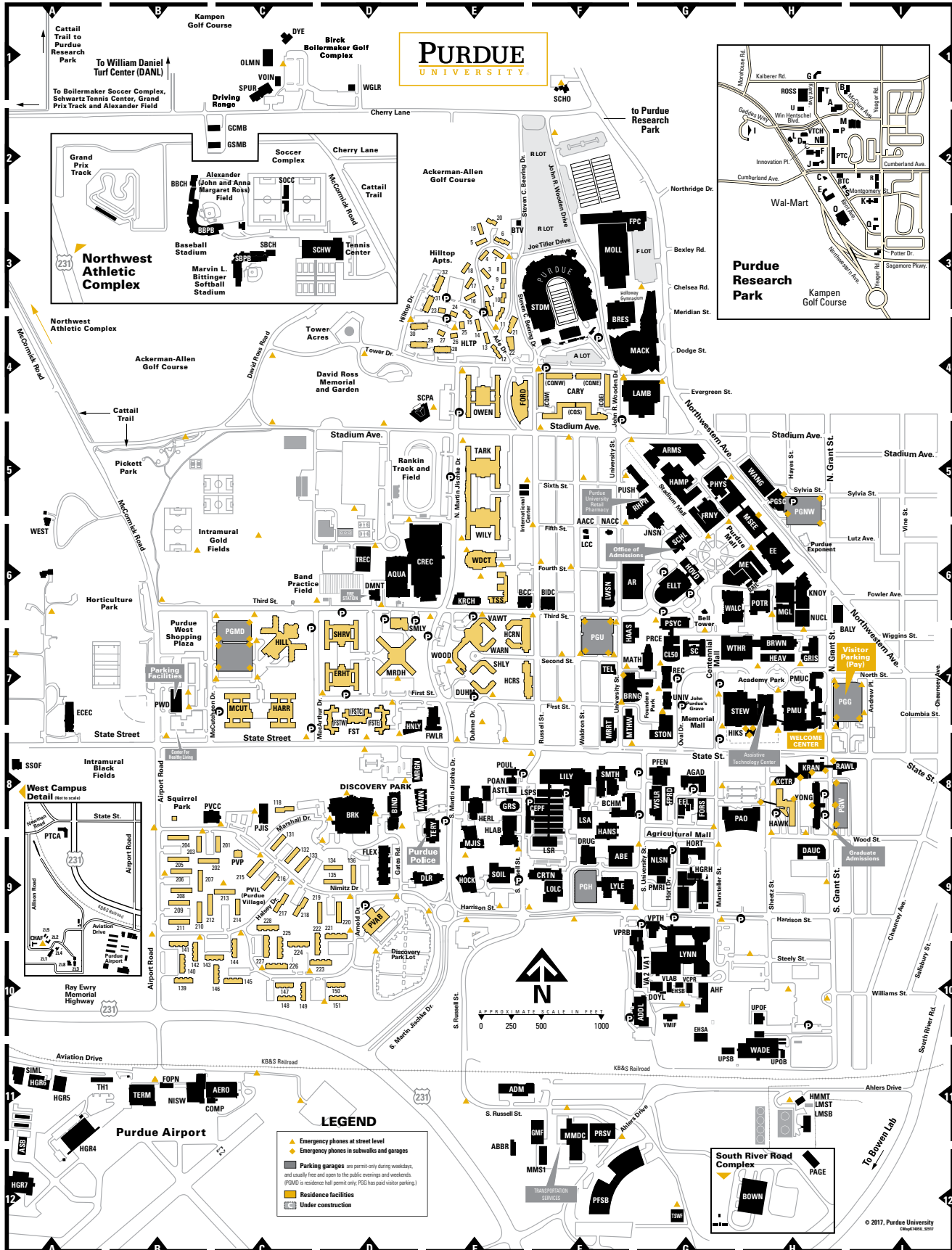
Fred and Mary Ford Dining Court • Seating for 800 and features marketplace-style dining that allows diners to choose from food stations that are distinctive in their decor and food offerings.

Birck Boilermaker Golf Complex • Features two 18-hole championship golf courses and a practice facility with a large driving range and multiple short-game areas.



LEARN MORE ABOUT PURDUE ONLINE AT
www.purdue.edu/purdue/about

CAMPUS MAP



ABE Agricultural and Biological Engineering F9
ADDL Animal Disease Diagnostic Laboratory G10
AERO Aerospace Science Laboratory C11
AGAD Agricultural Administration Building G8
AHF Animal Holding Facility G10
AQUA Boilermaker Aquatic Center D6
AR Armory G6
ARMS Armstrong (Neil) Hall of Engineering G5
ASTL Animal Sciences Teaching Laboratory E8
BCC Black Cultural Center F6
BCHM Biochemistry Building F8
BIND Bindley (William E.) Bioscience Center D8
BRK Birk Nanotechnology Center D8
BRNG Beering (Steven C.) Hall of Liberal Arts and Education F, G7
BRWN Brown (Herbert C.) Laboratory of Chemistry H7
BSG Building Services and Grounds F9
CDFS Child Development and Family Studies Building D8
† CHAF Chaffee Hall A9
CIVL Civil Engineering Building G5
CL50 Class of 1950 Lecture Hall G7
COMP Composites Laboratory C11
† DANL Daniel (William H.) Turfgrass Center B1
DAUC Dauch (Dick and Sandy) Alumni Center H9
DLR Hall for Discovery and Learning Research E9
DMNT DeMent (Clayton W.) Fire Station D6
DOYL Doyle (Leo Phillip) Laboratory G10
DYE Pete Dye Clubhouse C1
EE Electrical Engineering Building H6
EEL Entomology Environmental Laboratory G8
EHSA Equine Health Sciences Annex G10
EHSB Equine Health Sciences Building G10
ELLT Elliott (Edward C.) Hall of Music G6
ENAD Engineering Administration Building G6
EXPT Exponent H6
FOOD Food Stores Building F9
FOPN Flight Operations Building B11
FORS Forestry Building G8
FPRD Forest Products Building G8
FREH Freehafer (Lytle J.) Hall of Administrative Services H10
FRNY Forney Hall of Chemical Engineering G5
FS Food Science Building G9
FWLR Fowler (Harriet O. and James M., Jr.) Memorial House E7
GCMB Golf Course Maintenance Barn C2
GRIS Grissom Hall H7
GRS Grounds Service Building E8
GSMB Golf Storage Maintenance Barn C2
HAAS Haas (Felix) Hall G7
HANS Hansen (Arthur G.) Life Sciences Research Building F8, 9
HEAV Heavilon Hall H7
HERL Herrick Laboratories E8
HGR4-6 Hangars, Numbers 4 through 6 A11,12
HGRH Horticulture Greenhouses G9
HIKS Hicks (John W.) Undergraduate Library G, H7, 8
HOCK Hockmeyer (Wayne T. and Mary T.) Hall of Structural Biology E9
HORT Horticulture Building G9
HOVD Hovde (Frederick L.) Hall of Administration G6
HPN Heating and Power Plant-North G6
IAF Intercollegiate Athletic Facility F3
JNSN Johnson (Helen R.) Hall of Nursing G5, 6
KCTR Krannert Center for Executive Education and Research H8
KNOY Knoy (Maurice G.) Hall of Technology H6
KRAN Krannert Building H8
LAMB Lambert (Ward L.) Fieldhouse and Gymnasium F, G4
■ Library, Main (see HIKS)
LILY Lilly Hall of Life Sciences F8
LMBS Laboratory Materials Storage Building H11
LMST Laboratory Materials Storage Trailer H11
LSA Life Science Animal Building F8
LSPS Life Science Plant and Soils Laboratory F8
LSR Life Science Ranges (Greenhouse and Service Building) F8, 9
LWSN Lawson (Richard and Patricia) Computer Science Building F6
LYNN Lynn (Charles J.) Hall of Veterinary Medicine G10
MACK Mackey (Guy J.) Arena F, G4
MANN Mann (Gerald D. and Edna E.) Hall E8
MATH Mathematical Sciences Building G7

ME Mechanical Engineering Building G, H6
MGL Michael Golden Engineering Laboratories and Shops H6
MJIS Martin C. Jischke Hall of Biomedical Engineering E9
MMDC Materials Management and Distribution Center F11
MMS1 Materials Management Storage Building 1 F12
MOLL Mollenkopf Athletic Center F3
MRGN Morgan (Burton D.) Center for Entrepreneurship E8
MSEE Materials and Electrical Engineering Building H5, 6
MTHW Matthews (Mary L.) Hall F7, 8
NISW Niswonger Aviation Technology Building B11
NUCL Nuclear Engineering Building H6
OLMN Ollman (Melvin L.) Golfcart Barn C1
PAO Pao (Yue-Kong) Hall of Visual and Performing Arts H8
PFEN Pfendler Hall (David C.) of Agriculture G8
PFSB Physical Facilities Service Building F12
PHYS Physics Building G5
PJIS Patty Jischke Early Care and Education Center C8
PMU Purdue Memorial Union (includes Visitor Information Center at PMU [VIC@PMU]) H7
PMUC Purdue Memorial Union Club Hotel H7
POAN Poultry Science Annex E8
POTR Potter (A. A.) Engineering Center H6
POUL Poultry Science Building E8
PRCE Peirce Hall G7
PRSV Printing Services Facility F11
PSYC Psychological Sciences Building G6, 7
PUSH Purdue University Student Health Center F, G5
PVCC Purdue Village Community Center C8
PWF Purdue West, Building F B7
RAIL American Railway Building H6
RAWL Rawls (Jerry S.) Hall H, 18
REC Recitation Building G7
RHPH Heine (Robert E.) Pharmacy Building F, G5
RSC Recreational Sports Center D, E6
SC Stanley Coulter Hall G7
SCCA-E South Campus Courts, Buildings A through E G, H9, 10
SCHL Schleman (Helen B.) Hall of Student Services G6
SCPA Slayter Center of Performing Arts D4
SEAN Service Building Annex F9
SERV Service Building F9
† SIML Holleman-Niswonger Simulator Center
SMTH Smith Hall F8
SOIL Soil Erosion Laboratory, National E9
SPUR Spurgeon (Tom) Golf Training Center C1
SSOF State Street Office Facility A8
STDM Ross-Ade Stadium (includes Ross-Ade Pavilion [RAP]) F3
STEW Stewart Center G, H7
STON Stone (Winthrop E.) Hall G7, 8
■ Student Health Center (see PUSH)
TEL Telecommunications Building F7
TERM Terminal Building B11
TERY Terry (Oliver P.) Memorial House E8, 9
TH1-6 Tee-Hangars 1 through 6 A11
TMB Transportation Maintenance Building E9
UNIV University Hall G7
UPOB Utility Plant Office Building H10
UPOF Utility Plant Office Facility H10
VA1 Veterinary Animal Isolation Building 1 G10
VA2 Veterinary Animal Isolation Building 2 G10
VCPR Veterinary Center for Paralysis Research G10
VLAB Veterinary Laboratory Animal Building G10
VOIN Voinoff (Samuel) Golf Pavilion C1
VPRB Veterinary Pathobiology Research Building F, G9, 10
VPTH Veterinary Pathology Building G9
■ Visitor Information Center (VIC) and Parking Services (see PGNW). Visitor Information Center at PMU [VIC@PMU] (see PMU).
WADE Wade (Walter W.) Utility Plant H11
WEST Westwood (President's Home) A5, 6
WGLR Women's Golf Locker Room D1
WSLR Whistler (Roy L.) Hall of Agricultural Research G8
WTHR Wetherill (Richard Benbridge) Laboratory of Chemistry G, H7
† ZL1 Combustion Research Laboratory
† ZL2 Gas Dynamics Research Laboratory
† ZL3 High Pressure Research Laboratory
† ZL4 Propulsion Research Laboratory
† ZL5 Turbomachinery Fluid Dynamics Laboratory
501H 501 Hayes Street H5
600R Latino Cultural Center (600 Russell St.) F5

Residence Facilities

CARY Cary (Franklin Levering) Quadrangle F4
*** DUHM** Duhme (Ophelia) Residence Hall E7
ERHT Earhart (Amelia) Residence Hall D7
FORD Ford (Fred and Mary) Dining Court F4
FST First Street Towers D7
HARR Harrison (Benjamin) Residence Hall C7
HAWK Hawkins (George A.) Hall H8
HILL Hillenbrand Residence Hall C7
HLP Hilltop Apartments E3
MCUT McCutcheon (John T.) Residence Hall C7
MRDH Meredith (Virginia C.) Residence Hall D7
OWEN Owen (Richard) Residence Hall E4
PVAB Purdue Village Administration Building D9
PVIL Purdue Village B, C, D8, 9, 10
PVP Purdue Village Preschool C9
*** SHLY** Shealy (Frances M.) Residence Hall E7
SHRV Shreve (Eleanor B.) Residence Hall D6, 7
SMILY Smalley (John C.) Center for Housing and Food Services Administration D6, 7
TARK Tarkington (Newton Booth) Residence Hall E5
*** VAWT** Vawter (Everett B.) Residence Hall E6
*** WARN** Warren (Martha E. and Eugene K.) Residence Hall E7
WDCT Wiley Dining Court E6
WILY Wiley (Harvey W.) Residence Hall E5, 6
*** WOOD** Wood (Elizabeth G. and William R.) Residence Hall E7
YONG Young (Ernest C.) Hall H8

Parking Garages

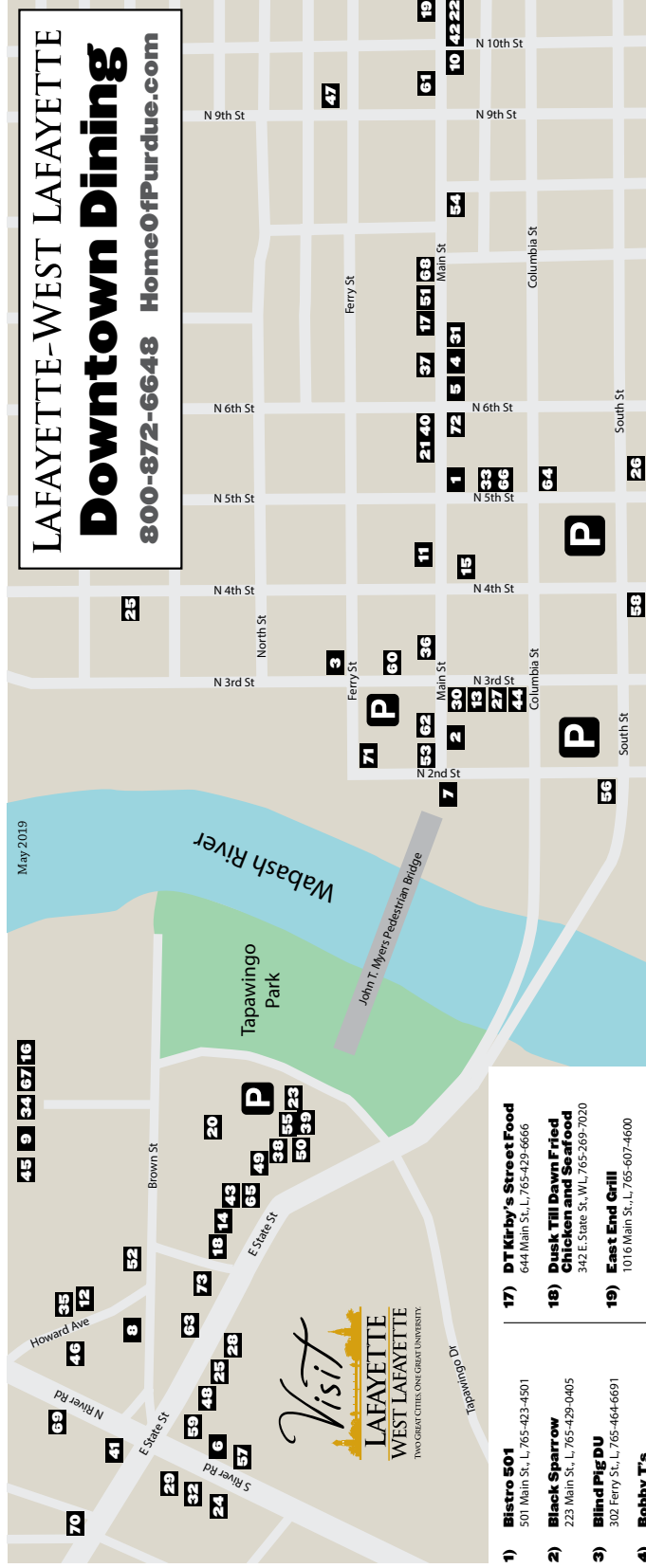
PGG Parking Garage, Grant Street H, 17
PGW Parking Garage, Wood Street H8
PGM Parking Garage, Marsteller Street G, H8
PGMD Parking Garage, McCutcheon Drive C6, 7
PGNW Parking Garage, Northwestern Avenue (includes Visitor Information Center and Parking Services) H5
PGU Parking Garage, University Street F6, 7

Purdue Research Park (H2 inset)

BTC Business and Technology Center
CHAO Chao Center for Industrial Pharmacy and Contract Manufacturing
CMBR 1231 Cumberland Ave.
HENT Hentschel Center
KENT 1205 Kent Ave. (IPPH)
PTC Purdue Technology Center of West Lafayette, Purdue Research Foundation (PRF) corporate headquarters
ROSS Ross Enterprise Center
VTCH Vision Technology Center (VISTECH 1)
YEAG 2655 Yeager Rd.
A International Technology Center (includes fitness center)
B Lakeview Technology Center (includes MRI Center)
C Pritscher Building
D SIMULIA CORP. Central Region
E Bioanalytical Systems (BASi)
F Cook Biotech
G Just Us Kids (child care center)
H Lafayette Community Bank
I MED Institute – 1 Geddes Way
J MED Institute – Annex
K North Central Superpave Center (NCSC)
L Purdue Employees Federal Credit Union (PEFCU)
M Kurz Purdue Technology Center (KURZ) (under construction)
N SSC – An Aptuit Company
O State Farm Insurance Company
P Thermophysical Properties Research Laboratory (TPRL)
Q WLF – TV 18
R 1201 Cumberland Ave. (formerly CTS Microelectronics)
S 2700 Kent Ave. (270K)
T 3400 Kent Ave. (under construction)

* Windsor Residence Halls
 † Part of Maurice J. Zwrow Laboratories
 ‡ Buildings not appearing on map

RESTAURANT GUIDE



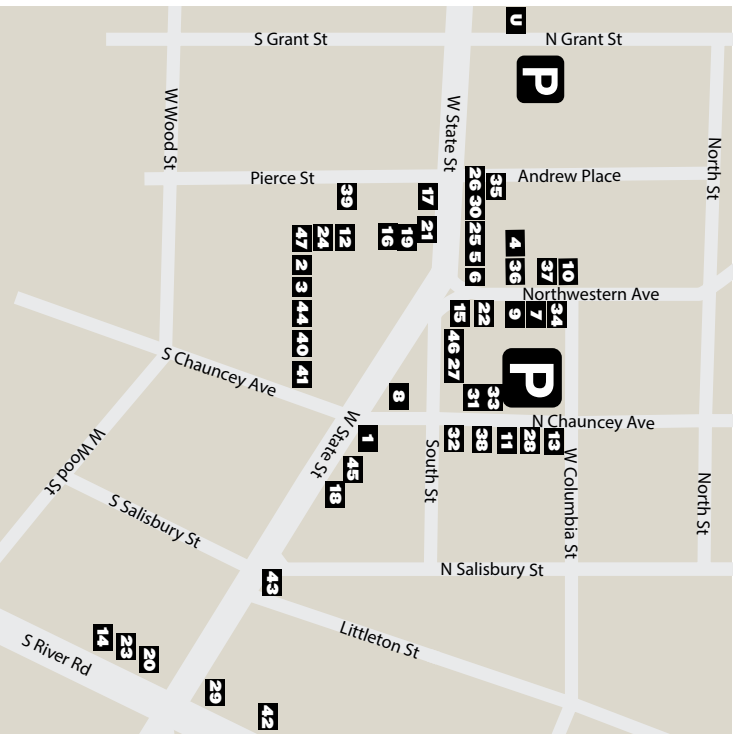
LAFAYETTE-WEST LAFAYETTE
Downtown Dining
 800-872-6648 HomeOfPurdue.com

- 1) **Bistro 501**
501 Main St., L, 765-423-4501
- 2) **Black Sparrow**
223 Main St., L, 765-429-0405
- 3) **Blind Pig DU**
302 Ferry St., L, 765-464-6691
- 4) **Bobby T's**
605 Main St., L, 765-420-8262
- 5) **Bobby T's Diner**
601 Main St., L, 765-420-7383
- 6) **Bohe**
124 S. River Rd., Wl, 765-838-0963
- 7) **Bru Burger Bar**
101 Main St., L, 765-479-7400
- 8) **Bruno's**
212 Brown St., Wl, 765-743-1668
- 9) **Buffalo Wild Wings**
360 Brown St., Wl, 765-743-1188
- 10) **Buttery Shelf Eatery**
927 Main St., L, 765-429-8250
- 11) **Cellar 422**
422 Main St., L, 765-746-6754
- 12) **China Buffet**
132 Howard Ave., Wl, 765-743-9988
- 13) **Chumley's**
122 N. 3rd St., L, 765-420-9372
- 14) **Cold Stone Creamery**
338 E. State St., Wl, 765-250-5184
- 15) **Digby's Pub & Patio**
133 N. 4th St., L, 765-269-7179
- 16) **Dos Amigos**
360 Brown St., Wl, 765-479-1671
- 17) **DT Kirby's Street Food**
644 Main St., L, 765-429-6666
- 18) **Dusk Till Dawn Fried Chicken and Seafood**
342 E. State St., Wl, 765-269-7020
- 19) **East End Grill**
1016 Main St., L, 765-607-4600
- 20) **Echo Karaoke**
306 E. State St., Wl, 765-743-6666
- 21) **Folle**
526 Main St., L, 765-607-8900
- 22) **Fuel Coffee Shop**
1005 Main St., L, 765-701-3044
- 23) **Garden Grille**
336 E. State St., Wl, at Hilltop Garden Inn, 765-743-2108
- 24) **Green Leaf Vietnamese**
111 S. River Rd., Wl, 765-743-2288
- 25) **Happy China**
219 E. State St., Wl, 765-743-1666
- 26) **Holiday Inn City Centre Restaurant & Bar**
515 South St., L, at Holiday Inn Lafayette City Centre, 765-742-5230
- 27) **Honey Baked Ham**
116 N. 3rd St., L, 765-250-5770
- 28) **Hungry Howie's**
227 E. State St., Wl, 765-250-9121
- 29) **Indian Mahal Fine Indian Restaurant**
111 S. River Rd., Wl, 765-746-2345
- 30) **Java Roaster**
130 N. 3rd St., L, 765-742-2037
- 31) **Kathy's Homemade Candies & Chocolate Lounges**
611 Main St., L, 765-429-5176
- 32) **Kibu Café**
111 S. River Rd., Wl, 765-743-3190
- 33) **Knickerbocker Saloon**
113 N. 5th St., L, 765-423-2234
- 34) **KTV Bubble Tea**
360 Brown St., Wl, 917-251-5188
- 35) **La Hacienda del Sol**
140 Howard Ave., Wl, 765-771-7930
- 36) **La Scala Italian Restaurant**
312 Main St., L, 765-420-8171
- 37) **Lafayette Brewing Company**
622 Main St., L, 765-742-2591
- 38) **Latea Bubble Tea Lounge**
358 E. State St., Wl, 765-586-9998
- 39) **Mukuran Ninja Char Grill & Izakaya**
350 E. State St., Wl, 765-838-2111
- 40) **McCord Candies & Lunches**
536 Main St., L, 765-742-4441
- 41) **McDonald's**
124 E. State St., Wl, 765-749-6069
- 42) **Merlin's Beard**
1001 Main St., L, 765-714-4441
- 43) **Moe's Southwest Grill**
332 E. State St., Wl, 765-743-5000
- 44) **Nami's Bar & Grill**
102 N. 3rd St., L, 765-607-1176
- 45) **Neon Cactus**
360 Brown St., Wl, 765-743-6081
- 46) **O'Bryan's Nine Irish Brothers**
119 Howard Ave., Wl, 765-746-4782
- 47) **O'Rear's Pastry Shop**
321 N. 9th St., L, 765-742-2285
- 48) **O-Ishi**
213 E. State St., Wl, 765-743-3888
- 49) **Panera Bread**
328 E. State St., Wl, 765-746-2400
- 50) **Peppercorns Kitchen**
360 E. State St., Wl, 765-250-3416
- 51) **Professor Joe's Sports Pub & Pizzeria**
648 Main St., L, 765-746-6271
- 52) **Puccini's**
300 Brown St., Wl, 765-746-5000
- 53) **Red Seven Bar & Grill**
200 Main St., L, 765-742-7337
- 54) **Sake Sushi Asian Fusion**
731 Main St., L, 765-888-8382
- 55) **Scotty's Brew House**
352 E. State St., Wl, 765-746-3131
- 56) **Sgt. Preston's of the North**
6 N. 2nd St., L, 765-742-7378
- 57) **Shaukin Indian Fast Food**
138 S. River Rd., Wl, 765-743-2222
- 58) **Sichuan House**
138 S. 4th St., L, 765-742-6600
- 59) **Silver Dipper Ice Cream**
20 E. State St., Wl, 765-743-7511
- 60) **Smoking Irishman**
221 N. 4th St., L, 765-423-7709
- 61) **Something Blue Bakery**
918 Main St., L, 765-388-6212
- 62) **Star City Coffee & Ale House**
210 Main St., L, 765-420-7099
- 63) **Starbucks**
240 E. State St., Wl, 765-746-1674
- 64) **Sunrise Diner**
501 Columbia St., L, 765-742-4204
- 65) **Sushi Burrito**
350 E. State St., Wl, 765-771-7970
- 66) **Sweet Revolution Bake Shop**
109 N. 5th St., L, 765-743-7437
- 67) **The Taste**
360 Brown St., Wl, 765-838-0784
- 68) **Thieme & Wagner Bar**
652 Main St., L, 765-607-4804
- 69) **Town & Gown Bistro**
119 N. River Rd., Wl, 765-250-3425
- 70) **Triple XXX Family Restaurant**
2 N. Salisbury St., Wl, 765-743-5373
- 71) **The Vault Bar & Billiards**
205 N. 2nd St., L, 765-269-9329
- 72) **Yatagarasu**
533 Main St., L, 765-607-2979
- 73) **Wendy's**
252 E. State St., Wl, 765-743-5885

LAFAYETTE-WEST LAFAYETTE

Village Dining

800-872-6648 HomeOfPurdue.com



May 2019

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| <p>1) A.J's Burgers & Beef
134 W. State St., 765-743-1940</p> <p>2) Basil Thai & Bubble Tea
135 S. Chauncey Ave., 765-743-3330</p> <p>3) Blaze Chinese BBQ
135 S. Chauncey Ave., 765-464-6999</p> <p>4) Blue Nile
117 Northwestern Ave., 765-269-9980</p> <p>5) Bobby T's Campus
308 W. State St., 765-250-9278</p> <p>6) Brother's Bar & Grill
306 W. State St., 765-746-1090</p> <p>7) Captain Gyros
132 Northwestern Ave., 765-743-7170</p> <p>8) Chipotle Mexican Grill
200 W. State St., 765-743-4804</p> <p>9) Egyptian Cafe & Hookah Bar
130 Northwestern Ave., 765-743-0500</p> <p>10) Einstein's Bagels
201-203 Northwestern Ave., 765-743-8988</p> <p>11) Fiesta Mexican Grill
102 N. Chauncey Ave., 765-838-0987</p> <p>12) Five Guys Burgers & Fries
135 S. Chauncey Ave., 765-743-3100</p> <p>13) Freshii
102 N. Chauncey Ave., 765-250-9182</p> <p>14) Green Leaf Vietnamese
111 S. River Rd., 765-743-2288</p> <p>15) Greyhouse Coffee & Supply Co.
100 Northwestern Ave., 765-743-5316</p> <p>16) Hammer Donuts
135 S. Chauncey Ave., 765-743-6622
(inside Discount Den)</p> <p>17) Harry's Chocolate Shop
329 W. State St., 765-743-1467</p> <p>18) Hi Tea
134 W. State St., 765-250-3567</p> <p>19) Hot Box Pizza
135 S. Chauncey Ave., 765-743-3400</p> | <p>20) India Mahal Fine Indian Restaurant
111 S. River Rd., 765-746-2345</p> <p>21) Jimmy John's Subs
311 W. State St., 765-743-8200</p> <p>22) Khana Khazana Indian Grill
108 Northwestern Ave., 765-743-1223</p> <p>23) Kibu Cafe
111 S. River Rd., 765-743-3190</p> <p>24) Kung Fu Tea
135 S. Chauncey Ave., 765-838-3513</p> <p>25) Lotsa Stone Fired Pizza
316 W. State St., 765-761-4400</p> <p>26) Mad Mushroom
320 W. State St., 765-743-5555</p> <p>27) Maje' Sushi
204 South St., 765-743-7777</p> <p>28) Maru Sushi
102 N. Chauncey Ave., 765-743-2646</p> <p>29) McDonald's
124 E. State St., 765-743-6069</p> <p>30) Metro Cafe
318 W. State St., 765-746-6484</p> <p>31) Miss Sugar
107 N. Chauncey Ave., 765-409-5636</p> <p>32) Noodles & Company
102 N. Chauncey Ave., 765-743-4444</p> <p>33) Noodles & I
111 N. Chauncey Ave., 765-743-1190</p> <p>34) Panda Express
138 Northwestern Ave., 765-743-0105</p> <p>35) Poke Hibachi
112 Andrew Pl., 765-838-2292</p> <p>36) Potbelly Sandwich Shop
117 Northwestern Ave., 765-743-2993</p> <p>37) Qdoba Mexican Grill
139 Northwestern Ave., 765-807-0338</p> <p>38) Red Mango
102 N. Chauncey Ave., 765-743-3300</p> | <p>39) Rice Cafe
128 Pierce St., 765-743-3503</p> <p>40) Subway
135 S. Chauncey Ave., 765-743-0889</p> <p>41) Taco Bell
135 S. Chauncey Ave., 765-743-4433</p> <p>42) Town & Gown Bistro
119 N. River Rd., 765-250-3425</p> <p>43) Triple XXX Family Restaurant
2 N. Salisbury St., 765-743-5373</p> <p>44) Tsunami Japanese Fusion
135 S. Chauncey Ave., 765-743-0606</p> <p>45) Two Fellas Grill
134 W. State St., 765-269-7857</p> <p>46) Vienna Espresso Bar & Bakery
208 South St., 765-743-4446</p> <p>47) Where Else? Bar
135 S. Chauncey Ave., 765-746-1122</p> <p>U) Purdue Memorial Union
101 N. Grant St.</p> <p>1869 Tap Room, 765-494-8989</p> <p>Freshies, 765-494-8931</p> <p>Green Leaf's, 765-494-8879</p> <p>Indian Masala, 765-494-8943</p> <p>La Salsa Fresh Mexican Grill, 494-8895</p> <p>Lemongrass, 765-494-8885</p> <p>Oasis Cafe, 765-494-8887</p> <p>Pappy's Sweet Shop, 765-494-8948</p> <p>Sagamore Restaurant, 765-494-8945</p> <p>Starbucks, 765-494-8879</p> <p>Villa Fresh Italian Kitchen, 765-494-8878</p> |
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FACULTY AND STAFF BIOGRAPHIES



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Craig Anderson

CHIEF OPEPRATING OFFICER, AGRELIANT GENETICS

With 30 years of experience and a passion for helping farmers grow, Craig Anderson brings his strong knowledge of commercial operations, along with his strategic thinking and authentic leadership skills to AgReliant Genetics as the company's chief operating officer.

Craig has been a part of AgReliant Genetics and its legacy companies for the past 30 years. He moved into his current role as the company's COO in 2015. Prior to that, he held positions in all areas of commercial operations, including regional sales manager, brand manager, VP of operations and VP of sales & marketing.

Craig is originally from southeast Minnesota where he grew up on his family's farm. He holds a Bachelor of Science degree in agricultural business from the University of Wisconsin, River Falls.



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Brady Brewer

ASSISTANT PROFESSOR, DEPARTMENT of AGRICULTURAL ECONOMICS,
PURDUE UNIVERSITY

Brady Brewer is an assistant professor in the Department of Agricultural Economics at Purdue University. Brady's teaching responsibilities include the undergraduate agribusiness management course. His research agenda includes the broader topics of agribusiness and profitability, agricultural finance, and production/supply chain issues at the farm level. His extension program includes educating farmers on credit concerns and lending as well as working with the agricultural banks across the state. Courses that he has previously taught include agribusiness management and agricultural finance courses at both the undergraduate and graduate level.

Before joining the faculty at Purdue, Brady spent three years in the Department of Agricultural and Applied Economics at the University of Georgia. While there, he taught undergraduate courses in agribusiness management, agricultural finance and a graduate course in agricultural finance. Brady grew up on a family farm in Oklahoma that raised wheat, soybeans, alfalfa, and cattle. He received a B.S. in agricultural economics and accounting from Oklahoma State University and later earned both his M.S. and Ph.D from Kansas State University in agricultural economics.



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Craig Carter

EASTERN SALES MANAGER, AGRIGOLD

Craig grew up on a corn, soybean and swine farm near Frankfort, Indiana. He has a bachelor's and master's degree in agricultural economics from Purdue University and an MBA from the Kelley School of Business at Indiana University. Craig was an AgriGold intern in college and hired upon undergraduate graduation as a corn specialist in Northwest Indiana. He led AgriGold's expansion into Nebraska and Kansas as a regional sales manager from 2009-2010. Craig served as the sales operations manager from 2011-2016 where he coordinated the brand's geographic expansion, managed five sales regions, led company-wide recruiting efforts, helped launch the Field Advisor program, and oversaw the industry-leading internship program that hired 70+ interns annually. Today, as the eastern sales manager, he has responsibility for all sales efforts and personnel east of the Mississippi River.

As the eastern sales manager at AgriGold, Craig's passions are people and customers. His time is focused on engaging sales teams and customers in the east to develop lasting relationships and grow the brand. AgriGold has a tremendous company culture, a track record of continued growth and success, and a lot of fun!



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Luciano Thomé e Castro

CLINICAL ASSOCIATE PROFESSOR, CENTER FOR FOOD AND AGRICULTURAL BUSINESS

Luciano Castro is a clinical associate professor in Food and Agribusiness Management at Purdue University. He has served as a marketing and sales professor for over 15 years, most recently as a visiting professor in the Department of Agricultural Economics at Purdue and a faculty member in the Business Administration Department at the University of Sao Paulo in Brazil.

Before joining Purdue as a faculty member, Luciano was the executive director of Markestrat in Brazil. There, he worked as a consultant on projects in the marketing and sales area in the crop protection, seed, irrigation, machinery, fertilizer and cattle industries. He is the author of several marketing and sales books and peer reviewed articles in academic journals and case studies.

Luciano earned his doctorate from the University of Sao Paulo in 2008, during which time he came to Purdue on a visiting scholar appointment where he wrote a PhD thesis on ag-input distribution channels and the comparison between America and Brazil. He also earned his master's degree in sales management and bachelor's degree in business administration from the University of Sao Paulo with an extension in Germany at the University of Kiel in 2004. Luciano resides in West Lafayette, IN with his wife, Virginia, and their children, Lais and Natalia.



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Aidan Connolly

CHIEF EXECUTIVE OFFICER, CAINTHUS, and PRESIDENT, AGRITECH CAPITAL

Aidan Connolly is the CEO of Cainthus, an Irish artificial intelligence company using computer vision to monitor animals. Cainthus' technology is identifying and memorizing individual cows, specifically to understand their feed and water intake and track health.

Aidan is also the president of AgriTech Capital, a new company in the field of advisory investment and development of ventures in agriculture focused on both start-ups and existing traditional business development.

He is the author of the recently launched strategic business planning book, *2-1-4-3*.

Aidan previously worked with Alltech for more than 25 years, initially in Ireland, and then based in France, Brazil and the United States. He has traveled for business to over 100 countries, including most recently extensively in China. From 2002 until 2008, Aidan held the position of Vice President of Alltech Europe and then Vice President of Corporate Accounts in Washington, D.C. As the chief innovation officer, he was responsible for the commercialization of Alltech's global research, in addition to continuing corporate account strategy within Alltech.

Aidan is responsible for the highly anticipated Alltech Global Feed Survey, released annually. He has also led the implementation of the Pearse Lyons Accelerator, a late-stage, agri-tech accelerator run by Alltech and Dogpatch Labs, which received over 200 applications from more than 30 countries.

His expertise is in branding, agriculture and international marketing. Aidan is an adjunct professor of marketing at University College Dublin and visiting professor at the China Agricultural University. He is a former member of the European FEFANA organization and the International Food and Agribusiness Management Association (IFAMA).

Aidan received a bachelor's degree in commerce from University College Dublin and a master's degree in international marketing from the Michael Smurfit Graduate Business School, University College Dublin.



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Nathan DeLay

ASSISTANT PROFESSOR, DEPARTMENT OF AGRICULTURAL ECONOMICS,
PURDUE UNIVERSITY

Dr. Nathan DeLay is an assistant professor in the Agricultural Economics Department at Purdue University. His research interests focus on agricultural analytics and production. Nathan is especially interested in how digital agriculture can be leveraged to improve producer decision making, farm policy and rural community development.

Before joining the faculty at Purdue, Nathan graduated with a Ph.D. in Economics from Washington State University in 2018. He previously worked in online advertising while he earned a master's degree in Economics from the University of Colorado Denver. He received his bachelor's degree in Business Administration from Rocky Mountain College in 2009. Nathan grew up in Denver, CO and came to Purdue with his wife, Faith, and their two children.



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W. Scott Downey

PROFESSOR, DEPARTMENT of AGRICULTURAL ECONOMICS and
ASSOCIATE DIRECTOR, CENTER for FOOD and AGRICULTURAL BUSINESS,
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Scott Downey is a professor in the Department of Agricultural Economics, where he teaches courses in sales and marketing. He is coordinator of the sales and marketing degree program. He joined Purdue University on a full-time basis in 2000 after spending 15 years in the financial services industry. He is the lead author of “ProSelling: A Professional Approach to Selling in Agriculture and Other Industries.”

Scott is also an associate director of the Center for Food and Agricultural Business. He teaches in many of the center’s programs. He is a frequent speaker and consultant for agribusiness industry sales teams on professional development topics, including precision selling, sales management and competitive sales strategies. The discovery process he created has been adopted by Fortune 300 companies and has been presented all over the world.

Scott received his bachelor’s degree at Purdue University in 1985 and his MBA from Cal Poly in San Luis Obispo, Calif., in 1991. He completed his doctorate at Purdue in 2007 in consumer behavior, looking at the relationship sales preferences of ruralpolitan buyers.

He has served as an adviser to the Purdue chapter of the American Advertising Federation and helped students found the Purdue Ag Sales and Marketing Club. He is active in the National FFA sales competition and has been active on local boards at United Way and other organizations.

Scott is a fellow of Purdue’s Teaching Academy, which strives to bring together the best teaching faculty from across campus. He is the recipient of the 2012 Richard Kohls Outstanding Undergraduate Teaching Award in the College of Agriculture at Purdue. He won a national teaching award in 2011 from the Agriculture and Applied Economics Association, the service organization for academics in agricultural economics.

His wife, Laura, is a veterinarian and currently heads a business that provides patient drug adherence products to pharmacies.



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Matt Ginder

CHIEF CORE MARKETS OFFICER, COMPEER FINANCIAL

Matt Ginder is the chief core markets officer at Compeer Financial. He also serves on the organization's Young, Beginning, Small Farmer; Asset Liability; and IT Governance committees. Matt oversees the Core Markets team in the sales and delivery of financial services. Matt received his Bachelor of Science degree in Accounting and Master of Science degree in Agribusiness from Illinois State University. He is also a Certified Public Accountant.

After college, Matt held positions in the Feed & Structures and Controller's divisions at GROWMARK, Inc. He joined 1st Farm Credit Services in 1999 as a controller, became the director of finance in 2001, the vice president of financial services in 2003, the senior vice president of marketplace delivery in 2010 and the executive vice president of marketplace delivery in 2014.

He and his wife, Jill, live in Goodfield, Ill., and each have two children. Matt is a Village Trustee for the Village of Goodfield. He also serves in various leadership roles at Trinity Lutheran Church in Bloomington, Ill. His hobbies include watching his children's activities and helping with the family farm.



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Don Goodwin

OWNER AND PRESIDENT OF GOLDEN SUN MARKETING

Don Goodwin is the owner and president of Golden Sun Marketing, providing strategy, business development and marketing services to the fresh produce supply chain from seed to retail. He has enjoyed a successful career of over 40 years, during which he has touched just about every aspect of the supply chain from procurement to wholesale to marketing, giving him a 360-degree view of the food industry. His broad client spectrum includes vegetable breeders, grower/shippers, wholesalers, retailers and The Walt Disney Company.

Don began his career as a graduate of Western Michigan University's Food Distribution Program. For over a decade, Don has had the privilege of attending Harvard's Agribusiness seminar and sat on the Blue-Ribbon Panel for Food Foresight, a forward-looking trend group specializing in agriculture. As such, Don, along with his team, has spent a considerable amount of time researching trends and has become known for providing clients with pragmatic real world recommendations to capitalize on these trends. He is a well-respected speaker at industry events and university symposiums—both nationally and internationally—whose topics have ranged anywhere from trends to differentiating between new products, and from marketing and selling to business strategy and industry collaboration. Don is well known for his strategic planning skills as he has successfully facilitated the planning process for many companies in the supply chain. He is also a member of the advisory board for Titan Farms, the premier peach grower in eastern United States. Don is also an Advisor for Verdant Partners, working on mergers and acquisitions in the fresh produce space.

Don has served board positions at two non-profit organizations, as Executive Committee member of The Produce For Better Health Foundation and is currently a member of the Advisory Board for Titan Farms.

Before founding Golden Sun Marketing, Don led Target's produce division with the rollout of SuperTarget in 1998 and served as the chief operating officer of Green Giant Fresh where he built retail and grower partnerships to expand the Green Giant brand. Don has also received many accolades throughout his career, including being honored by The Packer 25: Most Influential Leaders in the Produce Industry.

In addition to offering his strategy and expertise to the industry, Don enjoys golfing, boating and spending time with his wife Roxanne, daughter Bella and pets Sadie and Sofia in his beautiful hometown of Mound, Minn.



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Allan W. Gray

EXECUTIVE DIRECTOR, CENTER for FOOD and AGRICULTURAL BUSINESS and
LAND O'LAKES CHAIR in FOOD and AGRIBUSINESS,
DEPARTMENT of AGRICULTURAL ECONOMICS, PURDUE UNIVERSITY

Allan Gray serves as executive director of the Center for Food and Agricultural Business and director of the MS-MBA in Food and Agribusiness Management. He joined the agricultural economics faculty at Purdue University in August 1998. Allan currently holds the position of Land O'Lakes Chair in Food and Agribusiness.

As director, Allan provides strategic direction for the center and MS-MBA in Food and Agribusiness Management, a dual-degree, online program offered in partnership by Purdue and Indiana University. He works with food and agribusiness managers in the center's professional development seminars and workshops, while also continuing to teach strategic agribusiness management in the undergraduate, master's and MS-MBA programs.

Allan's research interests are agribusiness management, strategic planning, decision making in uncertain environments and simulation. He also works on the Large Commercial Producer Survey, conducted every five years by the center, which explores the attitudes and buying behaviors of large commercial producers. In addition, Allan has researched the management implications of real-options thinking, the risks and returns to alternative vertical business relationships and the human capital constraints of agribusinesses.

He has won numerous awards, including the American Agricultural Economics Association's (AAEA) Distinguished Extension/Outreach Program Award, the Purdue University Dean's Team Award and the United States Distance Learning Association's Excellence in Distance Teaching Award. In 2012, he received the inaugural Early Career Leadership Award from the National Association of Agricultural Economics Administrators, a subsection of AAEA.

A native Texan, Allan and his wife, Stephanie, have two daughters and a son.



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Michael A. Gunderson

DIRECTOR, CENTER for FOOD and AGRICULTURAL BUSINESS,
and PROFESSOR, DEPARTMENT of AGRICULTURAL ECONOMICS,
PURDUE UNIVERSITY

Michael Gunderson is passionate about agriculture and improving the management competencies of agribusiness professionals. He is committed to lifelong learning and professional development. He conducts research that aims to improve the efficiency of the food and agribusiness value chain recognizing that the chain is only strong if all links are. Mike enjoys tackling issues at the intersection of growing a sustainable food supply profitably. He has published in peer-reviewed journals, trade magazines, and in the press.

He has taught over 1,500 undergraduate and graduate students and more than 2,000 agribusiness professionals in executive education seminars. He has been recognized by the Agricultural and Applied Economics Association, the North American Teachers and Colleges of Agriculture, the UF College of Agricultural Life Sciences, Purdue University, and the Southern Agricultural Economics Association for his outstanding teaching.

Mike earned his doctorate from Purdue in 2006 and holds a master's degree in agricultural economics from Cornell University and a bachelor's degree in agribusiness, farm and financial management from the University of Illinois. He is married to Alee Lynch Gunderson. They enjoy going on hikes with their children, Jarvis, Alma and Elodee and their two dogs, as well as following college sports and traveling internationally.



Phil Harris

PRESIDENT and CO-FOUNDER, RIPE.IO

Phil Harris is a co-founder at ripe.io, deploying the “Blockchain of Food” that provides solutions to help answer what’s in food, where it’s been and what’s happened to it. ripe.io’s mission is to provide “Transparency in every Byte” from farm to fork to help customers improve their intelligence and insights on the food supply chain through the service of automation and the application of blockchain and IoT. Phil brings over 25 years of experience in global financial technology with roles in sales, product, corporate and business development, spanning innovative companies such as Nex, Blockstack.io, Nasdaq, 360T, CME Group and Lava Trading.

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David Hunt

CEO, CAINTHUS

David Hunt started his career as a corporate banker before leaving to enjoy a more meaningful role in agriculture.

David has long been fascinated by the opportunities to exploit emerging technology in various agricultural areas.

He has provided consultancy for the Advanced Research Projects Agency of the United States Department of Energy on sustainable agriculture and the European Union Agriculture and Rural Development Cabinet on agricultural legislation and entrepreneurship. He is also an accomplished public speaker, chiefly discussing the intersection of technology and agriculture.

David sits on the Exponential Advisory Board of Singularity University in Silicon Valley, California, USA. Singularity University was founded by Peter Diamandis and Ray Kurzweil to educate people about the impact that exponentially improving technologies can have on the world.



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Peter Votkjaer Jorgensen

VENTURE PARTNER, MAERSK GROWTH

Peter Votkjaer Jorgensen is a venture partner for Maersk Growth, a launchpad for new ventures that invests in the future stars of trade. Maersk Growth works to break down barriers for global trade and secure supply chain, addressing major challenges in the industry such as food waste.

Peter is an experienced senior leader, developing, driving and executing business opportunities and building long lasting relationships with customers, business partners, governments and key stakeholders. He has a proven track-record within multiple functional disciplines, including business development, legal, corporate finance and commercial. Peter was a TEDxFultonStreet speaker and currently serves as a member of the Board of Directors for ripe.io, as well as a board observer for many organizations.



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Jayson Lusk

DEPARTMENT HEAD AND DISTINGUISHED PROFESSOR, DEPARTMENT OF AGRICULTURAL ECONOMICS, PURDUE UNIVERSITY

Jayson Lusk is Distinguished Professor and Head of the Department of Agricultural Economics at Purdue University. He has a BS in Food Technology and a PhD in Agricultural Economics from Kansas State University. He was previously Regents Professor and Willard Sparks Endowed Chair in the Department of Agricultural Economics at Oklahoma State University and Assistant Professor at Mississippi State and Purdue.

Lusk is a food and agricultural economist who studies what we eat and why we eat it. Since 2000, Lusk has published more than 200 journal articles in peer reviewed journals, including several of the most cited papers in the profession. He has served on the editorial councils of eight academic journals including the *American Journal of Agricultural Economics*, the *Journal of Agricultural and Resource Economics*, and the *Journal of Environmental Economics and Management*, and *Food Policy*. He was elected to and served on the executive committees of the Southern Agricultural Economics Association, the Western Agricultural Economics Association, and most recently the Agricultural and Applied Economics Association for which he served as president. Lusk was named a fellow of the AAEA in 2015.

In 2007, Lusk co-authored a book on experimental auctions and coauthored an undergraduate textbook on agricultural marketing and price analysis. In 2011, Lusk released a book co-authored with Bailey Norwood on the economics of farm animal welfare and also co-edited the *Oxford Handbook on the Economics of Food Consumption and Policy*. In 2013 he published the popular book, *The Food Police*. His latest popular book is *Unnaturally Delicious: How Science and Technology are Serving up Super Foods to Save the World*.



Joe Messer

CEO, PURE GREEN FARMS

Joe Messer is the CEO of Pure Green Farms, located in South Bend, IN and an associate professor of entrepreneurial studies at Manchester University. He is an experienced entrepreneur and executive with a demonstrated history in the horticulture, medical and higher education industries. Joe is a business consultant who helps firms to develop and enhance the core areas of negotiation, business planning, strategy and employee coaching. He received his bachelor's and master's degrees from Purdue University.

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Marcos Fava Neves

PROFESSOR OF PLANNING AND STRATEGY, UNIVERSITY OF SÃO PAULO SCHOOL OF BUSINESS, BRAZIL

Marcos Fava Neves is an international expert on global agribusiness issues and a part-time professor of planning and strategy in the University of São Paulo School of Business and FGV Business School in Brazil. He graduated as an agronomic engineer from ESALQ/USP and earned his master's degree and doctorate in management from the FEA/USP School of Economics and Business. Marcos completed postgraduate studies in European agribusiness at ESSEC-IGIA in France and in chains/networks at Wageningen University in the Netherlands. In 2013, he came to Purdue University as a visiting international professor where he maintains linkage as a permanent international adjunct professor. Since 2006, Marcos has also served as an international professor at the University of Buenos Aires, Argentina.

Marcos has specialized in strategic-planning processes for companies and food chains and serves as a board member for both public and private organizations, including more than 10 international boards over the past 15 years. In 2004, he created the “Markestrat Think Tank” with his business partners, which now employs over 60 people working on international projects, studies and research in strategic planning and management for more than 250 agri-food business organizations. Some of these projects were important in suggesting public policies for food chains that were implemented in Brazil with economic and social impacts.

In 2008, Marcos became CEO of Brazil's second-largest biofuel holding company, a position he occupied until returning to the University of São Paulo and Markestrat in 2009. He has also advised over 30 doctorate dissertations and master's theses. Marcos has helped to provide around 1,200 undergraduate degrees in business administration by teaching approximately 120 courses to undergraduate students at the University of São Paulo.

Strongly focused on supplying simple and effective methods for business, Marcos has published more than 100 articles in international journals and has been an author and editor of 63 books by 10 different publishers in Brazil, Uruguay, Argentina, South Africa, Singapore, Netherlands, China, the United Kingdom and the United States. He is also a regular contributor for China Daily Newspaper and has written two case studies for Harvard Business School, one for Purdue and five for Pensa/University of São Paulo. Marcos is recognized as the Brazilian academic with the largest number of international publications about orange juice and sugar cane chains and one of the top three most cited Brazilian authors in the area of food and agribusiness. He has reached more than 5,000 citations in the Google Scholar index.

Marcos is an active speaker and has received 150 recognitions from Brazilian and international organizations. He is considered a “Fellow” of the International Food and Agribusiness Management Association.

Coming from a family of farmers, Marcos is a worldwide defender of agriculture and farmer's roles in the development of society. Together with his parents, Marcos is one of the creators and maintainers of Mucapp, a non-governmental organization that has built more than 450 houses for families in Brazil facing unfavorable conditions over the last two decades. He and his wife, Camilla, have three children: Beatriz, Julia and Cecilia. Marcos also enjoys sports and classic cars.



Daniel Padrão

CHIEF OPERATING OFFICER, SOLINFTEC

Daniel Padrão is Chief Operating Officer for Solinftec, overlooking digital-ag integration for over 20 million acres of crops worldwide. With 10 years of experience, he joined Solinftec five years ago after managing an agriculture operation in Brazil that became one of the first real-time data-driven farms in the world. Solinftec is a global leader in digital agriculture. The company develops solutions by bringing together the best in class technologies in IoT, telecommunications and data science to support farmers making real-time decisions, increasing farm efficiency and reducing environmental impact.

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Johnny Park

CEO, WABASH HEARTLAND INNOVATION NETWORK (WHIN)

Johnny Park is the CEO of Wabash Heartland Innovation Network (WHIN), a consortium of 10 counties in north-central Indiana devoted to developing the region into a global epicenter of digital agriculture and next-generation manufacturing by harnessing the power of internet-enabled sensors. Prior to WHIN, Johnny founded, scaled and led a successful exit of an agriculture technology company, Spensa, focused on smart IoT devices and data analytics to help growers better manage agronomic pests such as insects, weeds and disease. Spensa was named by Forbes as one of the Top 25 Most Innovative Ag-Tech Startups in 2017. Before Spensa, Johnny was a faculty member in the School of Electrical and Computer Engineering at Purdue University where his research spanned various topics on robotics, machine learning and sensor networks. Johnny received his BS, MS and Ph.D. degrees from the School of Electrical and Computer Engineering at Purdue University.



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Leandro Pinto

CO-OWNER, MANTIQUEIRA

Leandro Pinto started his business in Brazil at only 18 years old in Itanhandu with approximately 30 thousand birds. Over 30 years ago, he sold his old car and truck to buy his first chickens—the first step in establishing the Mantiqueira Group, a company that produces more than 6 million eggs per day.

When a friend became too ill to run his farm, Leandro took over the business and housed his chickens in a shed. In the beginning, his operation only sold to a small audience with orders for local farmers, bakeries and restaurants.

In 1989, Leandro set up his first own farm with 70,000 chickens and later began heavily investing in European technology for his sheds. Soon after, he signed a contract with a large supermarket chain in Rio de Janeiro that forced him to adapt the entire production of Mantiqueira to meet the new demands.

In 1999, Leandro added a business partner to his company. Money from trading was used to reinvest in the expansion of Mantiqueira, which tripled its production from previous periods. In 2007, Leandro purchased an area in Mato Grosso to build his largest farm yet. It featured over 50 warehouses and was classified by an American consultancy survey as one of the largest farms in Latin America.

The move allowed Mantiqueira to gain customers from all over Brazil and other countries around the world. The company now sells to the entire value chain with its main markets being in the North and Midwest of its national territory. Today, Mantiqueira has 4 units; two in Minas Gerais, one in Mato Grosso and one in Rio de Janeiro. Together, the units total over 11 million birds and employ over 2,200 people.



Matthew Strongin

CHIEF FINANCIAL OFFICER and CO-FOUNDER, SUSTAINABLE BIOPRODUCTS

Matthew Strongin brings extensive experience in startup commercialization, financing and strategy. Previously, Matthew was an investor at First Green Partners, an early-stage venture capital firm founded in partnership with Warburg Pincus, a global private equity firm. There, he focused on investments in food/ag, energy and chemicals. Matthew started his career in investment banking and holds a degree in physics from Carleton College.

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Jay Theiler

EXECUTIVE DIRECTOR OF MARKETING, AGRIBEEF CO.

Jay Theiler joined Boise-based *Agri Beef Co.* as the marketing director for the company's Snake River Farms subsidiary in 2001.

Since joining the company, Jay has expanded his role for all of Agri Beef Co.'s marketing programs, including development of new beef brands, value-added products and most recently, leading the company's e-commerce initiative. Under his leadership, the company has launched several other high-quality fresh beef brands, including Double R Ranch Northwest Beef, a repositioned St. Helens beef brand, and a beef brand geared exclusively toward Hispanic consumers, *Rancho El Oro*. Jay has extensive experience in consumer packed goods and brand development.

Currently, Jay serves on the USMEF's Board of Directors as Exporter Committee Chair, as well as the Idaho District Export Council and One Stone, a Boise-based organization supporting young people's involvement in philanthropy. He is also a current director for Bogus Basin Ski Resort and Recreational Association, a non-profit 501(c)(3), and a past director of the Idaho Beef Council, serving in that capacity for six years. Jay was involved in helping the industry set its most recent strategic priorities through his participation with the NCBA's Long Range planning committee.

Prior to joining Agri Beef Co., Jay held positions with Jacobs-Suchard, a German coffee and confectionary company, HJ Heinz's Ore-Ida division and Syngenta, a world-wide leader in agribusiness.

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Controlled Environment Agriculture: Disruption in the California Leafy Greens Industry?

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This case study was prepared by Don Goodwin, President/Owner, and Tom Thompson, Vice President/Owner, Golden Sun Marketing, as the basis for seminar discussion. No part of this publication may be reproduced or transmitted in any form without written permission of the University of California, Davis.

Ninety percent of the leafy greens consumed in the United States and Canada are grown outdoors in California and Arizona. In Monterey County, California, leafy greens are the highest-value agricultural crop, representing \$830 million in revenue in 2017 (Monterey County, California, Crop Report, 2017). In the same year, leafy greens were planted on more than 60,000 of the county's 393,315 total acres dedicated to farmland. This crop alone fulfills about six months of the demand for both food service and retail in the U.S. and Canada. According to the Leafy Greens Marketing Association, the strong demand for and high value of this crop has directly affected the agricultural land values in the county.

The California leafy greens industry has faced a number of challenges in recent years. They include availability and cost of farm labor, increased government regulations, rapidly escalating trucking costs, and highly publicized product recalls.

On top of these mounting challenges looms a new competitive threat for the leafy greens industry in California in the form of Controlled Environment Agriculture (CEA) operations that are sprouting up in major metropolitan areas across the United States. Significant investments in this space are coming from a number of private equity firms as well as from notable backers such as Jeff Bezos, IKEA, and the crown prince of Dubai. In addition, the most recent farm bill has an allocation of funds to open the USDA Office of Urban Agricultural and Innovative Production. This is the first time the farm bill has allocated monies dedicated to indoor agriculture.

While the exact number of CEA-based businesses currently in operation is not clear, some analysts estimate more than 50 facilities are open or under construction across the United States. Many of these operations are located in the Midwest or eastern United States in close proximity to densely populated areas. For example, Minnesota has four CEA operations growing leafy greens within one hour of Minneapolis, none of which existed five years ago.

The sudden availability of capital isn't the only factor driving the rapid expansion of CEA leafy greens operations. The cost and effectiveness of the light-emitting diode (LED) has improved significantly in recent years and is expected to continue to significantly outperform other lighting solutions, allowing for CEA operations to operate more efficiently with higher yields (Table 1). Also, transportation costs have increased nearly 40 percent since 2002, driving up the delivered cost of California-grown leafy greens (Table 2). These and other factors are driving the increase in the number of CEA leafy greens operations across the United States. In 2018, only

5 percent of CEA operations were dedicated to supplying leafy greens (Agrilyst, 2018), yet it is estimated that 65 percent of CEA expansion will be in the leafy greens category (USDA, 2014).

The purpose of this case is to explore the opportunities and challenges facing the CEA leafy greens industry and the potential for CEA operations to disrupt the California leafy greens industry.

Challenges and Opportunities Facing CEA-Grown Leafy Greens

The CEA leafy greens industry faces both significant challenges and competitive advantages when compared to the California leafy greens industry. CEA will likely have winners and losers as a steep learning curve confronts the players in their path to profitability. The potential success of CEA could have a considerable impact on California leafy greens players and land values in Monterey County, other areas of California, and beyond.

Challenges Facing CEA Leafy Greens Operations

Challenge 1 – CEA operations are facing profitability challenges, with nearly 50 percent of operations self-reporting that they have yet to reach profitability (Agrilyst, 2017). Players in this industry are focused maximizing yields, automating to reduce labor, and finding the right balance of products to satisfy retail and food service demand. Some operations do not have founders or leaders with any produce-industry experience, which may be contributing to delays in achieving efficiency and profitability.

Challenge 2 – Competition from national brand salad companies is fierce, with their experience at winning the business and shelf space. Most relationships between processors and the retailers who carry their bagged salad products are contractual, with many containing rebates and clauses to limit in-store competition. These national brand companies are very adept at maintaining shelf space and encouraging frequent promotions to help grow sales in the category. They have made substantial investments in new product development and frequently launch new mixes, pack styles, and other value-added formulations.

Challenge 3 – With increasing pressure on reducing labor to drive profitability, CEA operations are turning to automation. The largest cost drivers in the labor category are

harvesting and packing. Some CEA operations have included automation in their original build-outs, while others race to adapt current operations. The ability to automate and the cost to do so vary widely, depending on the type of operation. The three most common growth systems—hydroponics, aeroponics, and aquaponics— included automation in their original build-outs. The most advanced setups are able to automate from seeding to harvesting, which affords them the ability to claim that no human hand has touched your lettuce until you open it in your kitchen.

Challenge 4 – Overall yield and predictability of yield are significant challenges for CEA operations. Many industry participants report underestimating this challenge after opening their operations (Agrilyst, 2018). The vegetable seed industry has been slow to embrace this space as they try to understand not only the differences in temperature, humidity, and pest pressure but also the correct lighting protocol to maximize production. A few operations have become organically certified, creating additional challenges for plant breeders as they try to determine the correct formula for organic fertilizers.

Opportunities for CEA Leafy Greens Operations

Opportunity 1 – Consumers are seeking more locally grown foods as they express their values through their purchasing power. They are looking for foods that are sustainable and demonstrate transparency. CEA operations are often located in the communities they serve, making them better positioned than the California growers to capitalize on this trend.

Opportunity 2 – Freight rates have escalated rapidly, affecting the delivered cost of California- grown product. Locations farthest from California enjoy the greatest freight advantage. Operations located on the East Coast are reporting a \$6–8 per case freight advantage compared to California-grown product. With newly implemented regulations restricting drivers and expected increases in fuel costs, freight rates are likely to continue escalating in the near and longer term.

Opportunity 3 – Retail and food-service buyers continue to seek simplified and streamlined supply chains. As their customers demand more locally sourced products, buyers are embracing the simplicity of buying leafy greens with one- to two-day lead times. This can be compared to four- to 10-day lead times for product shipped from California. CEA buyers are reporting lower inventories, fresher product, and lower shrink rates.

Opportunity 4 – From the spinach crisis of 2006 through the two recalls of romaine lettuce in 2018 (Yuma and Central Coast), consumers’ confidence in the safety of leafy greens has been waning, and buyers are responding by seeking a supply chain with less risk. The cost of each of these recalls has exceeded \$100 million across the industry. CEA operations are positioned to benefit from this shift in consumer confidence, as their operations appear to be safer sources of leafy greens.

Major Types of CEA Operations and Structures

CEA operators have to choose between various types of growing systems and structures. Key factors to consider include initial investment, product mix, yields of leafy green types, and overall operating costs.

Growing Systems

Hydroponics – Plants are grown in water as opposed to soil. Nutrients are fed through channels or pools to feed the plant roots.

Aeroponics – Plant roots are suspended in air and misted with a solution of nutrients.

Aquaponics – Aquatic species, mostly fish, are grown in tanks adjacent to a leafy greens growing operation. The biomass produced by the fish is used as nutrients for the leafy greens. Marketable crops include both fish and leafy greens. Interdependence exists between the production and sales rate of fish and success of the leafy greens segment.

Soil-Based – Plants are grown in soil and nutrients are typically applied through drip methods.

Growing Structures

Glass – This is a fully enclosed structure that is transparent. Plants are grown using natural light but may be supplemented with artificial light.

Indoor Farms – This is a fully enclosed structure that is opaque. Plants are grown using 100 percent artificial light sources.

The most common type of growing system is hydroponics (49 percent), followed by soil-based (24 percent), aquaponics (15 percent), and aeroponics (6 percent). The most common structure is glass/poly (47 percent), followed by indoor vertical farm (30 percent) (Agrilyst, 2018). In comparing revenue per square foot, aquaponics ranked highest at \$53.89, followed by indoor farms at \$41.16 and hydroponics at \$21.15 (Agrilyst, 2018).

A Look at the Minneapolis Market

In 2000, Minneapolis retailers primarily offered their consumers three national-brand choices of value-added salads. Fresh Express and Dole were available in conventional form, while Earthbound Farms was the primary organic brand in the market. A small amount of private-label product conventionally grown by California companies was also available. As private-label suppliers expanded both conventional and organic offerings, companies (brands?) such as Taylor Farms, Ready Pac, and Organic Girl have gained market share with Minneapolis retailers in the last 10 years. Since 2014, six CEA operations growing leafy greens have also gained distribution in the Minnesota market (Figures 1 and 2). Of the six, the following three are the main players:

Urban Organics – Based in St. Paul, Minnesota, Urban Organics is an indoor aquaponics operation serving the retail market with a range of leafy greens packed in 5-oz. clamshells. All products are organically grown.

Revol Greens – Based in Medford, Minnesota, Revol Greens is a two-acre, highly automated, hydroponic grower of conventional leafy greens. The company recently announced an expansion to 10 acres as it focuses on capturing market share from conventional growers in the leafy greens category. Its products are offered in 4.5-oz. clamshells.

Gotham Greens – Gotham is a multi-location CEA operation growing conventional leafy greens. Its distribution in Minnesota comes through Whole Foods and is served out of Gotham's Chicago-area plant. The company offers its products in 5-oz. clamshells.

According to syndicated data from Information Resources, Inc. (IRI), the Minnesota, Iowa, and Wisconsin markets have estimated sales of \$252 million in the packaged-salad category. The current production potential of the six CEA operations in this area is estimated at \$73 million,

which would reflect a 29 percent share of the three-state market. Local retailers (Figure 3) report adding local CEA items while discontinuing some California-grown products. With the planned expansions of CEA growers in the Midwest, locally grown lettuce could conceivably capture a majority share of the retail market within five years in this three-state area.

Food Safety Implications of Leafy Greens Grown Indoors versus Outdoors

In 2018, consumers faced two well-publicized recalls of romaine lettuce. In the spring, a grower in Yuma, Arizona, was identified as a potential source. Just before Thanksgiving, a second recall occurred that eventually implicated a grower in central California. In both cases, the growers' water supply was identified as a likely source of contamination. It took weeks to sort this out. The media reported on it daily, and the initial government statements said romaine, regardless of growing region, may not be safe to eat. No doubt, consumers were confused. Romaine growers everywhere lost sales, incurred costs, and endured difficulties in satisfying their retail and food-service customers.

CEA growers and open-field growing and packing operations in the western United States both go through similar food-safety certifications. Yet, the risk profiles of the two types of operations are vastly different. CEAs have lower potential contamination from land animals or birds. Their water source is more controlled and frequently tested. CEAs also have indoor harvesting operations that give them a greater ability to control the work environment, as compared to outdoor operations. In some cases, CEAs have been able to automate their harvest operation fully, eliminating any human contact throughout the growing or harvesting process.

Another CEA advantage is related to washing. Western growers wash their product as many as three times before shipping. Most CEA growers harvest directly into the shipping container with no wash step. The stark differences between the two types of growing and packing operations have several potentially game-changing implications.

The Growing Opposition to Organic Certification for CEA Farms

Within the last year, organizations such as the Organic Trade Association and Center for Food Safety have come out against allowing produce that is not grown in soil to gain organic certification. Opponents contend that one of the key pillars of an organic certification is providing for a regenerative process to improve soil health. The Real Organic Project was started by a group of farmers who wanted to create a higher level of organic certification that includes assuring that soil health is intact. However, most consumers who purchase organic products do so to avoid ingesting pesticides and have limited or no information or interest in soil health.

Because of the highly controlled environments, CEA growers naturally use fewer, if any, pesticides. Many CEA growers would consider eliminating the use of synthetic fertilizers if organic certification were possible. Some indoor growers have lamented that this move to “real organic” is nothing more than a protectionist move to limit competition. One has to wonder if the “real organic” movement will just confuse the consumer while providing little incentive for consumers to switch from conventionally grown product. Focusing on organics will likely continue to be challenging for CEA operations.

Marketing Value-Added Salad

The national brands offer little to no consumer marketing or brand building beyond slotting fees, merchandising support, off-invoice allowances, and rebates to encourage their customers to advertise the category. Over the years, the salad category has become ultra-competitive with thinning margins, and any real funds for brand development have nearly been eliminated. Slotting allowances and rebates have generated a significant profit margin for the retailer.

The marketing of CEA operations has taken two paths. Revol Greens was formed by two former Bushel Boy tomato executives and a former Target Corporation executive in Medford, Minnesota. They built a 2.5--acre greenhouse that is highly automated, grows crops conventionally that are offered in clamshells. Their primary competition is the national brand supplier.

Beyond some local public relations, their marketing strategy has mostly focused on price promotions (e.g., coupons and trade allowances) as well as a strong social media presence. They also have provided demos and partnerships with companies such as Salad Girl, a Minnesota salad dressing company. They recently announced a plan to expand their growing operation to 10 acres. Their focus will be on high volume and lowering their production costs per package. They are positioning themselves to take a leadership place in the market against conventionally grown national brands.

Urban Organics has taken an approach similar to a successful local craft brewery. They have been deliberate in building their story and their brand, focusing on high-profile partnerships, strong public relations, and meet-the-maker demos at local stores. You can find their branded greens at local medical clinics and in the cafeteria of a local hospital system, where messaging on the Urban Organics story is shared with patients and consumers via serving trays and tabletop signage. Urban Organics offers varieties grown exclusively for a handful of Minneapolis-area restaurants, including Spoon and Stable, a James Beard award-winning restaurant.

Buyers Seek Simplicity and Reliability

As retail becomes more competitive and, in some ways, more complex, retail buyers are seeking simplicity. They are being challenged to reduce shrink and improve in-stocks while maintaining broad assortments. CEA operations offer a significant competitive advantage, as they are often located within one to four hours of a retailer's warehouse. This affords the retailer the opportunity to order with lead times of just one to two days, lower inventory levels, and improve freshness. Rick Steigerwald, senior vice president of Perishables for Lund Food Holdings Inc., stated it this way: "We can get product in 24 hours. This is meaningful to us. Our California product requires a seven-day lead time. We can be more precise with orders and maintain lower inventory. This has led to lower shrink levels." (Figure 4)

Seed Industry Opportunity

The vegetable breeding industry has long focused on open-field production. Vegetable breeders work on challenges such as disease resistance, adaptability to a wide range of growing areas, and performance at varying temperatures. Many—but not all—of these issues

are eliminated or significantly minimized when growing indoors. The pipeline to develop new varieties can be five to 15 years, depending on species. As the indoor agricultural space explodes in North America, seed breeders are scrambling to play catch-up.

Two of the highest-volume leafy greens are romaine and spinach, which are both used widely in food service and retail. Each item presents unique challenges when grown indoors. When romaine is grown indoors, it tends to be smaller with a softer texture as compared to that grown in open-field production. Spinach is susceptible to downy mildew in the high-humidity CEA environment. Breeders will undoubtedly solve these challenges, which will expand the potential of CEA-grown leafy greens significantly.

Pure Green Farms

In early 2020, private equity investors in Ceres Partners will open their first Controlled Environment Agriculture operation in South Bend, Indiana. This new company, Pure Green Farms, will be a highly automated glasshouse operation that will produce leafy greens for retail stores, food-service suppliers, and institutional customers within a 300-mile radius.

The team at Ceres Partners spent three years researching CEA models, including vertical farms, container farms, and traditional greenhouse operations as well as multiple growing systems. They also looked at investing in several existing operations throughout the United States. They were compelled to enter this space for several reasons. They saw the potential to disrupt a supply chain faced with growing concerns about food waste, water usage, shelf life, and ongoing food-safety concerns. They saw indoor ag as a path to invest in fresh produce while reducing the volatility caused by nature. The opportunity to eliminate some pricing risk through products sold mostly on year-round contracts was also compelling.

As they assessed the opportunity, they became keenly aware of the rapid rollout of several operations across the country. They felt it was important to invest in systems and automation that would position the company as a low-cost competitor through investments in systems and automation. The new Pure Green Farms will be automated from planting to harvest to packing as they produce mostly clamshells for retail customers and bags for food service and institutional buyers. Their goal is to produce a clamshell of mixed greens that no human hand will touch until it gets to the consumer's kitchen.

Joe Messer, CEO of Pure Green Farms, explained, “We have taken several steps to assure we can maximize productivity. We chose the horizontal greenhouse over the vertical indoor farm as we knew we could automate it more effectively. Our growing operation will only require 1.5 full-time employees per acre.

“This automation and other steps we are taking will allow us to deliver the greens seven days fresher than our California competitors and at more competitive prices. We will use 90 percent less water, and our product will travel 2,500 fewer miles,” said Messer. “Our energy costs are far less than indoor operations as we supplement with artificial light only when natural light is not sufficient.”

Ceres Partners plans to build out the Pure Green Farms operation in South Bend in four phases. Phase one will include a four-acre growing operation and a one-acre production facility. The initial investment will be about \$25 million, with excess post-harvest capacity in anticipation of future growth. Phases two, three, and four will be growing operations of four acres each. The production building has been scaled to handle production from all 16 acres. Each four-acre operation has the potential to produce 6,000 pounds of leafy greens per day. At full capacity, the company will be producing 24,000 pounds of leafy greens daily. South Bend’s location—situated between Chicago, Detroit, Indianapolis, Cincinnati, and Columbus—provides a densely populated area in which to achieve further efficiencies over California-grown product.

As Messer stated, “We don’t need to win everywhere. We will focus on the customers in our core market, communicating that we are local and more sustainable than our competitors. We have some further product innovation planned which should make our offer to retailers very compelling.”

Summary and Discussion Questions

CEA-grown leafy greens production is expanding rapidly across the United States. While profitability challenges remain a paramount concern, it appears consumer trends, the rising costs of California-based agricultural production, increasing transportation costs, and significant investments in the CEA space will position indoor growers to capture notable market share of the leafy greens market in some areas of the United States. The shift in the industry brings to light a number of questions:

1. Which CEA models will thrive?
2. In the future, will most processing plants have some type of CEA operation adjacent to their facility?
3. Will retailers vertically integrate on a large scale by opening their own CEA operations?
4. Is the CEA movement just a blip on the competitive radar, or will it truly disrupt the California leafy greens industry and capture a notable market share of the leafy greens category?
5. Will consumer demand for local or food safety concerns be more of the driving force behind the growth of CEA?
6. What is the long-term impact on land values in Monterey County, California?

Table 1: LED Efficacy and Cost

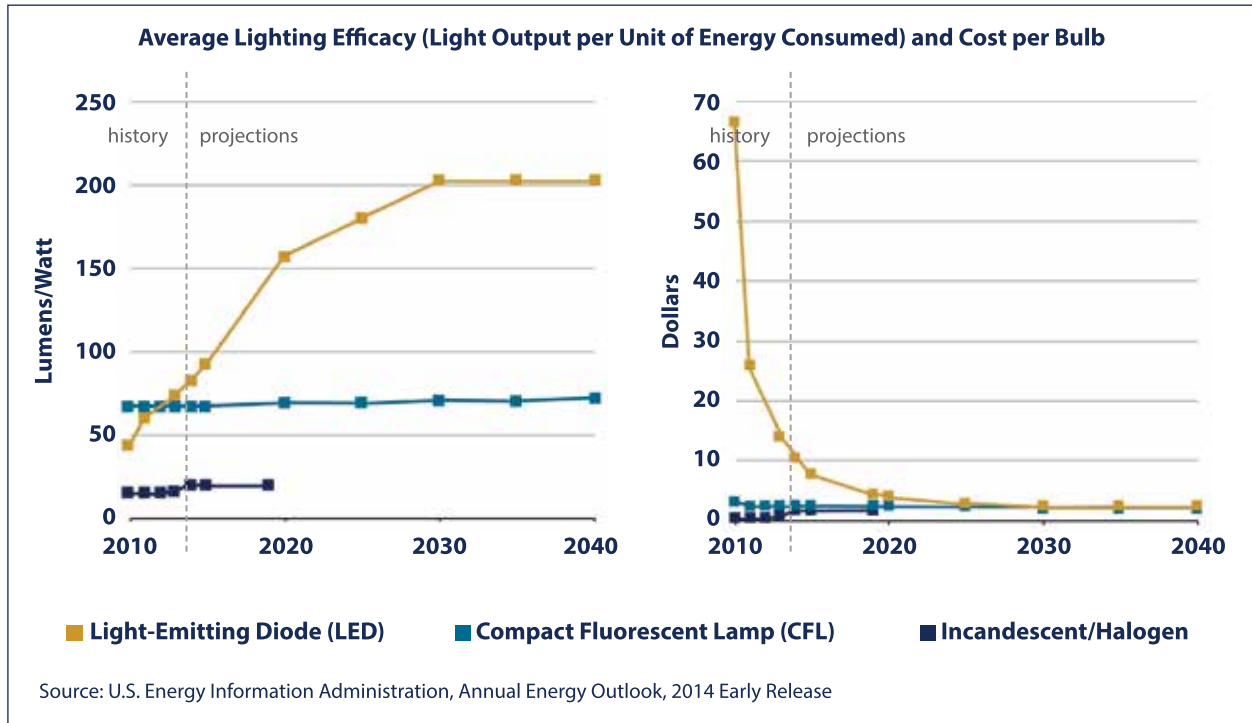


Table 2: Transportation Costs

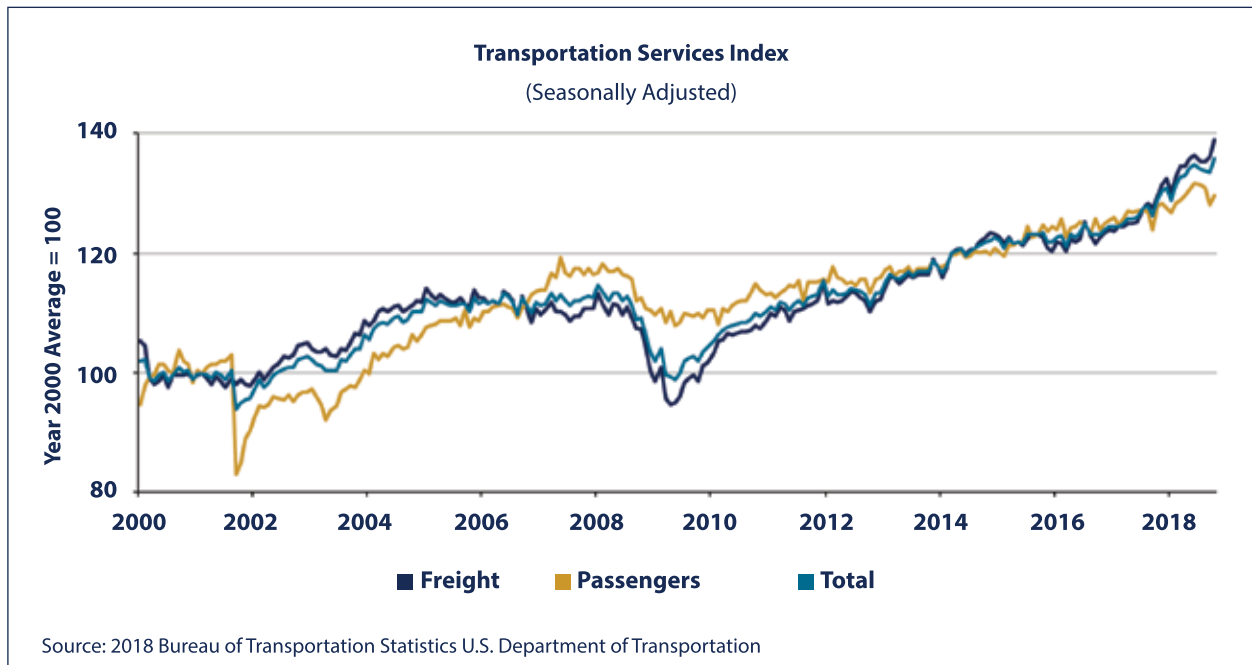







Figure 1: Midwest Value-Added Salad Players

Conventionally Grown National Brands	Organically Grown National Brands	CEA Grown — Conventional	CEA Grown – Organic
			
			
			
			
			

Figure 2: Value-Added Salad Companies, Minneapolis-St. Paul Area

	Background	Method	Size	Model
	Founded in 2010 in Baldwin, WI	Conventional	27,000 sq. ft.	Low-tech hydroponic greenhouse
	Founded in 2015 in Faribault, MN	Conventional	45,000 sq. ft.	Indoor aeroponic vertical farm
	Founded in 2017 in Medford, MN	Conventional	108,900 sq. ft.	High-tech hydroponic greenhouse
	Founded in 2017 in Hixton, WI	Organic	123,000 sq. ft.	High-tech aquaponic greenhouse
	Founded in 2014 in St. Paul, MN	Organic	87,000 sq. ft.	Indoor aquaponic vertical farm

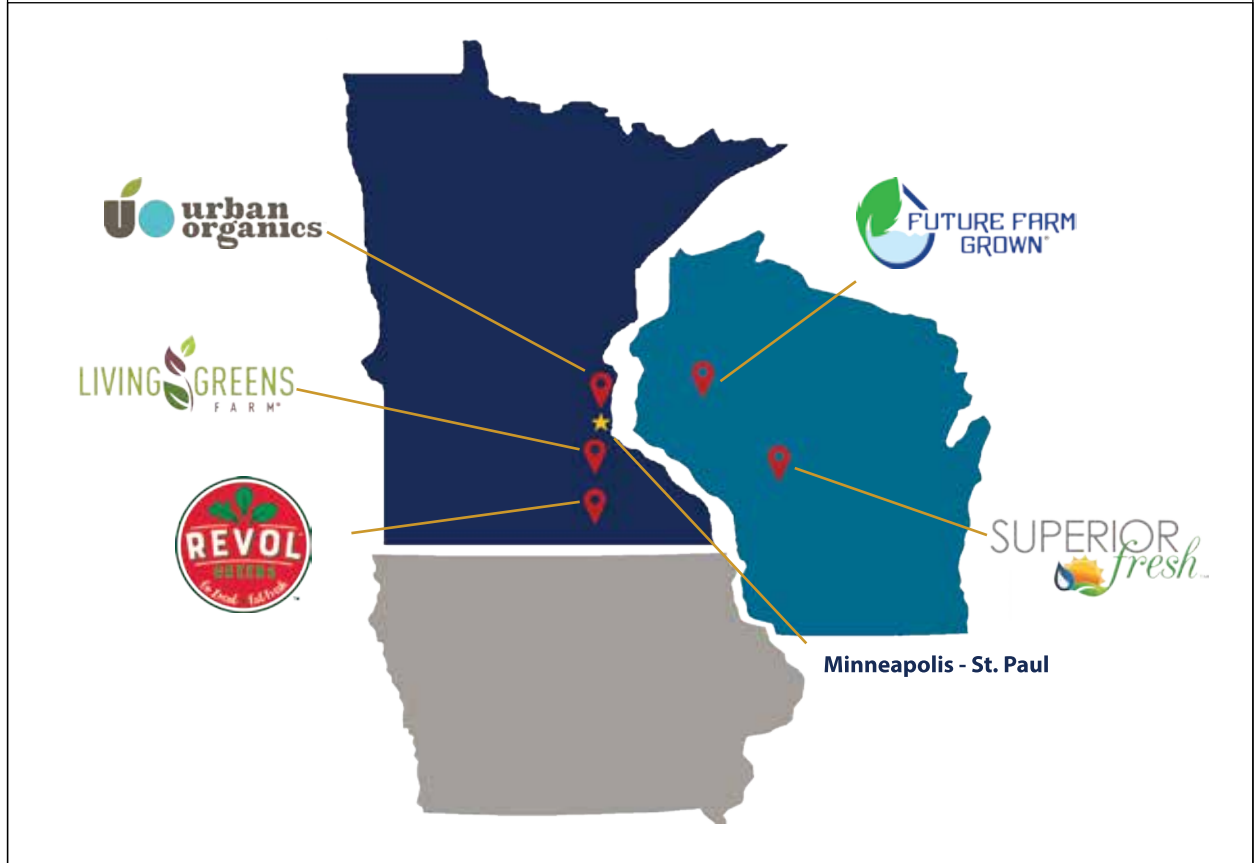


Figure 3: A Retailer's Perspective

Lunds and Byerlys operates 27 upscale grocery stores in the Minneapolis–St. Paul market. Author Don Goodwin spoke to Rick Steigerwald, senior vice president of Perishables for Lund Food Holdings Inc., and got some insights on CEA growers and their ability to deliver sustainable food practices to the local community.

Don: How long have you been carrying products from CEA growers in the leafy greens space?

Rick: We started carrying our first local brand in 2014, and now we have multiple brands on the shelf.

Don: Why do you buy from these growers?

Rick: A number of reasons. We love that they are local and focused on sustainability, as well as grow organically in some cases.

Don: How is their quality?

Rick: We find it to be equal to or better than the national brands that we buy.

Don: How about their pricing?

Rick: Most of the local players are competitive with our California suppliers.

Don: Most importantly, how are they selling?

Rick: Very well. On like items, products sell at an equal rate to the national brand.

Don: I noticed that your local lettuces are not displayed adjacent to the national brands. Is there a specific reason behind that decision?

Rick: Yes! We wanted to separate our prewashed lettuces from the non-washed. The local lettuce companies do not take their product through a wash step. We also wanted to emphasize our selection of local lettuces. We thought a separate section would help us do that.

Don: How do you market the product to your customers?

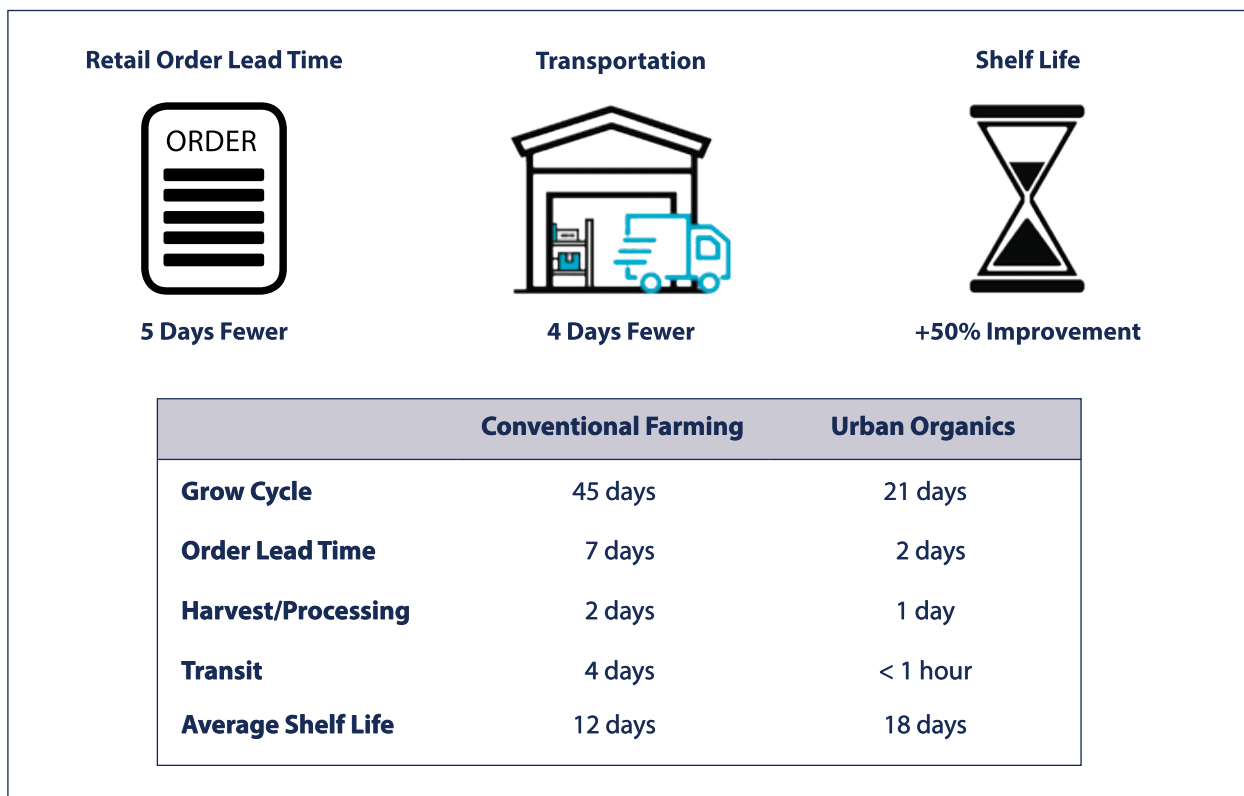
Rick: We work closely with the founders of these companies. We love when they come to our stores and conduct meet-the-maker demos. We also like to tell their story in our social marketing and through ads.

Don: Is there anything else you want to share?

Rick: We can get the product in 24 hours. This is meaningful to us. Our California product requires a seven-day lead time. We can be more precise with orders and maintain a lower inventory. This has led to lower shrink levels.

Don: Thanks, Rick!

Figure 4: Comparison of Supply Chain (Life) Cycle: Conventional Farming vs. Urban Organics (CEA Operation)



PURDUE FOOD AND AGRIBUSINESS EXECUTIVE SUMMIT

Cainthus: Disrupting the Face of the Animal Industry

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This case was prepared by Aidan Connolly, Chief Operating Officer, Cainthus, and Simon Bradley, Director, Weekando LTD. The authors would like to thank Cainthus and particularly David Hunt, President of Cainthus. This case is a basis for class discussion and represents the views of the authors, not of Purdue University. No part of this publication may be reproduced or transmitted in any form without written permission from Purdue University.

A Critical Year for Cainthus

David Hunt, one of Cainthus' three co-founders, addressed the leadership team in early February, 2019. He was introducing Aidan Connolly, who had recently joined the company as CEO after 28 years as a senior business leader in Alltech Inc., an innovative global agribusiness. David said:

Cainthus has the potential to become an agritech unicorn. We are introducing game-changing technologies to revolutionize food production, empowering farmers to make data-driven farm management decisions. Farmers are conservative when it comes to innovation. The graveyard of agritech failures is already very full. We have hired world-class technical and managerial talent to help us succeed in our mission. So, the question is, are we ready to scale up, Cainthus?

Cainthus is a computer vision company focused on farm management solutions. Following several false starts in launching commercially viable products, Cainthus decided to target large Holstein dairy cow farms in the United States with a product that helped manage a cow barn's feed bunk by monitoring cow feeding behaviors.

David, along with company co-founders, Ross Hunt (his twin brother) and Dr. Robin Johnston, was convinced that Cainthus was on the cusp of transforming dairy farming due to its revolutionary technology that allowed farmers to identify and monitor individual cows continuously. Publicity from recent features covering the company in publications, including The Wall Street Journal (front page), The New Yorker, and Forbes, generated both excitement and concern for the senior management team. This press coverage had heralded an era of enhanced farmer profits thanks to artificial intelligence helping optimize farmers' decision making on cow welfare, nutrition, health, and development.

Computer Vision Company

Sight is the most extraordinary of the human senses. Since the advent of computers, humans have striven to build machines that mimic human visualization and interpretation. By definition a computer vision company is one which enables a machine or computer to obtain data and information from multidimensional data sources and images to transform them into valuable insights. This technology has advanced rapidly with recent progress including medical image analysis, pollution monitoring, facial recognition, gesture analysis, and enhanced security and surveillance application. Computer vision today is revolutionizing industries such as insurance, manufacturing, healthcare, and more. Fundamentally, computer vision is transformational because it promises to enable machines to provide human level observation and interpretation of a visual environment at infinite scale.

Yet, Cainthus still did not have an operationally viable product, even though it already had installs in farms in nine different countries. Complicated installations, rigorous on-site testing, and numerous system customizations performed at the expense of engineering development time slowed product deployment. Consequently, the installs had not yet performed as intended, and, by February 2019, it was clear that after 4 years Cainthus was ready for a major rethink.

A Foundation for Success

In the days immediately after joining as CEO, Connolly focused on two activities. First, he visited several key potential customers across Europe to inform them Cainthus was not ready to sell them its computer vision-based cow monitoring system. Next, he organized a retreat for the senior management team. Having reflected on the company's strategic challenge and its Irish heritage, he chose Dowth House, 50 kilometers outside Dublin, in a region rich in ancient Irish history and mythology (see Figure 1). A 4,500 year old Neolithic tomb was discovered under the 275 year old house, a consequence of the presence in the valley of Western Europe's first farmers.



Figure 1: Dowth House excavations and below sunrise and aerial view of Newgrange.

With a nod to the origins of farming, Cainthus must set correctly the cornerstone for its future. The company priority was to stop trying to develop a product in multiple countries, for different species and with different functionalities depending on customer comments, and simply deliver a product to one specific target market—a product that worked, repeatedly, within a set of known constraints—before adding features or scaling up sales. As a first task at the retreat, the team had assessed what needed to change for Cainthus to realize its potential (see Figure 2). Thinking beyond on-farm applications of its technologies, Cainthus management perceived significant opportunities for food brands in terms of traceability, provenance, and accountability for animal welfare, for example. Gathered in the 200-year-old kitchens of Dowth House, there was consensus—to realize the dream of transforming the world’s food production systems, the very next step in the Cainthus story was to lay a solid foundation for growth, under the mantra “one pen, in one barn, on one farm.”



Figure 2: The 2-1-4-3 business planning tool.

As the leadership team reflected on how to prioritize and address the issues Cainthus was facing, related questions sprung to mind. For example, given the disruptive potential of its technology, how could Cainthus products lead in computer vision solutions for agriculture and food? How should it work with Cargill—the global agribusiness conglomerate who had invested in Cainthus in 2018—and how would that affect its relationship with other commercial partners and investors? How could the team work together to get the product to market, and then how would Cainthus cope with the huge anticipated demand?

Strategic Opportunities in the Global Dairy Market

According to the Food and Agriculture Organization of the United Nations (FAO), global milk output in 2018 was estimated at 843 million metric tonnes representing an increase of 2.2% from 2017. This was driven mainly by production expansions as a result of higher dairy herd numbers along with improvements in milk collection and capacity efficiencies.

Growth was driven by India, Turkey, the European Union, Pakistan, the United States, and Argentina, while partially offset by declines in China and Ukraine. Prices had slipped almost 5% between 2017 and 2018, but the milk market was generally price volatile due to time lags between production and demand. The United States was the world's top milk-producing country, accounting for almost 100 million tons of global production while ranking 6th in the number of dairy cows with approximately 9.328 million cows or 3.4% of the total population in 2016.

Global production had been growing since 2007 at 2.3% annually—additional production equivalent to the output of New Zealand each year. Research indicated milk production would continue to increase to meet increased per capita demand and general demand due to population growth, especially in regional and developing markets.

While prototypes were installed on farms in the United States, Canada, Northern Ireland, Sweden, Spain, Netherland, and Ireland, Cainthus' ONE plan was to focus on one geographic market. As Connolly said, "We won't get the same credibility and customer traction from other markets like France, New Zealand, or Ireland that we will from the U.S., and, more specifically, California." While the generally poor U.S. dairy farm profitability in recent years was complicating the introduction of new technologies, the overall size and concentration of dairy farms in Northern California made it an attractive primary target market for Cainthus as a place to build a global business.

California's Role in U.S. Dairy

The United States ranks 3rd globally in per capita demand for milk equivalents at 274 kilograms consumption. California had been the United States' leading dairy producer since 1993, accounting for about one fifth of total U.S. production and one fifth of the national dairy herd in 2018. It ranked first in milk, butter, ice cream, and nonfat dry milk, and second in cheese and yogurt production. It had also internationalized intensely over the previous two decades, accounting for about one third of all U.S. dairy exports in 2017—leaving it exposed to the larger forces impacting global trade, such as tariffs. Almost half of California milk went toward California cheese manufacturing. In all, the sector was a significant contributor to the state's economy, generating approximately \$6 billion from milk production in 2016.

In total, California counted more than 1,300 dairy families managing a herd of almost 2 million cows, while Northern California's 24 milk-producing counties accounted for nearly 100% of the manufacturing milk produced commercially in 2017. California dairy farms had increased milk productivity by 55% per cow since 1986 with an average output of almost 10,500 kilograms per annum per animal in 2017. Yet, California dairy farmers' profits had suffered since prices peaked in 2014, and profits took another knock as a result of tariffs on cheese imposed by Mexico in 2018 as part of negotiations over the North American Free Trade Agreement (NAFTA).

Cainthus Early Days

Cainthus defined itself as a computer vision company. Essentially, it turned visual information into actionable knowledge, providing data-driven solutions to reduce inefficiencies in food production and ultimately facilitate the more effective, environmentally sustainable use of natural resources.

Like many good origin stories, that of Cainthus was forged by entrepreneurs with key qualities: a track record in the industry, a ferocious work ethic, relevant talent, and market-tested resilience. The three co-founders shared a view that using analytics and artificial intelligence on-farm could transform farm performance and profitability, and they actively began seeking ways to realize that vision.

David Hunt's eureka moment came in 2015 when he tried on a Google Glass headset during a workshop at the Singularity University's Silicon Valley campus. He shared:

I could see huge potential. What if we could bring this onto the farm to generate empirical evidence about animal behaviors that could inform decisions and save farmers money? We could identify, monitor and help them monetize patterns in behavior perhaps they can't even see, either because they are too busy or because they are patterns only software can recognize. Take feeding behavior for example: we could determine if all cows are getting their daily nutritional requirements, and what role other factors such as bullying in the herd has played in preventing younger cows from bulking up sufficiently.

The economics of the 21st century farm was a topical issue that interested all three. Experts determined that agriculture and food distribution systems would have to transform to feed an expected global population approaching 10 billion people in 2050. Meanwhile, a variety of forces were driving change in farm management practices. These included changes to agricultural policies and subsidy systems, climate change, the increasing power of food retailers, fluctuating commodity prices, precision agricultural technologies, the importance of food traceability, and popular interest in animal welfare. Yet, while average farm size in developed countries had been steadily increasing since the mid-20th century, some 84% of the world's estimated 570 million farms were still less than 2 hectares in size—accounting for 12% of total farm land—with China and India accounting for almost 60% of all farms. This profile helped determine the scale and scope of Cainthus' initial market.

The trio brainstormed around using artificial intelligence and computer vision to develop a product that would empower farmers through data-driven decision making, which helped them pinpoint inefficiencies and thereby increase profitability. Powered by artificial intelligence software, computer vision technology offered the potential for always-on monitoring of farming activities and the interpretation of data to help a farmer make better farm management choices.

An opportunity to consult with Saul Griffiths, entrepreneur and founder of OtherLabs, who was also connected to Singularity University, helped hone the business concept before the trio set to work developing their first prototype and proprietary software algorithm—the heart of a computer vision system. Initially they focused on crop farming, reasoning this was where the biggest gains could be made for the emerging technology.

From Downstream to Upstream: A Brief History of Agritech Investment

Digital technologies were changing the food production business. Precision agriculture solutions promised to improve the flow of data, enhancing decision making, reducing inefficiencies, and improving profitability across the spectrum from the farming stage (upstream) to the consumer (downstream) and in between.

According to research by AgFunder—an online agricultural venture capital firm, the global agritech investment sector counted \$16.9 billion in investments in 2018 (see Figure 3), having grown in excess of 40% for the second year running (see Figure 4). The bulk of that investment (\$9.3 billion) was in later stage startups. The United States, China, and India dominated the investment landscape with significant activity also in Brazil, Singapore, Australia, and Ireland, as well as new activity developing in other markets including Albania, Romania, Serbia, and Zambia. Geographically speaking, California accounted for \$5 billion, dwarfing all other U.S. states in terms of investment activity. Food tech and crop tech continue to attract the majority of investments, while livestock tech investments with a few shining exceptions, most notably the acquisition of Antelliq (All-flex, SCR) by MSD for \$2.4 billion, were less common. Antelliq assumed \$1 billion in debt of a company with \$407 million in sales.

Annual Financings | 2012-2018

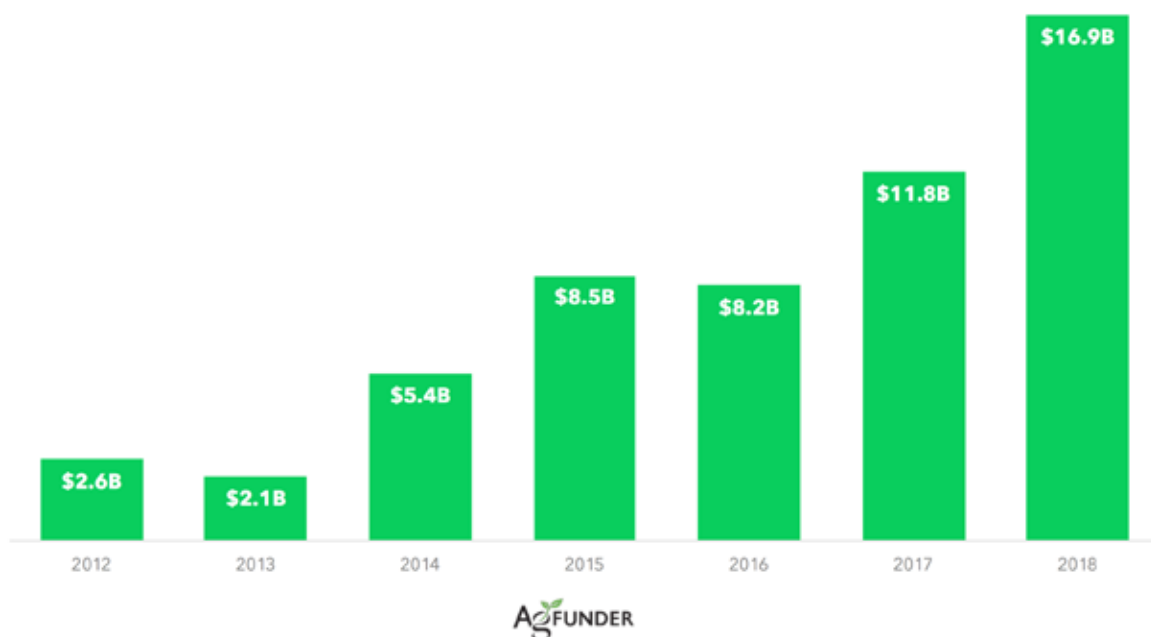
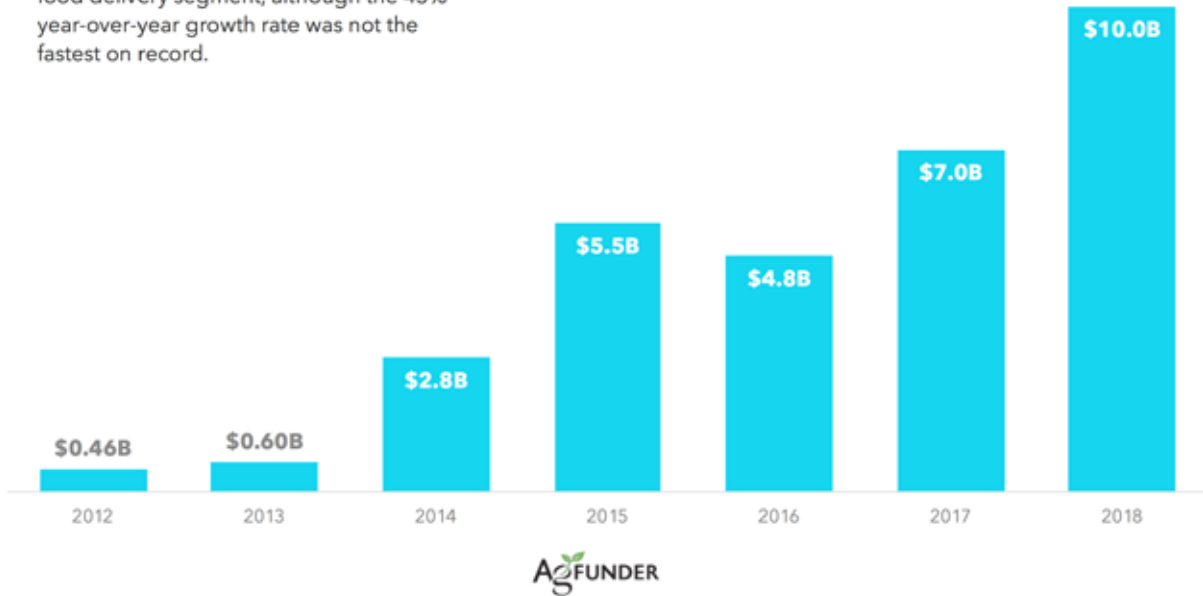


Figure 3: Annual growth in investments. *Source: Agfunder 2018.*

Annual Financings | 2012-2018

Funding continues to grow into downstream startups dominated by the food delivery segment, although the 43% year-over-year growth rate was not the fastest on record.



Annual Financings | 2012-2018

Investment to startups operating closer to the farmer grew over 44% year-over-year, the fastest annual growth rate on record, and in-line with downstream funding growth for the first time.

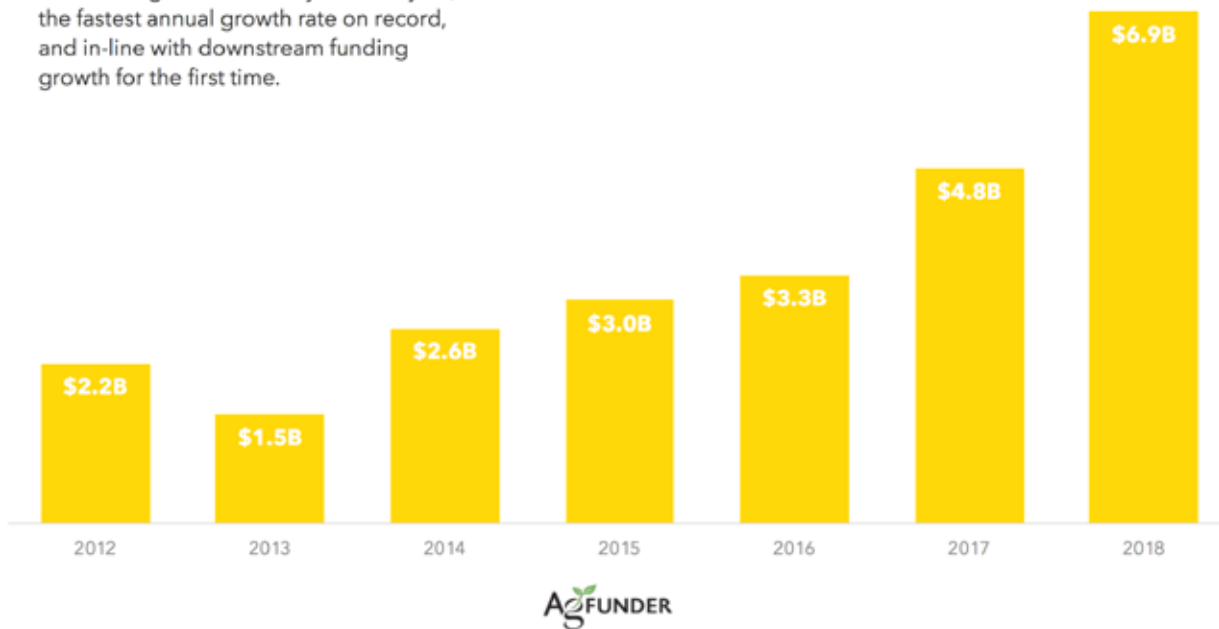


Figure 4: Annual growth in investments upstream and downstream. *Source: Agfunder 2018.*

For David Hunt, the growth in investment in viable commercial agritech businesses was hindered by competition from proposals and technologies that appealed to nonexpert investors. Globally, there were almost 1,800 investors in the agritech space. Overall, the investor profile increasingly resembled that of traditional technology investment markets. This level and diversity of investor interest demanded ingenuity from startups to differentiate their pitch and gain support at a critical time in their project’s development.

Cainthus’ business concept was focused upstream in the farm management software, sensing and internet of things sector (FMSSIoT). Annual tracking and research calculated that the FMSSIoT sector accounted for 6% of total agritech investments for 2018 (see Figure 5). While the top three deals in that sector in 2018 were valued at \$300 million, \$85 million and \$75 million, respectively, the average value of the top 20 deals in FMSSIoT was approximately \$35.5 million. Investments were dominated by startups focusing on crop production or, in the case of livestock-oriented products, using “wearable” technologies, such as ear tags harnessing radio frequency identification (RFID) technologies, for example. A viable computer vision solution that could reliably identify and monitor individual animals could be more efficient than using wearables, potentially replacing the need for numerous sensors with a system of cameras.

2018 AgriFood Tech Investment

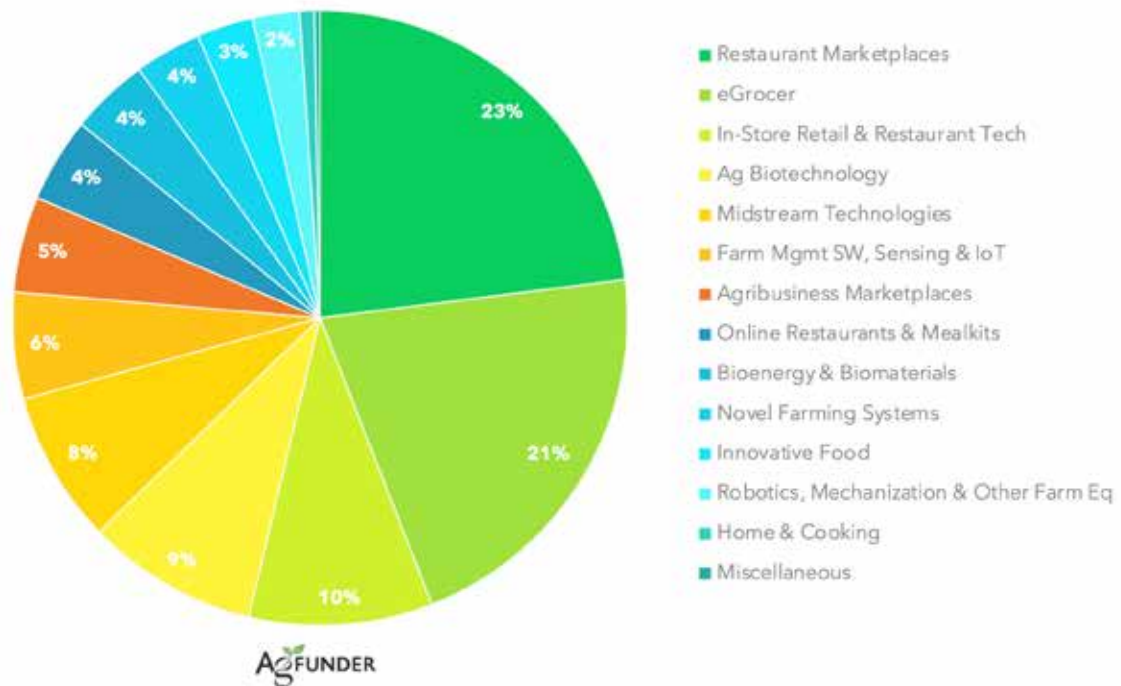


Figure 5: Proportion of funding per sector. *Source: AgFunder 2018.*

Recent reviews of livestock digital technologies have concluded that despite activity in all 9 technology categories (Robots, Drones, Sensors, AI, VR, AR, 3-D Printing, IOT & Blockchain) the hype exceeds the reality. Dairy robotic milkers are the most visible example of success and 40 companies have ventured into the task of putting sensors on cows, including tail, leg, cowbells, ear-tags, rumen probes etc., but the total number of cows with sensors attached still represents less than 5% of the world's most productive dairy producers. While this number may seem small the potential for sensors still encouraged MSD to acquire Antelliq (<https://agritradenews.co.uk/news/2019/01/08/antelliq-acquired-by-merck-msd-for-its-digital-expertise/>) for E2.1 billion, the leader in cow sensor technology, with sales of E360 million plastic ear tags and smart sensors, while absorbing their E1.15 billion debt. Most other livestock species had fewer companies offering sensors, but a review of the Equine sector identified 120 (<https://www.linkedin.com/pulse/horsepower-aidan-connolly-7k-/>) and the companion animal sector had even more. In the field of AI, Cainthus identified 14 companies who claimed to be using the technology but artificial intelligence was ill defined and hard to police. Connolly met with these companies one-on-one and so far, has found them lacking in technology, hardware that wasn't scalable, or a clear understanding of what farmers wanted and needed to be a viable partner.

Cainthus' Journey: From Crops to Dairy

The core technology was groundbreaking. At the heart of Cainthus' system was its proprietary algorithm, which had been developed in-house iteratively through customer-based practical trials. Working with the customer to test the computer vision software under real-world farming conditions was fundamental to the business approach the trio wished to pursue. As Cainthus' co-founder Dr. Robin Johnston said, "The voice of the customer must guide our product decisions." When connected to a camera, the trio's algorithm could analyze photographs or even video. Using all wavelengths of light, it could identify patterns based on predefined baselines, crunch massive amounts of data in near real-time, and turn that into visually appealing graphics in an app that worked on tablets, smartphones, and laptop computers. Suddenly a farmer could identify which patches in his cornfield needed more watering to boost plant growth or the distribution patterns of soil nutrients in a fallow field.

Initially Cainthus had focused on digitizing images of row crop production and cultivation. With the first prototype, data were collected using quadcopter drones fitted with specialized

cameras. An early stage version of Cainthus' crop analytics tool showed the potential to save customers over \$1650 per acre of fungicide application over the conventional method (see Figure 6). With population growth, the demand for farmland was increasing annually. Almost 40% of the world's total land area was dedicated to agricultural production, about one third of which was given to crop production, both for livestock and human consumption purposes, suggesting the potential was massive for any business that could help improve efficiencies anywhere in the value chain.



Figure 6: Modeling savings for crop farmer. *Source: Cainthus.*

But crops presented other challenges. Cainthus software was device independent, meaning the team could analyze data whether it came from a smartphone, camera, drone, or satellite. Drones were the preferred way to capture images from large crop production areas because they were the only delivery mechanism that could give 1 centimeter/pixel resolution. While drones are sufficiently consistent and reliable, the main problem was cost and complexity, and, drones require a human pilot. Crop monitoring will not likely be commercially viable until drones are fully autonomous and completely independent of human pilots. In addition, the founders quickly realized the crop marketplace was already crowded with startups pursuing a similar mission through applying related technologies.

Cainthus pivoted from crops to dairy without discontinuing their crop product research and development. With no direct competitors, dairy seemed a logical and enticing space to enter given that Robin's family owned a dairy farm, and his father was a renowned dairy nutritionist. The team was enthused and set to work immediately reconfiguring their system to identify and passively monitor live animals.

The original concept revolved around deploying cameras on-farm to monitor for mastitis and lameness, feeding and watering behavior, and bullying in the herd. Each of these issues could impact the cow's productivity and quality of life and cost the farmer money. Yet, given the state of the art of the technology, the size of the herd and the complex environment in a feeding barn, each cow was difficult to monitor systematically on an individual basis. Technically, computer vision was nondeterministic, meaning it may or may not be able to detect whether a cow was in heat or if it was lame. With increased datasets, however, the founders were confident they could improve the system to determine these and other issues. Achieving this would allow Cainthus to attract investors.

At the time, RFID technologies dominated dairy with numerous forms of "wearables" in use. The founders believed there was a significant opportunity to bundle some of the value added by wearables into one scalable system. "We knew some farmers referred to wearable devices as a necessary evil. That is not a nice way for a customer to describe a company's product! Instead, we wanted to work with the farmer to find solutions they wanted," said Ross.

Cainthus' Journey: From Technology to Product

Securing external investment became necessary with the decision to enter the dairy market. Up to that point, the founders had been "bootstrapping"—that is, financing all activities from personal savings. The founders approached their funding network to pitch and present their vision and their technology, both for crop and dairy farming.

By late 2016 Cainthus had successfully completed a Series A financing round, raising \$2 million. The money was used to develop the company's crop and cow analytic prototypes, valuing Cainthus at \$24 million. Around this time, the founders turned down another offer for \$10 million to acquire 47% of the company, betting they could build a commercial prototype for \$2.5 million within 30 months instead. Within the year, Cainthus launched Version 1.0 of

the dairy system, beating their own expectations. Based on estimates and research papers, without farm confirmation, the company helped a customer with 2,000 cows realize savings of \$145,000 (see Figure 7).

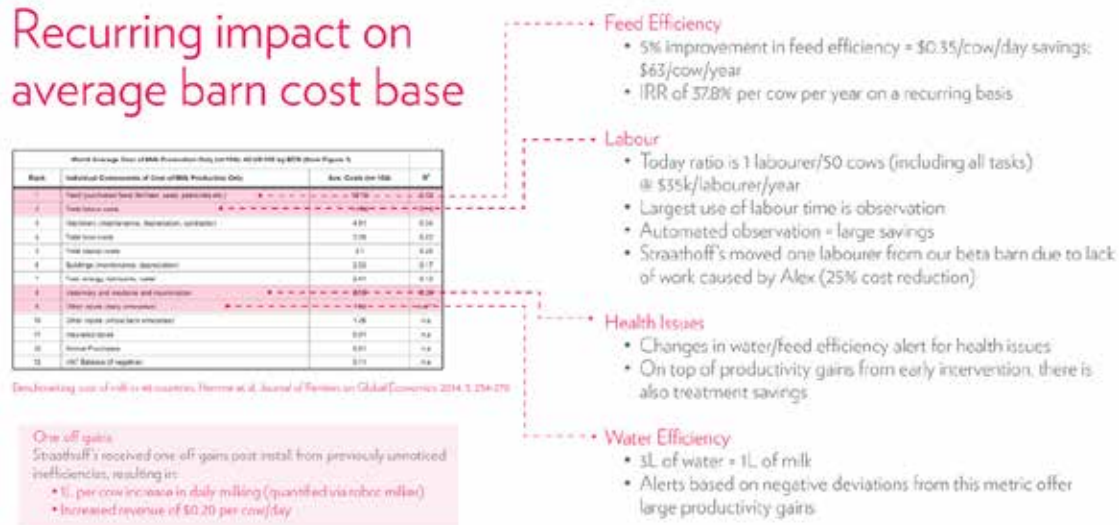


Figure 7: Modeling savings for dairy farmer. *Source: Cainthus.*

The following 2 years were spent working closely with a small group of seven customers located in North America and Europe to fine tune the algorithm and the first version of the computer vision system for dairy farms. The plan was to successfully complete another round of financing to help take the company to market. The founders knew they would need to hire more engineering talent for product development but also a senior management team that could structure and execute the growth phase. Ross said:

The difference in the skills required to start a company and to grow it is akin to quantum and Newtonian physics—both are valid but they don't operate on the same levels or in the same way and there are few exceptions where the founders successfully transition from one to the other.

By this stage the company had offices in Dublin, Ottawa, and San Francisco. Working remotely and adopting a flat organizational structure allowed Cainthus to retain its dynamism and creativity while keeping costs down. R&D was performed primarily in Ottawa where Robin was based, with easy access to farmland and livestock, as well as availability of high-caliber data science graduates. Product commercialization was executed in San Francisco to take

advantage of the level of technical talent available in the Bay Area of San Francisco. All other company functions were performed in Dublin. With the company taking shape, the founders' dreams turned to a global market accessed through a partner who could help them transform the dairy industry and set about identifying suitable opportunities.

In late 2017, the global agribusiness conglomerate Cargill approached Cainthus, expressing interest in investing in its dairy cow solution. For Cargill, Cainthus represented the prospect of credibly beefing up its presence in precision agtech and leading in computer vision, while Cainthus could access global markets with Cargill. The fit was also cultural—both companies valued each other's respective agricultural heritage. Following an 8-month due diligence process, the Cargill digital business division took a minority stake in Cainthus in early 2018, based on the prototype, its potential once it was commercialized, and the management plan to bring it to market presented by the founders. Excited and better resourced, the founder team set about preparing Cainthus for the future.

News of the deal between the two companies excited an already vibrant global marketplace for agritech investment. The significant boost it gave the founder team in terms of confidence and profile for the business came with strings attached. With more attention paid to Cainthus, the expectation to deliver was heightened, placing strain on the team to finalize the product and the marketing strategy that would support it. Crucially, Cainthus' dairy product still could not reliably deliver insights on a replicable basis for lameness, mastitis, acidosis, or other commonplace dairy herd issues. But, the founders believed they were close enough, reasoning that extra engineering talent could help accelerate the development process while the management team readied the company for anticipated growth.

Part of this process was to develop test product 2 (TP2) of the dairy farm system. Physically, test product 1 and 2 resembled each other (see Figure 8) although TP2 was oriented in a vertical, compact setup for installation. Each prototype consisted of a static 120-degree field-of-view digital camera and data transmitter fitted to an adjustable metallic truss that could be mounted to a barn wall. All of the hardware was available on the open market. Installation involved an initial walkthrough of the site to identify any issues with the barn layout or the internet connection, for example. Once mounted, engineers would connect it via WiFi to relay data in real-time to servers located remotely. The final step was to test for bugs and run a trial to ensure the system worked seamlessly.



Figure 8: Cainthus prototype test products 1.0, 2.0, and 3.0. *Source: Cainthus.*

Scaling Up Under New Management Team

One of the first actions after the Cargill investment was to begin the recruitment process for a management team who could lead the business transformation and the world-class engineers who would get the prototype ready for market. The founders were keenly aware they would have to entrust the new management team with the authority to scale the company, but first they had to acquire the right people to do the job. Convincing top talent to join a startup meant leveraging relationships and spending time handpicking recruits who were motivated by the company's mission and potential. By September 2018, Cainthus had doubled in size from 12 to 26 staff.

The new hires entered an organizational structure led by a new senior leadership team (SLT). This included the Chief Executive Officer (CEO), Aidan Connolly; Chief Operating Officer (COO), Steve Kickert; Chief Marketing Officer (CMO), Ann Kehoe; Chief Product Officer and Vice President (VP) of Computer Vision, Jane Cummings, as well as the three company founders.

As part of this plan, David Hunt changed role from CEO to Chief Strategy Officer (CSO), becoming responsible for ensuring Cainthus reached its goals through its work. Johnston retained his role working with Cummings in the development of the computer vision technology. Ross remained the Chief Finance Officer (CFO) until a new CFO was hired in mid-2019, allowing him to transition to a senior business development role. Ross' stated vision was

that Cainthus should have “ubiquitous computer vision technology helping to solve a myriad of societal and economic challenges.”

Aidan Connolly was a global agribusiness business leader who had built a 28-year career helping Alltech, Inc. grow into a \$2.2 billion global yeast-based technology company as Chief Innovation Officer. As he pointed out, Alltech had just \$25 million in turnover when he joined. Through a series of private investments, he helped nurture several small and medium-sized food and agriculture-related businesses, including Cainthus. As CEO, Connolly’s style was pragmatic and practical, leading from the front while ensuring “we have a team where everyone is smart.”

As COO, Steve Kickert was responsible for ensuring the team, operations, and product matched up with Connolly’s representation of Cainthus to the outside world. He joined Cainthus from a position as Director of Technology in Cargill’s Digital Business Division, having built a career as an entrepreneur in software solutions for the agricultural sector in the Midwest region of the United States with two successful exits. See Figure 9 for the Cainthus Organigram.

Figure 9: Cainthus Organigram

Team	Business Administration	Product	Customer Success	Pork Research	Sales	Finance	Human Resources	Marketing	Strategy	Business Development	Administration
Number of employees	2	17	2	3	1	1	2	1	1	1	1

Aidan Connolly, Chief Executive Officer

Aidan joined Cainthus as CEO in January 2019 after stepping down from his 25+ year career at Alltech. He is often referred to as the fourth Cainthus founder given his involvement with the company since its inception. Aidan's leadership experience varies from strategy to operations to production, developing sales programs and building cohesive teams that deliver strong results. He is also the author of the strategic business planning book, '2-1-4-3, a Plan for Explosive Business Growth' and is an Adjunct Professor of Marketing at M. Smurfit Graduate School of Business in Dublin and the China Agriculture Universities EMBA.

Jane Cummings, Vice President of Computer Vision

Jane Cummings joined Cainthus in 2017, following a successful career at CERN, including work on the discovery of the Higgs boson. She assumed her role as VP of Computer Vision in early 2019, focusing on developing computer vision and machine learning models at the heart of Cainthus' business model.

The SLT was also supported by a top team of 40 engineers, algorithm programmers, and product developers, each with impressive resumes.

David Hunt, Co-Founder

David started his career as a corporate banker before leaving to pursue his fascination of emerging technologies in various agricultural areas. He co-founded Cainthus in 2016 and has led many different initiatives pivotal to building the company. He currently leads the company's strategic focus. David has provided consultancy for the Advanced Research Projects Agency of the United States Department of Energy and the European Union Agriculture and Rural Development Cabinet and teaches at Singularity U on the NASA campus in Palo Alto.

Ross Hunt, Co-Founder and Business Development Leader

As a director of Comex McKinnan, Ross designed and developed a computer system that digitized and automated all processes, resulting in doubled revenue. Ross realized the power of digitization and was inspired to co-found Cainthus. Ross was previously with KPMG. He has directed different initiatives vital to building Cainthus and currently leads the Business Development Department researching new opportunities for growth to apply in computer vision and other special projects.

Robin Johnston, Co-Founder

Robin Johnston's background is in computer science and AI, specializing in agriculture. Robin's interest in data-driven decision-making tools and robust methodologies lead him to co-found Cainthus. Robin has applied his doctoral work to both international and domestic projects ranging from temporal systems modelling to pattern recognition, working on projects involving the British Government and a variety of livestock applications.

Ann Kehoe, Chief Marketing Officer

Ann Kehoe joined Cainthus as Chief Marketing Officer in February 2019 following a 25-year career in food and agricultural marketing, including 14 years at Alltech Inc., most recently establishing the company's innovation incubator—the Pearse Lyons Accelerator Program. Kehoe was responsible for creating and developing Cainthus' marketing strategy, leveraging its commitment to engaging with the voice of its customers.

Steve Kickert, Chief Operating Officer

Steve joined Cainthus in early 2019 as COO, bringing in 30+ years of experience building leading software products. At present he oversees the company's day-to-day operations and helps set strategic direction. Before Cainthus, Steve served as Director of Technology at Cargill where he led product development focused on creating software solutions for animal nutrition and animal production. He also co-founded and directed a number of hardware and software companies.

Marketing the Value Proposition

The co-founders believed the Cainthus value proposition was centered around its technology being a computer vision system that empowered dairy farmers to pinpoint cost savings opportunities at a scale of economy far more efficient than wearable technologies. Cainthus said its product could ultimately generate 15% cost savings per cow per year for an average large farm housing 150 to 400 cows per barn.

Based on the California dairy farm business model, the average farmer lost \$600 per annum per cow in revenue due to health and nutrition issues. Fertility issues alone accounted for half of that loss, with lameness, mastitis, and acidosis each costing at least \$100 per animal per annum. As Connolly said:

If the value we bring to the farmer is \$10 or \$20 per cow, then hardware is a problem and not the only one. But if we generate \$100 per cow then we are on track for our growth trajectory. Once we get the product working in dairy barns, we can add features and eventually extend into other livestock species.

The immediate aim was to launch a product that could monitor and help farmers manage the dairy barn feed bunk where food was placed in troughs for the herd's daily nutrition. Research indicated there was opportunity for improvements by ensuring each cow could access the feed bunk and eat their required daily ration. These were dynamics that could be affected by factors such as food being placed just out of reach for smaller cows in the herd or even where a dominant cow bullied others away from feeding to have more for herself.

While a relatively low-value proposition for the farmer, improving feed bunk management was attractive as a "foot in the door" with prospective clients. It was a manageable task for the software to cope with at scale and afforded Cainthus the opportunity to develop and consolidate trust with its target clients.

In terms of engaging target audiences, events and trade shows remained a core marketing activity, but the digital space was fast emerging as a customer lead generation tool. Analysis indicated the website was the number one place people used to validate buying decisions. This was followed by social networks such as Facebook and LinkedIn.

Coordinating online communications with the communications made by the sales team presented other considerations. These revolved around whether Cainthus should engage in partnerships or develop its own salesforce to sell its products. Each option presented its own advantages but so too its own implications for the marketing budget. For example, building a competent team in house would ensure quality and consistency but would take time and resources during a critical growth phase. In any case, there was a relatively limited pool of suitably qualified talent from which Kehoe could recruit. A partnership model was an attractive option to support expected growth, Kehoe reasoned, but it too came with challenges to address in terms of coordination of teams, reporting systems, messaging, and work styles, among other issues.

Addressing Key Challenges

Ultimately, the company faced a number of internal and external challenges as it prepared to scale up operations and launch its first commercially viable product. As it implemented a new formalized management structure, centralizing certain activities and reassigning key personnel to new responsibilities, management had to acknowledge and adapt to the differing value systems of younger and more senior employees, as well as differences in leadership styles between David Hunt and Aidan Connolly as successive CEOs. David and Ross Hunt had believed firmly in a flat, democratic structure, empowering younger “millennial” employees, but Kickert in particular struggled with managing a group where everyone felt empowered to comment and contribute to everyone else’s work.

Connolly and Kickert were also concerned about how Cainthus would interact with partners, including its investor Cargill. It was important that partners could interact smoothly to optimize Cainthus’ growth trajectory when the product eventually launched.

Marketing and Sales

One of the key challenges early on was that, despite interest in the technology, selling the system required significant education and explanation for customers to grasp its transformative potential. During one of the first planning meetings, Kehoe observed, “There is so much interest in this technology that we have to calm the waters. It won’t be a matter of generating demand but responding to it adequately.”

But once demonstrated, customers quickly grasped the potential. Cainthus believed it could harness this excitement to good effect through word of mouth marketing, which was a powerful influencer in close-knit farming communities. Conversely, Kehoe reflected on the power of digital marketing to generate significant awareness and interest in the technology given the limited capacity to show the product's performance through demonstrations.

This, combined with Cargill's market access and the power of word-of-mouth referrals among farmers, encouraged management to prioritize aligning the sales messaging with that of the product's performance capabilities. Already Connolly had begun making customer visits to larger potential clients to manage expectations and, in certain cases, pulling back on dates and timelines to which colleagues had previously committed. It remained to be seen how long such potential clients could wait, but Connolly preferred to lose a sale rather than risk damaging the company's nascent reputation.

Meanwhile, the team was still working to establish standards and norms around product installation methodology and best practices to support sales at scale. With every farm presenting its own unique configuration, it was difficult to standardize the installation process, much less the hardware design. In the past, this had led to strains on the engineers who found themselves spending time customizing systems already sold and installed at the expense of developing new code for new features and applications.

To what extent the company's pricing strategy would be affected by the constraints of the installed system remained to be seen. One option was to bundle the hardware and software costs into a single price. Alternatively, the company could charge an upfront fee for the hardware and license the use of the algorithm. For Kickert, the software as a service (SAAS) model was preferable. He stated, "This keeps everyone honest—the farmer has to vote on a periodic basis, let's say monthly, whether he keeps your product." He believed a system requiring a minimal server and minimal cloud connection would be a competitive advantage and be more cost effective. Overall, management's inclination was that the customer would decide the best pricing method for them.

Since its first prototype, Cainthus had cherished the voice of the customer approach—nurturing close working relationships, performing site-based trials, and organizing feedback sessions with each customer. The developing communications narrative reflected the reality:

Cainthus' dairy system was a product built by farmers for farmers with cascading benefits for animal, farmer, industry, the general public, and the environment.

Impressed by this ethos, Kehoe, began to align the company's identity—including its logo, digital communications, and tone of voice—to better represent the positioning to different key audiences and to support the sales effort. "Facial recognition (FR) sounds cool, especially to motivate early adopters, and no doubt people think of Cainthus as providing FR for cows. It's a buzz word and at the peak of media hype. But our technology is much greater than this, it looks at the entire animal and its behavior, and as such it delivers insights to the farmer on animal and barn activity."

The Road Ahead

As the company increasingly focused on livestock, it abandoned many of its early projects and products. In particular, crops had not progressed, despite contact and presentations with all of the major equipment, fertilizer, and crop protection suppliers. And, while the dairy segment had developed, the product was still unstable when scaled.

Yet, the capacity to passively monitor for specific individual behaviors across a herd of cows, using always-on cameras and artificial intelligence software, empowered farmers to pinpoint cost savings opportunities at a scale of economy far more efficient than wearable technologies. The potential to identify and reduce losses due to individual cow health was just the beginning, however. Looking beyond the farm, Cainthus perceived significant opportunities for food brands in terms of traceability, provenance, and accountability for animal welfare. Management felt the immediate priority was to better understand the global dairy market to identify a suitable target segment and develop a position that could be marketed credibly, consistently, and clearly.

Decision Time

There had been progress on all fronts in the months since the founder trio hired the management team. All believed Cainthus possessed the potential to become an amazing company if it could balance scaling while retaining its innovative spirit.

David for one knew all too well that it was not always the best solution or the first product to market, which captured the lion's share of the profits. As Cainthus prepared to step into the limelight, management was keenly aware that others, including several established "Big Ag" businesses, were watching how Cainthus would perform. Ultimately, for David and his new colleagues, there were critical questions to address:

1. Given the disruptive potential of its technology, is Cainthus ready to scale up? What are the appropriate steps to ensure a timely launch of a high-quality product with consistent marketing and brand messages? Is this focused strategy empowering or a straight jacket for a startup aiming to achieve an industry disruptor position?
2. What are the pros and cons for Cainthus having Cargill as a corporate investor, and what will Cargill's goals and motivations be? How can this be leveraged to create the best opportunity for the startup to succeed?
3. How could the team work together to get the product to market, and then how would Cainthus cope with the huge anticipated demand? What commercial partners will it need?
4. When should Cainthus consider another tranche of capital investment, at what value, to whom should it pitch, and how should it do so?
5. What competition does Cainthus have? Sensors, computer vision, other artificial intelligence companies, or are farmers so traditional they will never adopt new technology?

Endnotes

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The logo for the Purdue Food and Agribusiness Executive Summit. It features the word "PURDUE" in yellow above "FOOD AND AGRIBUSINESS" in black. A yellow line graph icon is positioned between "FOOD" and "AND". Below "FOOD AND AGRIBUSINESS" is the word "EXECUTIVE SUMMIT" in yellow.

PURDUE
FOOD AND AGRIBUSINESS
EXECUTIVE SUMMIT

Compeer Financial: Executing a Segmentation Strategy with Disruptive Service Value

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This case was prepared by Scott Downey, Associate Director and Professor, and Brady Brewer, Assistant Professor, Center for Food and Agricultural Business, Department of Agricultural Economics, Purdue University. The authors would like to thank Compeer and particularly Matt Ginder, Chief Core Markets Officer at Compeer Financial. This case is a basis for class discussion and represents the views of the authors, not of Purdue University. No part of this publication may be reproduced or transmitted in any form without written permission from Purdue University.

Introduction

Matt Ginder sat down at his desk. Based on his conversation with Compeer Financials' CEO, he was now charged with leading the sales effort in the newly merged organization and implementing the organization's segmentation strategy. As Matt took a sip of coffee, he realized that there were a lot of disruptions he would have to work through. In addition to internal factors, there were several external factors that would drive the daunting task in front of him. Changes in agriculture were shaping the way farmers did business and the agricultural lending sector was not immune to these changes. "This merger didn't happen overnight," Matt thought to himself. "I'm sure identifying the best practices for the sales team won't happen overnight either."

Internal Factors

The Farm Credit "system" in the United States evolved out of legislation that created the Federal Land Bank in 1916 (Farm Credit - About Us, 2019). The seasonality and risks faced by farmers and rural communities were different from the credit needs of other commercial enterprises and the US congress sought to provide a mechanism to serve those unique needs. Legislation evolved over many years and many different congressional acts to provide funds and terms that would ensure that food production in the

About Us

Compeer Financial is a member-owned, Farm Credit cooperative serving and supporting agriculture and rural communities. We provide loans, leases, risk management and other financial services throughout 144 counties in Illinois, Minnesota and Wisconsin. Based in the upper Midwest, Compeer Financial exists to champion the hopes and dreams of rural America. With 1,200 dedicated team members serving approximately 71,000 member-owners, we offer specialized expertise and personalized service regardless of the size of the farm, the type of crop grown or the livestock raised. Our services are provided with convenience in mind, through visits to fields, barns and homes, or by maximizing technology to make the most of every hour in every day.

Compeer Financial regularly collaborates with others who are also dedicated to agriculture and rural America. Our in-house specialists participate in conversations that extend beyond our service area, providing formal and informal insight on topics pertinent to all industries, including dairy, swine, grain and renewable energy. With \$19 billion in loan and lease assets, Compeer Financial is one of the largest cooperatives in the Farm Credit System. This nationwide network of lending institutions supports agriculture and rural communities with reliable, consistent credit and financial services.

Mission: Enriching agriculture and rural America.

Vision: Trusted financial services partner advancing agriculture and rural America.

Figure 1: Company Mission and Vision (from Compeer's website)

United States would not be interrupted. As residents of the United States began to urbanize in cities and suburbs in the years following World War II, the need for food production stability and financing in rural areas brought a new emphasis to the importance of Farm Credit. The “System,” made up of cooperative organizations which are primarily owned and run by members, grew beyond farm loans to serve rural property owners, businesses, and utilities who are dedicated to providing resources to produce, harvest, and process food and this focus was reflected in the organization’s mission and vision (Figure 1). Mergers and reorganizations have always been an important part of adapting to industry conditions in the financial services industry. As such, bringing together the three legacy organizations to form Compeer Financial was a logical evolution.

The merged organization’s footprint included offices that had previously been part of three strong organizations from the midwestern part of the United States, in Minnesota, Wisconsin, and Illinois (See Figure 2). Each had been profitable and innovative in their own right. While many “mergers of equals” have a hierarchy of “MergER” and “MergEE”, this merger sought to capitalize on the strengths of each legacy organization. The credit analysis system from one organization was going to be used, while the loan origination system from another organization would be used, for example. The structure and roles of financial officers (FO’s) had been combined with the roles of crop insurance specialists (IO’s) in Minnesota’s legacy organization, but now those functions would be separate across the organization. Each of the legacy organizations brought something unique to the marketplace. These strengths along with scale efficiencies would allow the combined organization to invest in processes and technologies that would better serve clients. All of these were important aspects of the decision to merge and part of what made Matt excited about the opportunity.

The three legacy organizations brought with them expertise in the credit needs of row crop producers, small grain producers, dairies, and other “specialty” areas like timber and fruits. A combined organization that served these different types of production needed to be nimble. A seasonal operating loan for a 5,000-acre corn and soybean producer in Illinois, for example, was very different than a loan to a dairy operator who needed to purchase several robots for milking 800 cows in Wisconsin or financing for a timber producer who might need 20 years before he could harvest a tree in Minnesota. These different areas of expertise would require effort to congeal and to develop a common set of loan policies. The result of the effort needed to be a unified organization.

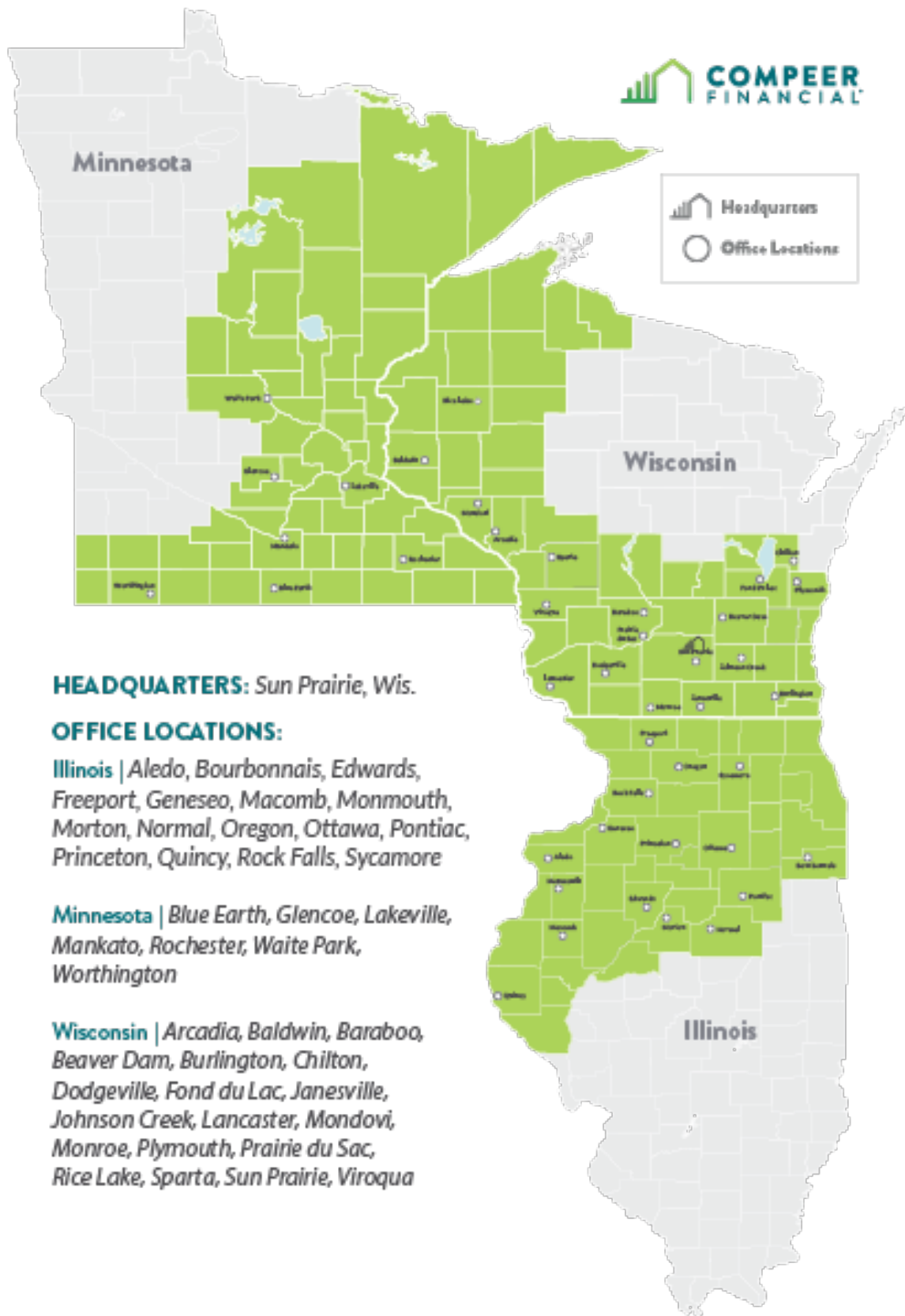


Figure 2: Compeer's Footprint

Fortunately, although each organization was unique, the three shared a common view about the importance of serving rural clients. Compeer Financials' mission statement "**Enriching agriculture and rural America**" reflects the passion all three legacy organizations and their staff genuinely feel about serving rural America. That sentiment was embedded deeply in the cultures and practices of their histories and has guided decisions formally as well as informally. In many ways, that mission and Compeer's vision stating the desire to be a "**trusted financial services partner advancing agriculture and rural America**" were reflective of the whole Farm Credit system (Compeer Financial - About Us, 2019).

External Factors

Matt and his colleagues at Farm Credit were not the only ones faced by a need to evolve. Nearly every organization who serves farmers was dealing with a set of external factors that required rethinking how best to serve the market. Agriculture, particularly farms, had been experiencing market disruptions for some time. Farm size, diversification, technologies, and production practices, to name a few, were changing, reshaping how farms conduct business. Matt knew that any business that supplied inputs to the farms, whether it be seed, chemicals, equipment, or credit would need to change along with the farm business.

Farm consolidation was a long-term factor that continued to shape businesses like Farm Credit who served farmers. In 1987, 57% of crop farms, for example, were less than 1000 acres. By 2012, only 36% of farming operations were under 1000 acres. Livestock operations followed a similar trend (MacDonald & Hopp, 2018). Efficiency and scale required to innovate and adapt to market volatility and threats to margin drove much of that consolidation. For Matt, larger scale and innovation meant more complex financial statements needed to be analyzed and innovative requests often had inherently more risk associated with them. For example, when larger dairies began to request financing for robotic milking machines, there wasn't enough data available for credit organizations to know how the purchase of a \$100,000 machine and its associated infrastructure and maintenance would offset the alternative costs of labor for milking.

As a result of this consolidation, Compeer Financial and other Farm Credit organizations were faced with a wider variety of operations to serve. While consolidation increased the percentage of acres managed by large farms, smaller farms remained in existence and continued to demand service. This created challenges in practice and policy for Compeer

Financial. The cooperative nature of the system meant that each member expected to receive organizational resources. Yet, the complexity of larger operations meant that more resources were required to serve and analyze requests for this portion of the market. Reducing the resources available to smaller farms in order to serve larger farms didn't sit well with traditional farm members. Often, it didn't sit well with staff either. Many of them had grown up being part of smaller farms or built their careers during a time when smaller farms were the majority of members. While this issue had been evolving over time in the legacy organizations, it was easy for the combined Compeer Financial organization to be targeted as a bigger company who only cared about bigger farmers.

Other issues have been rapidly changing farms as well. Diversification and technology were big disrupters of agriculture. Almost every farmer had a cell phone or some piece of technology that drove how they communicated with their suppliers or operated their business. A wide array of options for technology that farmers could choose from had appeared on the market and was readily accessible. Companies have been rolling out new technologies faster than farmers can learn how to use them. Global Positioning System (GPS) guidance, robotics, data management, and analytical software open up new avenues for farmers to drive profitability. These opportunities meant that lending institutions had to be just as knowledgeable as the farmer, understanding how new technology and equipment impacted revenues and costs for the farm. This new information then had to be adapted to the new credit analysis.

To adapt to the wider variation in members at the same time as resources needed to be concentrated required developing more efficient lending and insurance services. Tools like automated credit analysis, online tools for Compeer Financial clients, and other solutions that would allow efficient use of resources would require investment by Farm Credit organizations. This was one of the primary drivers of consolidation that led to Compeer Financial. The larger organization would have more resources to dedicate to services that could be spread across three organizations than each legacy organization could have had on their own. However, some of these objectives were at odds, automated credit analysis worked best when applicant criteria were similar. How would this work as Compeer Financials' customers became more diversified? Matt was charged with figuring out how best to allocate these resources.

Finally, competition in the marketplace was an important issue for Compeer. That competition came from national and international organizations like Rabo AgriFinance and

Wells Fargo, it came from manufacturer credit organizations like John Deere Finance, and it came from numerous small community banks who purported to have strong relationships with farmers in their communities, and often included them on their boards of directors. Compeer Financial offered some unique products geared toward long term fixed rates for rural and agricultural real estate and expertise in various aspects of production that some competitors couldn't offer. Some competitors were renowned for moving in and out of the ag industry depending on the perceived risk, allowing for greater portfolio diversification. In contrast, the Farm Credit system was tied to agriculture which created some difficult challenges of its own throughout the system's history. Perseverance through those tough times led to a stronger system that agriculture and rural constituents could rely on.

Compeer's Four-Pronged Approach

To address these market dynamics, Matt used the four-stage management process as a guide. Analyzing the problem, planning, executing, and measuring the impact is a continual cycle that is critical for these types of strategy decisions (Figure 3). Implementing this process is one thing; but seeing it through is a tall order. To get started, Matt considered four areas that require attention.

1. Compeer's Clients

If Compeer Financial is to remain true to its cooperative roots, it must consider the needs of all its members. This means serving smaller farmers and larger farms, younger farmers and older farmers, dairy, crop, and specialty farms. In doing so, the organization must reconcile how it will serve each client individually, but efficiently. Serving each farm individually, though, might mean allocating resources proactively. While some clients might prefer several hour-long meetings with their lender throughout the year, allocating resources proactively might mean figuring out ways of providing service without a lender being directly involved.

Clients face increasing competition and margin pressure as well. The dairy industry for example has faced several years of low milk prices and high input costs. To deal with this,

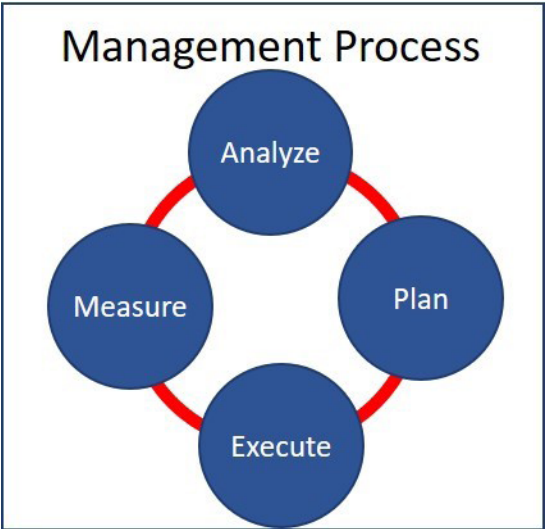


Figure 3: Management Process

dairy operators are making difficult choices between maintaining the tradition of a small dairy or increasing in size to improve efficiencies. Financing for the latter path isn't available to all operators. These trade-offs require time and counseling from financial officers. Beyond this, helping all clients understand the financials of their operations is an important component of the service provided by Compeer Financial. The specific knowledge of these factors is a point of pride within the financial officer corps and is viewed as a primary reason many clients choose to work with the organization.

Larger farming operations are often more like commercial businesses in other industries. There is often a formal officer structure that includes someone with financial management responsibilities, someone else who has technical expertise, and others who might manage people, land and landlord relationships, equipment, or procurement. There are often multiple generations as part of these operations and multiple decision makers. Farmers, who twenty years earlier might have been defined as a family patriarch, might now include any number of people who possess advanced degrees and management ability that make them formidable business owners. These operations may have diversified their farming operations into trucking, equipment service, seed sales, or specialty production. These types of operations have unique demands compared to more traditional operations.

The differences between farmers means that identifying and serving segments may be more important than ever. Segmentation based on size could result in clear segments that are easily identified by the field sales staff, but might miss some of the more nuanced behaviors that drive decisions on the farm. To serve segments effectively means not only that unique segments have to be identified, but that opportunities within them need to be clearly prioritized and resources dedicated to them. Allocating resources to targeted segments while retaining clients who don't fit into them presents a management and cultural challenge for any organization.

2. Value through Products and Services

Matt feels that these perspectives about clients mean several considerations for the value propositions they will bring to market. Bringing traditional products to traditional clients takes place in a crowded competitive space. "To be the preferred provider of products and services, Compeer Financial needs to create clear differences in the market place that are observable by clients in the targeted segments." Historically, Farm Credit organizations had

been siloed according to product lines – lending, credit analysis, insurance, other services – due to the similarities amongst the clientele base. However, given the changed scope of Compeer Financials' customers, a segmented value offering might bring aspects of each of those functions to the different segments, this would bring a more tailored product offering. In practice these tailored offerings may be difficult to implement...old habits and structures are often entrenched.

At its core, Compeer Financial generates revenues through loan and risk management products and that won't change with a segmented approach to the market. The organization can attempt to create new loan terms and structures to differentiate itself, but these methods of differentiation will be easy for competitors to imitate. The organization will need to become preferred because of the *WAY* it works with clients, not just because there is something unique about its loans. And, clients will need to be able to identify the ways Compeer Financial is unique in the way it worked with them. Service in this definition means more than just being "nice." Matt had identified that most credit organizations were pretty siloed. He feels that if Compeer could deliver a more client-focused approach in which the client feels like they are receiving advice from a team of professionals who are dedicated to working together to serve them rather than serving them only via individual product offerings, it could be a significant differentiator.

To execute a truly team-oriented strategy, means that everyone who interfaces with the client needs to communicate. It means that professionals in one area need to be knowledgeable, confident, and aware of needs in other areas – not experts, but also not threatened by having teammates discuss other areas of value needed by the client. The analogy is that if a fast food customer pulled into a drive-thru and ordered a hamburger and french fries, the restaurant employee wouldn't say, "Okay, I've got your hamburger order, let me go get the french fry guy so we can get your fry need taken care of."

Ultimately, service differentiation in this model doesn't come top down. The idea of differentiating on service is that financial and insurance officers closest to the client identify new needs of their clients for which solutions can be identified and shared across the organization. For example, if labor issues are the primary challenge faced by some farmers in a target segment, the organization would identify that and work with experts outside of Compeer to help bring knowledge, products, or training to address the issue. While

competitors might imitate any given solution, the process of innovating the “last mile of service” and bringing these innovations to clients should be far more difficult to execute.

3. Preparing Compeer’s People

Executing on a segment-focused team approach requires allocating resources to facilitate team communications. Thus, client-focused rather than silo-focused systems need to be in place. Those systems, although not cheap, are easy to put in place, but getting people to use them is a different matter. Historically, systems were in place to incentivize individual production, and that meant that relationships were often “owned” by individuals who wanted to control interactions with the client. Matt worried that some in the organization might be hesitant to share information about those interactions with others. Incentive systems need to be designed to encourage changes in these individualistic behaviors.

Training staff and managers on the importance of working together to bring value will be critical. Conceptually, the concept of working together as a team is easy to understand. But if this strategy is to work, many entrenched behaviors need to change. In the end, Matt believes these behavioral changes are more about creating a cultural shift. The legacy organizations were strong organizations, with strong client relationships. Matt says, “The point isn’t to get rid of the practices that led to historical successes, but rather to overlay a shared effort that could be observable by clients and generate new innovations in service. The role of managers in leading and guiding these behaviors is going to be critical!”

Not all staff are on board with these initial concepts. Many feel that the legacy organizations were successful because of their individual work with clients. They feel threatened by the idea that others are being encouraged to interact with those clients. A segmented approach to investing resources with some clients means that other clients are being abandoned, in the minds of some Compeer staff. Compeer staff are good at helping producers who need them. One staff member admitted, “It feels good to be needed, to turn “grandpa’s” shoe box full of receipts into advice for what to do on his farm.” They worry that they may have to tell some clients that they can’t talk with them or that they need to go online for help. While this isn’t the vision or intent of segmentation or a team approach, the reality of how each segment of members would be served is evolving, and some long-term employees are concerned.

4. Identifying Systems and Processes

If Compeer Financial is going to work with clients in new ways, Matt realizes they have to think hard about how they work with clients. While each of the legacy organizations had strong relationships, revenue was generated with a fairly transactional or siloed approach to how employees thought about their work. Loan volume and commitments were grown with individual transactions. Acres covered by insurance products were grown by individual transactions. Compeer, in contrast, has to think about what it means to have a relationship approach rather than a transaction approach to working with clients. Matt explains his view, “to me a relational approach means listening and understanding clients is as important as selling and telling.” Compeer’s ability to innovate value means knowing not only what loans and coverages a client needs this year, but what goals are driving those needs so that Compeer can predict behaviors and have new products, services, and information ready when they are needed.

Developing an accepting culture across Compeer’s teams of experts that can simultaneously: 1) embrace the strategy, 2) share information, and 3) innovate new value for both traditional and innovative clients likely requires new management practices and processes. Without new management practices, the organization may never truly adopt new behaviors that differentiate it in the market.

Relational approaches to working with clients means thinking of relationships as a process that can be managed and improved. Sales are the result of that process, and the ability to achieve sales with targeted segments of clients is dependent on how effectively that process is implemented. Matt stresses the importance of managers needing to think about their role not only as driving outcomes, but also managing the inputs that lead to those outcomes. Managing the process includes identifying metrics, analyzing the factors that lead to changes in those metrics, planning approaches for influencing those factors, and implementation of the identified plans. Matt wants all managers to understand that for the strategy to take shape they need to see managing as cyclical in that the results of execution should be measured, analyzed, and new plans re-created to be executed in the next cycle. Matt commented on the needed management process change: “I realize that the old management process had been built around transactions – outcomes. Today we want create value by relying on managers’ ability to measure the WAY Compeer Financials’ staff work with clients, not just the outcomes.”

Implementing the Strategy

As Matt thought about the opportunities and challenges of implementing this innovative strategy, he realized that he had several factors to consider as he made the numerous decisions that would lead to the execution of the strategy. How would a lending institution such as Compeer Financial redefine the customer relationship experience that was so entrenched in agricultural lending? How would the current clients be segmented to best address the diversifying needs of the farmers? Would it be on size, products grown, management characteristics, or some other farm characteristic? The end result would need to be easily recognizable and allow for sales teams to specialize in product offerings valued by the segment of Compeer's customers.

How would Compeer define value in regards to the products it offers to its customers and move from an undifferentiated product where they competed on price (interest rates) to a differentiated product? Matt knew Compeer needed to leverage their unique strengths to offer products that farmers valued. Further compounding the product offering dilemma was how Compeer would price these additional services that they would differentiate on. Traditionally, added services get bundled into the price of the loan, but could there be advantages to charging for these services, separately? It would be a major shift in the market for a lending institution to not bundle goods and services. How would farmers react to such a dramatic shift?

Matt also worried about the execution of this new strategy. Redefining customer segments and products was a tall task, made even taller by the fact that sales teams and staff would need to be retrained and reorganized. How would incentives shift so that customers would not be "owned" by an individual in the organization, but rather by a team? Internal barriers to this reorganization needed to be identified and addressed so that the risks could be minimized.

As Matt thought more about this he knew that the strategy Compeer Financial was undertaking was the right way to go. But the nuanced details for the implementation of this ambitious strategy would have to be worked out. Compeer has a clear desire to be the trusted financial advisor of agriculture and rural America in the future, they want to disrupt the traditional approach to this relationship, the question is, will the customers and the employees trust Compeer to lead them down this new path?

Discussion Questions

1. What does it mean to serve clients in all of the target segments differently?
2. How should value be defined? What does it mean to sell differentiated services instead of undifferentiated products? Should the costs of services be incorporated into the product cost or charged separately?
3. How do sales and management processes need to change in order to support these shifts?

PURDUE FOOD AND AGRIBUSINESS EXECUTIVE SUMMIT

Mantiqueira: Innovating and Disrupting in the Egg Business

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It is late afternoon when Leandro Pinto, the CEO of Mantiqueira, arrives for his interview at the charming restaurant located in Fundação Getúlio Vargas, in São Paulo, Brazil. Looking through the window, he observes a tropical thunderstorm approaching—a very common weather event during the early months of the year in a prone-to-flood São Paulo. “I feel like I am in the middle of a bridge that connects two islands...I can either return to the island where I was, or I can move forward to the island where I have never been...It is the same feeling that I had in 1997,” Mr. Pinto commented in a reflexive manner.

Mr. Pinto is at a crossroads. On one hand, he can keep the successful business model that led his company to become the largest egg company in the Brazilian market, scale his operations, and invest even more in efficiency—a comfortable strategy in the short run. On the other hand, Mr. Pinto can focus on a new cycle of diversification and expansion for his company by investing in cage-free layer flocks, introducing plant-based products and ready-to-eat meals, and effectively launching his company into the uncertain.

More relaxed after dinner, Mr. Pinto started to tell the history of Mantiqueira Group.

The History of Mantiqueira

The history of Mantiqueira is closely related to its own founder, Leandro Pinto. Mr. Pinto is a charismatic and innovative leader who believes hard work is an indispensable part of one’s personal development. And his history shows exactly how important work is for him.

“Every entrepreneur must have gratitude; ingratitude is the biggest sign of a lack of character that someone can show.”

-Leandro Pinto

Mr. Pinto started to work early—at 12 years old—against the will of his parents, who preferred the formal education path. At the age of 15, in the city of São José dos Campos, he was already employed at a bank as an office boy. During his years working there, he vividly remembers a conversation he had with a doorman after seeing a helicopter flying nearby. “I wish I were the son of whomever is flying in that helicopter,” to which the doorman replied, “Boy, you should never wish to be somebody’s son; wish to be yourself.” Mr. Pinto still carries the doorman’s advice with him.

Before turning 18, Mr. Pinto returned to Itanhandu in the Brazilian state of Minas Gerais, where he was born, to begin his career as an entrepreneur. Using the spare capacity of his father's agriculture machinery company, he started producing and selling horse carts.

By 1986, he abandoned the cart business to become a representative of a machinery company. The venture, which had been very successful in its initial years, failed in 1987 amid the hyperinflation crisis in Brazil. Looking back, Mr. Pinto believes that failing was the best thing that could have happened to him. It taught him not only that businesses are cyclical and complex, but also that these cycles can bring new opportunities.

And opportunities it brought! At the time Mr. Pinto filed for bankruptcy in 1987, his friend Mr. Juarez had a business proposal to share with him. Mr. Juarez, who had recently suffered a heart attack, felt he could not manage his egg farm with 30,000 hens anymore. He wanted Mr. Pinto to take over. A bankrupted Mr. Pinto saw the poultry farm as an opportunity to alleviate his financial situation. The only caveat was that he had no money to buy the business from Mr. Juarez.

That is when creativity struck. Mr. Pinto offered his car and a small leased truck to Mr. Juarez in exchange for renting the poultry farm. The deal allowed Mr. Pinto to change focus once again with the hopes of improving his financial situation. At the time, he thought, "Chickens produce eggs every day. By getting into the business of eggs, I will have a daily cash flow to honor my debts."

It was not that simple. The hens produced eggs daily, but they also needed to eat daily. Mr. Pinto soon realized that the profit margin in the egg farm was not very big. Not long after that, he realized he was indebted with no access to the credit market, and in addition, he was having problems in his personal life. Rogéria, his fiancée, broke up with him after discovering Mr. Pinto's true financial situation, which he had withheld from her.

It was the closest he ever felt to abandoning the business life. But Rogéria decided to help him. The marriage was off, but she would support him until he could get back on his feet. With her support, Mr. Pinto gathered strength to honor his debts. Equipped with a legal pad and pens, he wrote down all his debts. Due to his lack of cash, he would pay the smallest amounts first, marking them off from the legal pad as he did. He decided to rest only when he could toss that sheet away, with all his debts crossed off.

During the years of financial struggle, Mr. Pinto's new company, Mantiqueira, had no feed inventory, and Mr. Pinto remembers laying down at night and thinking about what the hens would eat the next day. He recalls that he always managed to feed them, but the process was not stress free. He remembers a time when he inadvertently bought contaminated corn from his neighbor to feed the flock, only to discover later that they stopped laying eggs. With no eggs, there would be no debt payment, and he would have to sell the 30,000 chickens. As a last resort, he bought corn from other producers in hopes that the chickens would get better. It took three days until the hens would lay eggs again.

He speaks with sadness about the only time in 31 years in business that he could not pay his employees. "Every entrepreneur must have gratitude; ingratitude is the biggest sign of lack of character that someone can show," he says. Mr. Pinto would not be ungrateful to his employees. He informed them about the situation and allowed them to buy groceries and medicine under his personal credit. "Truthfulness generates confidence!" according to Mr. Pinto. To liquidate the rest of his debt, he gave the last pieces of his personal jewelry to his creditors. The painful process of financial recovery was over. He married Rogéria in 1989—the same year in which he was, once again, debt free.

In 1990, he built his own egg farm with 70,000 laying hens. In 1994, he built a second one with another 30,000 laying hens. But he would not forget how risky production was. Amid a market of ups and downs, and with a production capacity of 100,000 birds, Mr. Pinto remembers the day he received a phone call from one of his associates: "The floor of the barn collapsed!" Once again, he thought he had lost everything. Luckily, only the internal part of the barn had collapsed, and there wasn't a big loss.

Shortly after the incident, Mr. Pinto decided it was time for expansion, so he returned to Mr. Juarez's farm to begin prospecting new clients.

The Expansion Phase

Mr. Pinto began prospecting in the Rio de Janeiro market. He promptly received an order from the Supermercado Paes Mendonça, a big supermarket chain. It would be a major step toward expanding production, but rumors about the financial health of the supermarket chain worried Mr. Pinto.

In his straightforward manner, he decided to meet with the supermarket's director of procurement, Mr. Agnaldo. Mr. Pinto was direct and sincere. He remembers telling Mr. Agnaldo that he could absorb the hit from delayed payments for one egg shipment, but he could not survive an entire month without payment, emphasizing his worries about the financial health of the supermarket. Mr. Agnaldo's answer was reassuring: "Get me one truckload of your best quality product per day, on time, and we will pay every single day on time." It was the commitment Mr. Pinto needed to expand production.

In 1996, he started to question the Brazilian way of producing eggs, which he perceived as archaic and too labor intensive. He began researching new ways of producing eggs in Europe and frequently visited agribusiness fairs and other poultry farms. He realized that automated production was the future of the sector. At the time, Mr. Pinto's plans were to expand production by investing in ten extra barns, each holding 30,000 hens under a more labor-intensive production system. However, after investigating new technologies, he realized he could only invest in one barn of 50,000 hens under a more capital-intensive technology.

To scale up his activities, Mr. Pinto would have to negotiate. He contacted a Spanish supplier who wanted to enter the Brazilian market and offered to buy one automated barn from him, cash up front, as long as the supplier would allow Mr. Pinto to finance a second one. The supplier agreed, and by 1997, Mantiqueira became the first fully automated egg farm in Brazil. Birds were fed, and manure and eggs were collected with no human contact.

Since he was already familiar with Rio de Janeiro, Mr. Pinto decided to start increasing his market penetration there. At the time, retail in Rio de Janeiro was dominated by families of Portuguese origin. He approached Carlos Cunha, a young businessman of Portuguese descent who owned Supermarket Dallas. Mr. Cunha was known as a revolutionary at the time. Taking advantage of higher family incomes arising from the monetary stability of Brazil in the mid-1990s, he successfully developed a network of neighborhood markets in Rio de Janeiro instead of investing in larger stores.

After being invited to visit Mantiqueira's automated barns, Mr. Cunha informed Mr. Pinto that Mantiqueira would be the only egg supplier of Supermarket Dallas. Mr. Pinto recalls teasing Mr. Cunha: "I do not know who is more irresponsible: you, for making me your only supplier, or me, for accepting it."

Following Mr. Cunha’s vetting of Mr. Pinto’s operations, Mantiqueira was able to expand distribution to several retail stores in Rio de Janeiro. The impressive growth rate of the supermarket chains linked to Mr. Cunha’s family—supermarkets in Dallas, Rainha, and Continente—drew the attention of other big players in the retail industry. In 1999, the French-owned hypermarket Carrefour bought all three chains linked to Mr. Cunha’s family. By that time, Mr. Pinto—already a friend of Mr. Cunha—made him a business proposition: “Carlos, you are rich, young, and now you are unemployed. Do you want to become my business partner?” Signed on a piece of napkin, which is preserved and stored, a successful business association was born that day out of the humility and character of the two men. In fact, the partners determined the Mantiqueira valuation with the current revenue and a guess of future profits. There was no calculation of net discounted present value of future cash flow, no beta assessment, no weighed average cost of capital, nor any detailed valuation of the business. But more important than monetary value, the personal values of the two partners formed the foundation for what would become a fruitful partnership.

“We are a family. I was always a hard worker, always worked with gratitude and honesty. You cannot reap success if you do not sow the soil with hard work.”

-Leandro Pinto

Mr. Cunha’s extensive network as well as his expertise of what retailers look for in an egg supplier allowed Mantiqueira to develop close ties with their clients. The partnership also enabled Mr. Pinto to focus more on the egg-production process and research the ways in which Mantiqueira could incorporate new technologies into its operations. This division of labor helped define what Mantiqueira is today: an innovative firm that focuses on product quality and excellent one-to-one client relationships.

During the expansion phase, Mantiqueira acquired the traditional Brazilian poultry farm, Granja Santa Clara in 2002 and also started to acquire nearby farms to supply their poultry farms. That same year, they remodeled Mantiqueira’s headquarters in Itanhandu and established a greenbelt surrounding the headquarters. Today, the area is considered a nationally protected environmental zone.

Figure 1: Mantiqueira, Itanhandu, Brazil



In 2004, the company began composting chicken manure at Horizonte Farm and using it to produce natural fertilizer. The product has been well received by the local agricultural community.

By the end of the 2000s, Mr. Pinto had an idea while visiting local corn and soybean farms in the state of Mato Grosso: he would start an egg farm there. Most of Mr. Pinto's colleagues were against the project because Mato Grosso is far from the major markets of Mantiqueira. But Mr. Pinto demonstrated how operations in the city of Primavera do Leste in Mato Grosso made strategic sense. The largest required inputs in egg production—corn and soybean meal—are produced abundantly there. Since eggs have more aggregated value than corn and soybean meal, the relative reduction in transportation costs to the consumers' markets made economic sense.

In 2008, Mantiqueira officially opened the largest egg farm in the world, with a capacity of 6 million laying hens, in Primavera do Leste. It was one of the biggest inflection points in the trajectory of innovation by Mantiqueira. Not long after that, the company decided to incorporate feedlot cattle and soybean and corn production, officially becoming a group of companies.

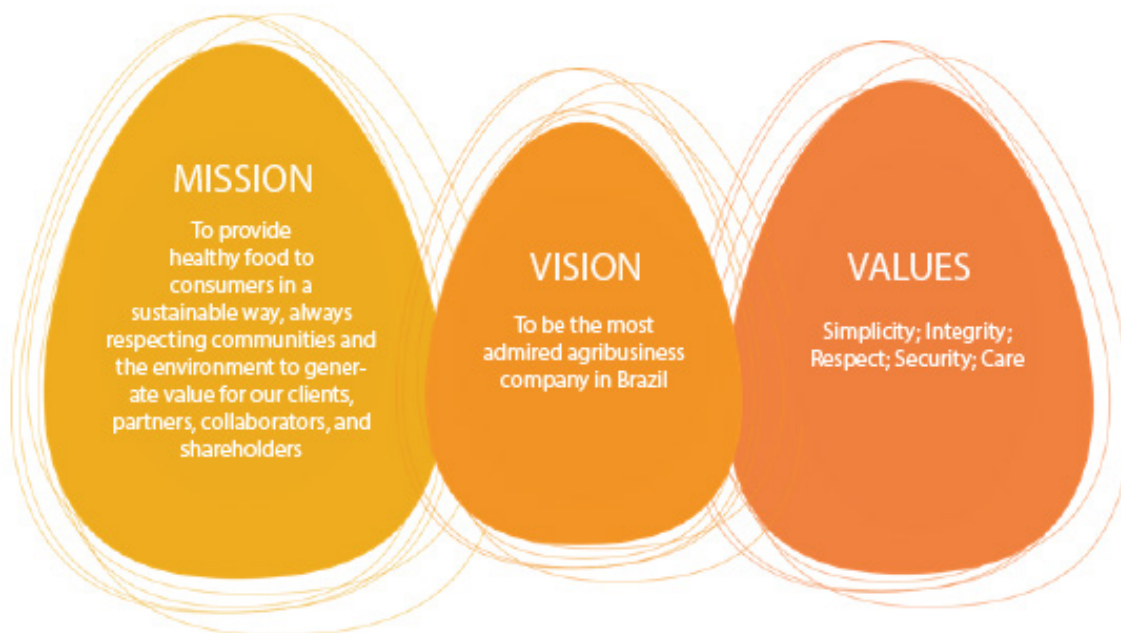
Figure 2: Mantiqueira egg farm, Primavera do Leste, Brazil



Mantiqueira's Integrated Companies

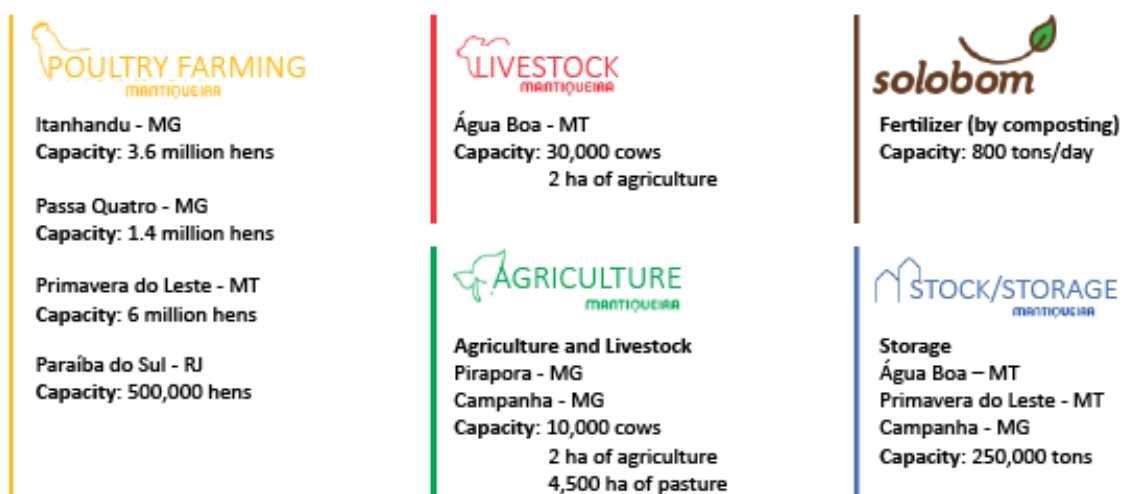
The personal values that guide Mr. Pinto and Mr. Cunha are the DNA of Mantiqueira. They are reflected in the mission, vision, and values¹ of the company.

Figure 3: Mantiqueira's mission, vision, and values



Today, Mantiqueira is an agricultural conglomerate that encompasses poultry and cattle activities, storage and grain production, and fertilizer production.

Figure 4: Operations of Mantiqueira



Source: Mantiqueira internal reports.

The company has 2,100 employees. Poultry represents 75% of Mantiqueira's activities and most of its labor force.

All the steps of production are mechanized, including production of feed (with specific diets for each phase of bird development), barn management (including the feeding process itself and manure and egg collection), and classification and packaging of eggs (separated by size, quality, and type of product). The mechanized and automated system used by Mantiqueira guarantees higher quality eggs in comparison to the average quality of eggs in the market. Automation also allows the final consumer to be the first human being to have contact with the eggs.

Mantiqueira divides production between four sites: the large Primavera do Leste unit, two barns in Minas Gerais (the Granja Santa Clara unit in the city of Passa Quatro and Granja Mantiqueira in Itanhandu), and one site in the city of Paraíba do Sul in the state of Rio de Janeiro. The latter, which only opened recently, has 500,000 laying hens and is the first large-scale operation of cage-free eggs in Brazil.

The eggs from Mantiqueira are sold in every state of Brazil, but the largest market shares are in the states of Rio de Janeiro, São Paulo, and Minas Gerais.

Product Lines

Besides traditional eggs, Mantiqueira has the following special lines of eggs and egg-based products:

Figure 5: Product Lines



Source: Mantiqueira internal materials and company's website

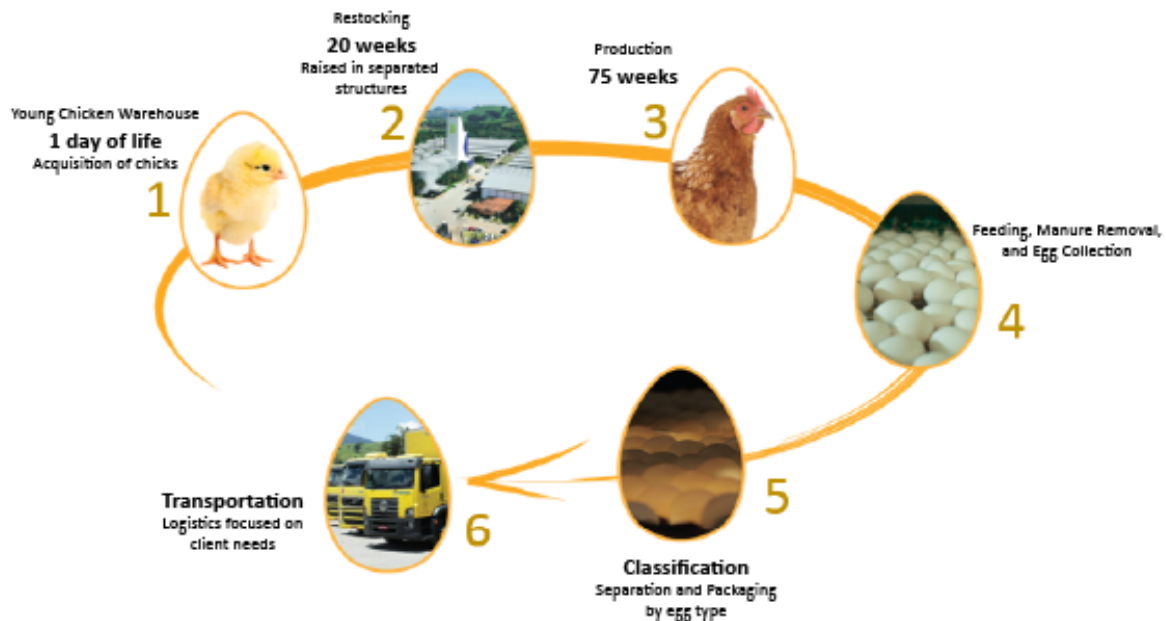
- The *Mantiqueira Organic Brown Eggs* are produced following the Brazilian organic production and animal welfare guidelines. Hens are cage free and allowed pasture area; feed contains only organic certified grains. Mantiqueira organic eggs are certified with the IBD organic seal. They are also certified by the seal Certified Humane Brasil, a branch of Certified Humane, one of the leaders in animal welfare certification in the world. Certified Humane seals follow the international standards known as Certified Humane Raised & Handled.
- The *Mantiqueira Happy Eggs*[®] are produced by cage-free chickens and comply with international animal welfare standards from Certified Humane Raised & Handled by Certified Humane Brasil.
- The *Mantiqueira Omega 3 Eggs* are rich in selenium and vitamin E. They are intended to support the immune system, regulate blood pressure, improve skin health, and supply antioxidants. Consumers concerned about health and nutrition may benefit from this product.
- The *Mantiqueira From the Farm Eggs* are produced by cage-free hens and are aimed to have a highly intense egg yolk color. They are also certified with Certified Humane Brasil seal following the international standards of Certified Humane Raised & Handled.
- The *Mantiqueira Gourmet Eggs*[®] have a bright egg yolk color. The company targets consumers interested in artisanal cooking who may use the product as the main ingredient of a lively and colorful dish.
- The *Mantiqueira Galinha Pintadinha Eggs* use a popular Brazilian cartoon to incentivize egg consumption by younger generations.
- Mantiqueira has introduced liquid egg-based products known as *Eggscellent*, which includes egg-white, egg-yolk, and other liquid egg products.
- The *Mantiqueira Quail Eggs* are used in salads and snacks.
- The *Mantiqueira Solidarity Eggs* designates 10% of its revenue to institutions that contribute to social causes. Since 2016, these specialized product lines have benefited many NGOs and nonprofits linked to social improvements in women's and children's health, education, and athletics.

Egg Business: World and Brazilian Markets

The beginning of egg production can be traced to thousands of years ago, when chickens were domesticated by humans. In small-scale egg production, eggs do not require complex handling. Hens are raised free-range, and their feed is provided from a pasture or the farmer. Large-scale egg production requires more care. Diets must be optimized, sanitary requirements must be met, and eggs must be classified by size and quality, according to consumer demand.

Large-scale egg production consists of six main steps: (1) acquisition of chicks (one day old); (2) raising of chickens; (3) egg production; (4) feeding, manure removal, and egg collection; (5) classification of eggs; and (6) transportation of eggs. The entire production cycle takes up to 90 weeks.

Figure 6: Cycle of egg production



Source: Mantiqueira internal materials

World Market

Egg production mainly supplies local and national markets and are rarely exported to other countries. Eggs are perishable and fragile, so there is a high risk for waste during transportation, and these risks increase with distance. The high transportation cost per egg can further reduce the already small profit margin, so transportation and logistics are important elements in egg production.

Table 1 shows egg production for the selected countries. Countries with high populations—including China, USA, India, Mexico, Japan, and Brazil—tend to have higher total egg production (Moura, Feil, and Sgavioli 2019).

Table 1: Egg production in the world, 2007 to 2016 (in thousand tons)

	China	USA	India	Mexico	Japan	Russia	Brazil	Indonesia	Ukraine	Turkey
2007	21,833.16	5,395.00	2,947.00	2,290.83	2,583.29	2,121.78	1,779.19	1,174.60	807.20	795.31
2008	23,292.21	5,344.00	3,047.00	2,337.21	2,553.56	2,118.50	1,844.67	1,122.62	855.20	824.42
2009	23,633.52	5,374.00	3,230.00	2,360.30	2,507.54	2,194.50	1,921.89	1,071.50	883.80	864.54
2010	23,820.08	5,437.00	3,378.10	2,381.37	2,515.32	2,260.60	1,948.00	1,121.10	973.90	740.02
2011	24,231.63	5,475.00	3,466.34	2,458.73	2,482.63	2,283.60	2,036.53	1,027.85	1,064.00	809.67
2012	24,659.15	5,589.00	3,655.00	2,318.26	2,506.77	2,333.60	2,083.80	1,139.95	1,092.60	931.92
2013	24,786.99	5,778.00	3,835.20	2,516.09	2,521.97	2,283.60	2,171.50	1,223.72	1,121.40	1,031.05
2014	24,942.68	5,974.00	4,111.36	2,567.20	2,501.92	2,313.50	2,240.55	1,244.31	1,119.80	1,071.59
2015	25,842.15	5,756.87	4,316.62	2,652.53	2,520.87	2,357.20	2,260.94	1,372.83	959.50	1,045.40
2016	26,835.48	6,037.55	4,561.00	2,720.19	2,562.24	2,412.85	2,289.46	1,428.16	854.60	1,122.05
Var. (%)	22.90	11.90	54.80	18.70	-0.80	13.70	28.70	21.60	5.90	41.10
Average	24,387.71	5,616.04	3,654.76	2,460.27	2,525.61	2,267.97	2,057.65	1,192.66	973.22	923.56

Source: Moura, Feil, and Sgavioli (2019) using data from the United Nations Food and Agriculture Organization (FAO)

Brazil ranked as the seventh highest egg-producing country in the world in 2016. From 2007 to 2016, the country saw a 28.7% increase in production, reaching 2.3 million. Despite the growth in production, Brazilian per capita consumption is relatively low as compared to other countries, as shown in Table 2.

Table 2 shows that China, Mexico, and Japan are the largest egg consumers in the world, consuming more than 300 eggs per capita/year. According to Moura, Feil, and Sgavioli (2019), Brazil reached peak egg consumption in 2017, consuming 192 eggs per capita/year, an increase of 47% over the 131 eggs per capita/year of 2007. The pro-consumption campaigns performed by the chain, under the coordination of “Instituto Ovos Brasil”², a kind of a Brazilian egg institute, and strengthen of internal market during the time were responsible for the increase.³

Table 2: Annual per capita consumption of eggs (units), 2007 to 2017

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
China	316	-	320	-	336	-	-	-	300	310	-
USA	250	247	246	249	234	255	259	263	261	252	274
Mexico	329	331	355	365	358	335	347	398	352	-	-
India	35*	36*	38*	39*	40*	-	-	62	63	-	-
Japan	327*	323*	316*	316*	315*	-	-	-	329	347	-
Russia	238*	236*	243*	250*	253*	269	269	269	285	273	-
Brazil	131	120	120	149	163	162	169	182	191	190	192
Indonesia	93	85*	76*	78*	70*	-	-	-	63	-	-
Ukraine	262	269	283	282	327	211*	244*	-	-	-	-
Turkey	165	159*	156*	158*	168	-	-	119*	194	-	-
South Africa	108*	112*	122*	112*	122*	163	148	142	142	141	128
Argentina	178*	173*	180*	197*	243	-	-	-	256	273	-
Canada	188*	183*	183*	194*	206*	214*	223*	223*	182	239	-
Australia	95*	105*	120*	105*	216	-	-	-	214	235	-
France	245*	248*	238*	232*	222	207*	243*	243*	216	-	-
Italy	193*	197*	212*	212*	206	-	-	229*	216	-	-
Sweden	187*	183*	192*	200*	207	-	-	-	217	195*	-
Germany	209	208	209	214	217	220	224	232	231	235	-

Source: Moura, Feil, and Sgavioli (2019) using data from International Egg Commission (2013), Helgi Library, International Egg Commission (2015), South African Poultry Association (2017), e Statista (2018).

*Transformed in units by dividing ton by the average eggs weight).

United States egg market⁴

The U.S. egg market provides a good benchmark to the Brazilian egg market. According to the U.S. Department of Agriculture National Agricultural Statistics Service (USDA–NASS), the country produced approximately 106.5 billion egg units in 2018. During that year, 60% of shell eggs were destined for retail; less than 3%, to exports; and the remaining, as inputs for other products (USDA-AMS 2018).

Per capita consumption has increased in recent years. In 2010, per capita egg consumption in the United States was 240; by 2018, it had risen to 279. The increase in demand was possibly due to an increase in the number of layers as well as to a boost in productivity. In 2017, the United States had 319 million layers, laying an average of 289 eggs/day.

Two trends are evident in the U.S. market: fewer producers supplying eggs and the increase of organic and cage-free eggs. First, the 10 largest U.S. egg producing companies own 53% of the layers, and the top 55 producers account for approximately 98% of all layers. Secondly, more than 18% of the layer flock produced table eggs under cage-free or organic systems in the United States in 2018. Cal-Maine Inc, the largest company in the sector, reported that 32%

of its revenue comes from the market of more differentiated eggs, which represents 23.5% of its total production.

Table 3: Top United States egg producers, 2019

Ranking	Company	Hens (millions)
1	Cal-Maine Foods	40.25
2	Rose Acre Farms	26.60
3	Versova Holdings LLC	21.10
4	Hillandale Farms	20.00
5	Daybreak Foods	14.00
6	Michael Foods	13.29
7	Rembrandt Enterprises	12.50
8	Center Fresh Group	10.50
9	Midwest Poultry Services LP	9.80
10	Prairie Star Farms	9.40

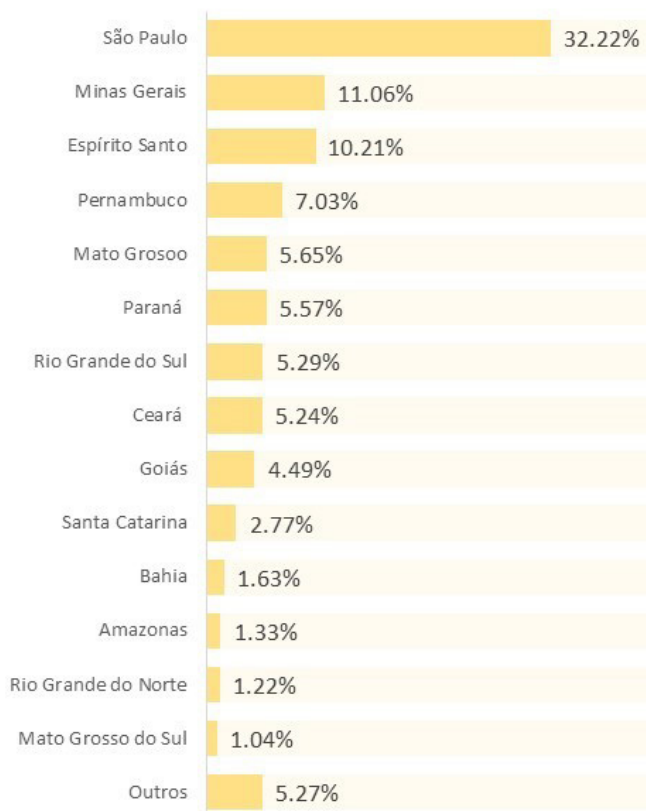
Source: WATTAGNet (2019)

Brazilian egg market

According to the Brazilian Institute of Geography and Statistics (IBGE 2019), egg production in 2018 was 43.2 billion eggs, or 120 million boxes of 30 dozen. Brazilian production is generally spread across the nation, but clusters of production exist in the states of Espírito Santo, São Paulo, and Minas Gerais in the southeastern part of Brazil and in Pernambuco in the Northeast. Top 3 states are responsible for almost 55% of egg production.

The share of eggs in the Brazilian diet has increased in the last decades, and nutritionists have started recommending eggs as an affordable

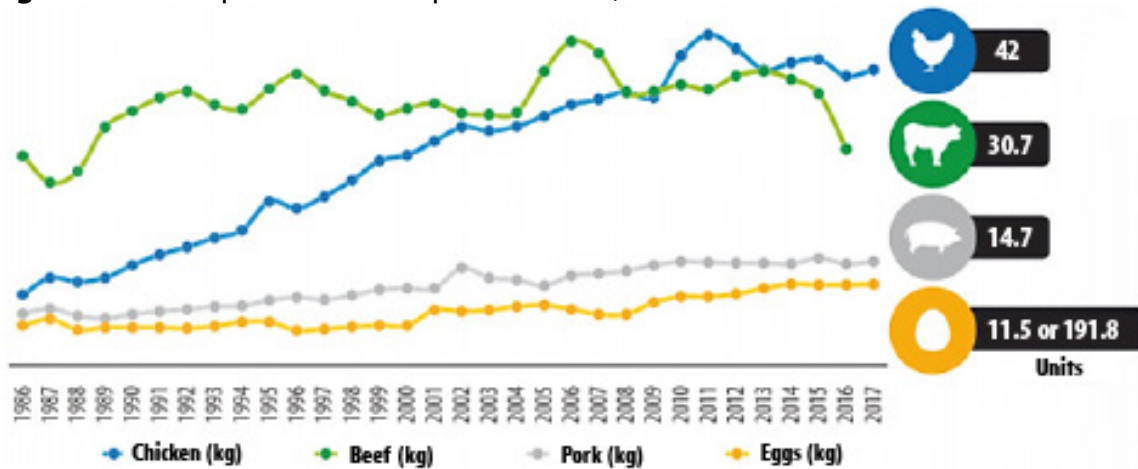
Figure 7: Share of chick housing by state, 2018



Source: IBGE (2019)

high-protein, low-caloric product. This was not always the case. During the 2000s, the benefits of eggs were in the center of the debate about health concerns, particularly in regards to the association between diets rich in eggs and high in cholesterol.⁵

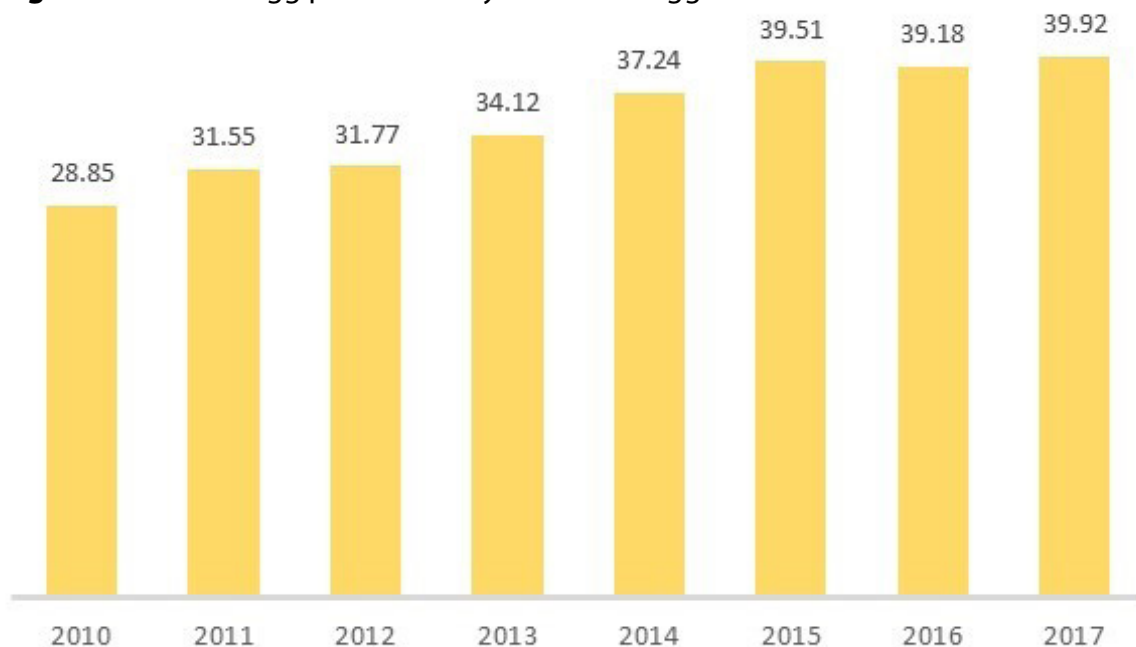
Figure 8: Animal protein consumption in Brazil, 1986 to 2017



Source: ABPA/ABIEC

Because of increasing demand, farmers in Brazil responded by increasing production. The Brazilian Association of Animal Protein (ABPA) and the Brazilian Association of Meat Exporters (ABIEC) lauded the increase of egg production in Brazil in 2017 and expects steady growth in the coming years.

Figure 9: Brazilian egg production by millions of eggs



Source: IBGE (2019)

According to Table 4 (below), Brazilian egg production increased by 52.1% from 2007 to 2017. Most of the growth can be attributed to the adoption of new technology by producers, genetic improvement, better sanitation, and advances in bird nutrition. Brazil reached 153.3 million layers in 2017. The country has also faced significant growth in nontraditional egg-producing regions. The center-west region increased production by 112.3% from 2007 to 2017. The north and northeast regions registered a 25.6% and 65.1% growth, respectively, during the same period. Despite the low levels of egg production in the northern part of Brazil, production may increase if producers take advantage of the river transportation system (Moura, Feil, and Sgavioli, 2019).

Table 4: Brazilian egg production in millions of dozens, by region, 2007–2017

	North	Center-West	Northeast	South	Southeast	Total
2007	62,369	196,897	290,060	495,985	1,118,264	2,163,575
2008	66,241	212,714	306,820	525,175	1,166,823	2,277,773
2009	79,002	244,172	323,018	530,969	1,179,855	2,357,016
2010	65,231	291,309	331,191	549,364	1,216,506	2,453,601
2011	59,954	331,361	351,847	601,903	1,217,337	2,562,402
2012	67,906	362,092	371,203	613,640	1,280,638	2,695,479
2013	71,134	379,073	373,948	603,485	1,312,682	2,740,322
2014	69,962	373,746	384,886	617,192	1,379,092	2,824,878
2015	74,154	375,986	401,516	669,762	1,405,924	2,927,342
2016	74,739	400,315	442,437	680,338	1,488,087	3,085,916
2017	78,345	417,967	478,791	719,340	1,596,200	3,285,509
Growth 07-17 (%)	25.62	112.28	65.07	45.03	42.74	52.09

Source: Moura, Feil, and Sgavioli (2019) using IBGE data

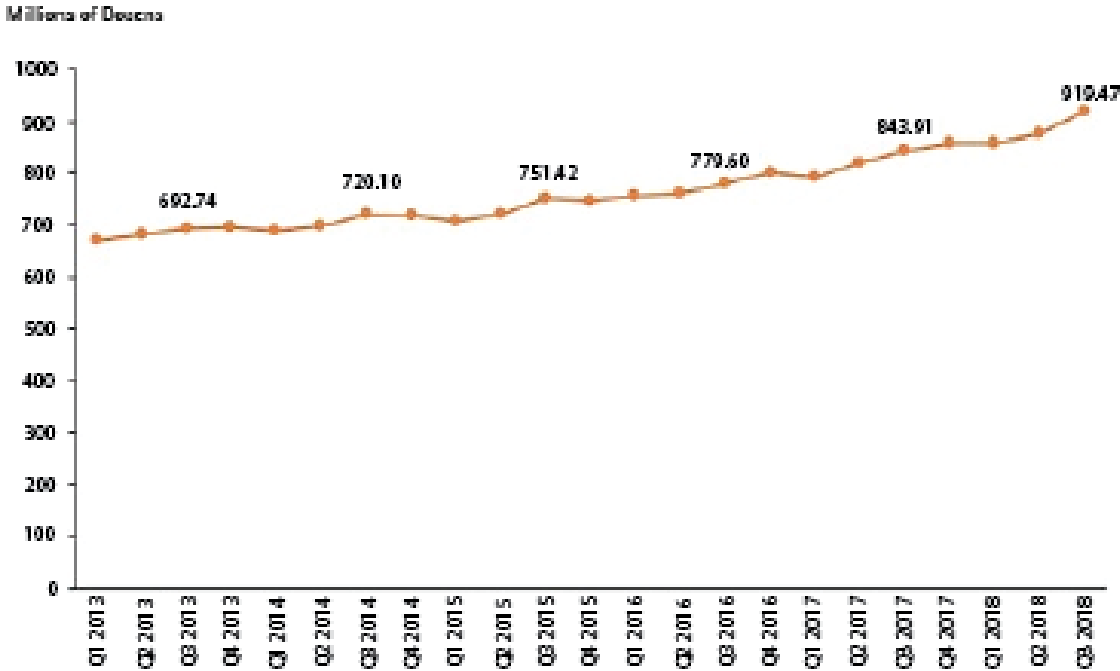
During 2017, the price of eggs in Brazil had mostly followed the inflation rate. But from January 2018 to September 2018, egg prices in Brazil decreased by 1.75%, placing them far below the inflation rate of the period, which was around 3.3% (IBGE, 2019). During this time, a low unit price made eggs a good protein option for low-income consumers, and the sales volume increased.

Using data from Q3 2018, IBGE (2019) showed that 1,042 farms (55.6% of total egg-producing farms in Brazil) produced table eggs, while 833 (44.4% of total) farms produced hatching eggs. During the same quarter, Brazil produced 919.5 million dozen⁶ eggs, an increase of almost 5% in relation to the previous quarter and a 9% increase over Q3 2017. Table eggs represented almost 80% of the total egg production in Brazil, and hatching eggs were a little more than 20% of total production. Figure 10 shows the evolution of egg production in Brazil by quarters. The steady increase in egg production resulted in Q3 2018 being the largest egg-producing quarter of the historical series, which began in 1987.

The growth of more than 75.7 million dozen eggs between the Q3 2017 to Q3 2018 can be explained by an increase of egg production in 23 out of the 26 Brazilian states. The state of São Paulo increased production by 24.74 million dozen (825,000 boxes of 30 dozen) and the increase in Espírito Santo was almost 14.3 million dozen (476,000 boxes of 30 dozen), making them the Brazilian states with the highest increase during the period.

Imports are insignificant, representing less than 1% of the market. The internal market supplies and consumes most of the eggs produced.

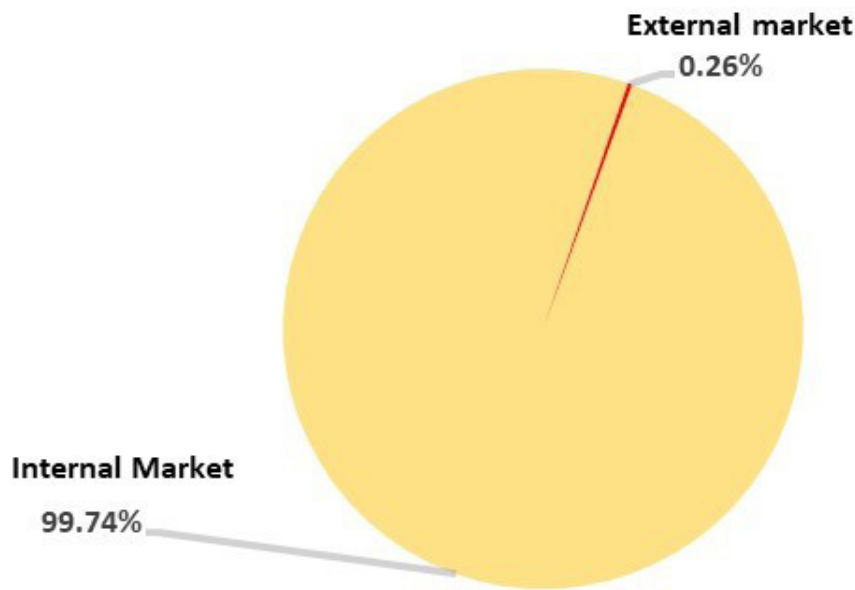
Figure 10: Brazilian egg production, Q1 2013 to Q3 2018.



Source: BGE. Diretoria de Pesquisas. Coordenação de Agropecuária. Produção de Ovos de Galinha, 2013, I-2018, III.

As in other parts of the world, Brazilian producers supply eggs to different sectors of the economy, including retailers, food services, and institutions⁷ as well as to other industries that use eggs as inputs. The retail sector was the largest buyer in 2017, particularly supermarkets and hypermarkets. They tend to carry the largest variety of eggs—white, brown, red, and organic—which tends to be convenient for consumers.

Figure 11: Destination of Brazilian egg products in 2017.



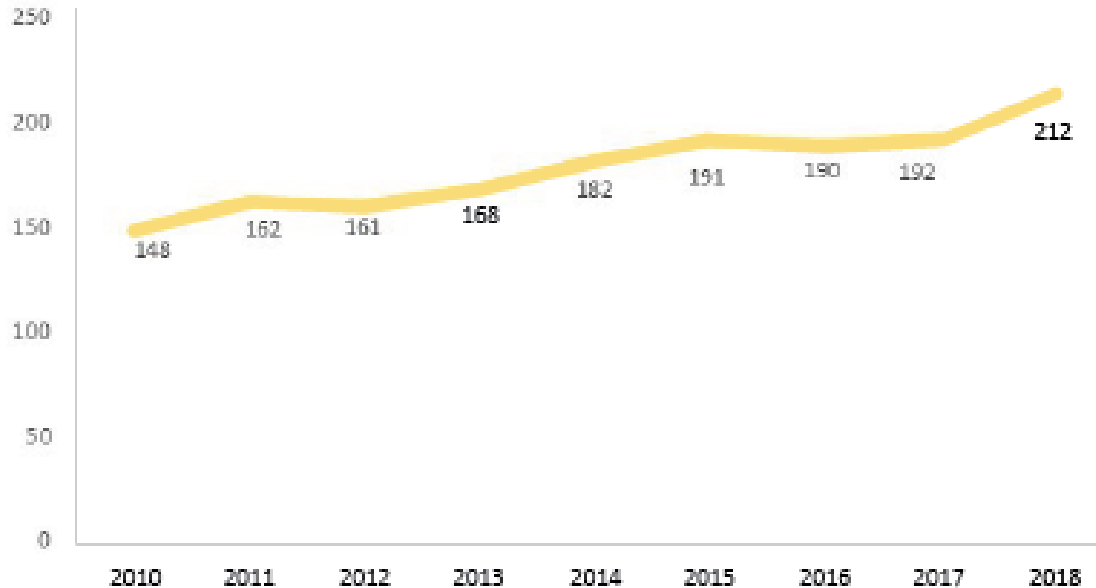
Even though eggs have the best cost-benefit ratio among animal protein products—both in economic terms (cost per serving) and in nutrition (grams of protein per dollar spent)—per capita consumption in Brazil remains relatively low, as Table 2 indicated. For instance, a consumer in the United States consumes on average 280 eggs per year, while Brazilians consume an average of 212 eggs per year.

Table 5: Average retail cost of high-quality protein product – January 2019

Protein Food	Avg. cost	Serving size	Cost per serving	Calories per serving (kcal)	Protein per serving (g)	Grams of protein per dollar spent (g/\$)
Eggs, Grade A large	1.60/doz.	1 egg	0.13	72	6	46
Milk, reduced fat, 2% milkfat	2.88/gal.	8 oz.	0.18	122	8	44
Chicken breast, skinless, boneless	3.05/lb.	3 oz.	0.57	102	19	33
Ground beef, 90% lean meat	5.25/lb.	3 oz.	0.98	149	17	17
Pork chops, boneless	3.73/lb.	3 oz.	0.70	132	18	26
Beef, round roast, USDA Choice, boneless	4.81/lb.	4.8/lb.	0.90	147	19	20

Source: American Egg Board (2019)

Figure 12: Evolution of per capita egg consumption in Brazil



Source: ABPA (2018)

However, the data from 2010 to 2018 shows the growth rate in egg consumption in Brazil is trending higher than in the United States: 42% in the former compared to 12% in the latter. Moreover, Brazil has a high-income elasticity of demand for eggs, implying that favorable income shocks can greatly increase Brazilian egg consumption.

The Competitive Environment of the Brazilian Egg Market

Mantiqueira is currently the biggest egg producer in Brazil and South America and the second largest in Latin America, and it ranks 12th in the world. But despite its size, Mantiqueira has only a 5% share in the fragmented Brazilian egg market. Thus, competition is intense, not only between large producers but also between small producers. For instance, it is not uncommon to see small retailers using Volkswagen Buses to sell eggs in bulk across multiple locations in Brazilian cities.

Thus, the company must leverage its production capacity. Mantiqueira sells in every formal market in Brazil: in bulk, in packages, and in the market of eggs with differentiated attributes. Using the slogan “Eggs also have a brand; buy Mantiqueira eggs,” the company’s strategy is to imprint the Mantiqueira brand into consumers’ minds.

Branding has been a strategy used not only in the Brazilian egg market but also worldwide. To stand out in a competitive market, Mantiqueira seeks to establish an effective bond with consumers, using the idea of emotional branding to retain buyers.

With emotional branding scholars argue that consumer fidelity does not arise from marketing the tangible or symbolic benefits of the product, even if those benefits boost self-esteem or consumers' status⁸. Rather, the bond between the consumer and a brand can be strengthened under narratives that appeal to empathy or situations that connect to consumers' dreams and aspirations, their life story, and the brand itself.

As a brand, Mantiqueira had already established roots in the first market it entered: Rio de Janeiro. There, 96% of the consumers state they are "very satisfied/satisfied" with Mantiqueira eggs, 87% say these are "the best eggs," and 97% affirm that they "will keep buying" Mantiqueira products, according to internal research. Despite its strong presence in Rio, the company has a weaker presence in other Brazilian cities. Thus, to reach different segments of the market and strengthen its brand, Mantiqueira launched differentiated packaging for its products to highlight their various attributes.

Communication campaigns

In another effort of branding, Mantiqueira personalized its eggs with a heart-shaped stamp that says: "You can always trust those with heart."

Figure 13: Top egg producers in the world, 2018 data.

Rank	Company	Country	Layers (million head)	Full profile details
1	Cal-Maine Foods (including Hillandale Farms)	United States	40.1	goo.gl/P1cw6f
2	Proteina Animal (PROAN)	Mexico	33	goo.gl/by2MFO
3	Rose Acre Farms	United States	26.9	goo.gl/nesezx
4	CP Group (worldwide operations of CP Foods)	Thailand	22	goo.gl/7loe4R
5	Ise Inc.	Japan	20	goo.gl/5yM1P0
6	Versova Holdings LLC	United States	16.4	goo.gl/NV7gTvx
7	Arab Company for Livestock Development (ACOLID)	Saudi Arabia	13.4	goo.gl/Ojqu9A
8	Daybreak Foods	United States	13	goo.gl/Zv6tu6
9	Kazi Farms Group	Bangladesh	12.7	goo.gl/KEUjPo
10	Rembrandt Enterprises	United States	12.5	goo.gl/uwvZo5
11	Michael Foods	United States	12.2	goo.gl/Zhxiwh
12	Granja Mantiqueira	Brazil	12	goo.gl/JvhWj3
13	CP Foods (including Chia Tai Group, COFCO)	Thailand	12	goo.gl/ltiu5Z
14	Avangardco	Ukraine	10.7	goo.gl/Y1wPa0
15	Avril Group	France	10	goo.gl/JtYyo4
16	El Calvario	Mexico	10	goo.gl/PWlkyW
17	Empresas Guadalupe	Mexico	10	goo.gl/cXbWqN
18	Granja Yabuta	Brazil	10	goo.gl/qqIQpr
19	Wadi Group	Egypt	10	goo.gl/z0v5m4
20	Center Fresh Group	United States	9.7	goo.gl/h0lkeX

Source: WATTAgNet (2018)

Figure 14: Mantiqueira stamped eggs



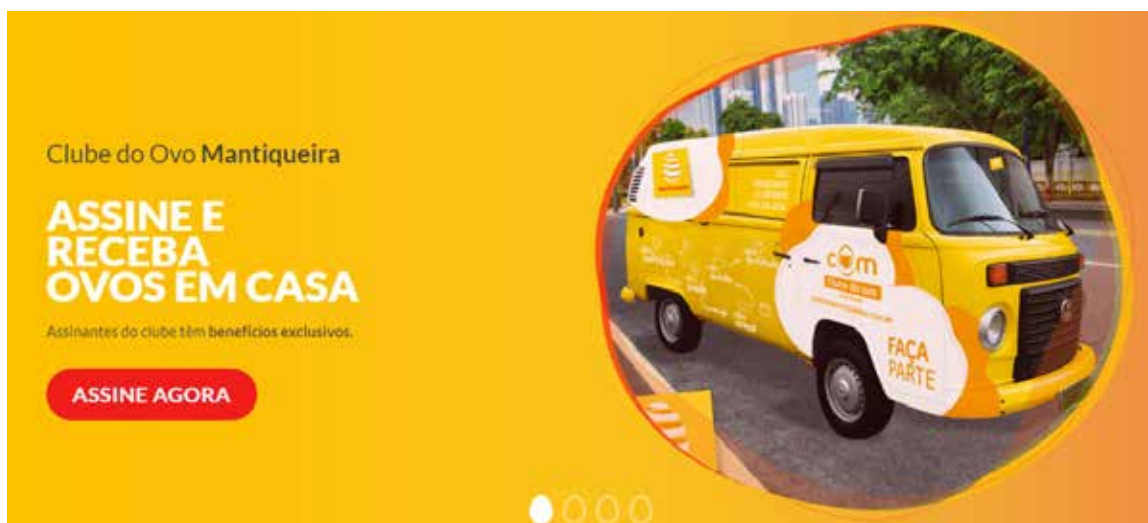
Figure 15: Mantiqueira advertisement—
The figure reads: “You can always trust those with heart.”



New products

Following global tendencies, Mantiqueira launched two new products/services in 2019. The first, named the Egg Club, is structured in a similar fashion as meal delivery kits. Members of the club select the type of eggs they would like to purchase and the frequency of deliveries to their homes. The company believes that this convenient channel will connect the client to the company by personalizing the consumer’s shopping experience. This strategy may help boost the egg producer’s share of the final retail price above the current 40% depending on the total cost of the system (digital platforms, delivery and other costs).

Figure 16 Egg Club campaign—The figure reads: “Sign up and receive eggs at home.”



Source: Mantiqueira (2019)

The second product is aimed at a different market segment: vegan consumers. According to the Brazilian Vegan Society, the market of vegan products grows around 40% each year in Brazil. Mantiqueira entered the vegan market with a plant-based, vegan-friendly substitute for its main product, the egg. Named *N.ovo*⁹, the product is designed to mimic the taste, texture, and structure that eggs would give to cakes, pasta, and pancakes.

Figure 17: *N.ovo* package



N.ovo comes in a box similar to conventional eggs, even though it is actually a powdered product. A measuring cup is included inside every *N.ovo* package.

Trends in the Egg Market

According to the Brazilian Bank of Development (BNDES), consumption of eggs can be greatly increased by taking advantage of industrialized eggs (BNDES 2016), known in the industry as egg products. The BNDES conclusion is supported by a worldwide trend: egg products took 25% of the egg market in the European Union, 30% in the United States, and 49% in Japan. Moreover, egg products can be targeted to both the final consumer and processors.

Egg products can be either liquid or dehydrated (powdered). Many contain only the egg white or the egg yolk. To be considered an egg product, eggs must represent more than half of the mixture when combined with other ingredients (e.g., salt, sugar, enzymes).

Egg products were developed to make better use of products that were deemed unsuitable for the final consumer, such as damaged or low-quality eggs. But because egg products have a longer shelf life, their prices are more stable over time as compared to shell eggs, effectively making egg products a consistent stream of revenue for companies (BNDES 2016).

From the consumer's point of view, egg products have become a convenient alternative. They allow for simpler handling, longer storage, better transportation—as eggs in the shell

can break—and higher levels of food security since contamination tends to decrease after processing (Kakimoto 2011).

According to BNDES (2016), guidelines recommend that liquid eggs should be consumed, on average, within four weeks if stored without refrigeration or within 10 weeks if refrigerated. Some products in the market claim to last up to 75 days before spoilage. Depending on who the final consumer is, liquid eggs are packaged in bags, tank trucks with cooling systems, or in Tetra Pak®-style carts.

Ready-to-eat eggs have gained traction among consumers. For instance, hard-boiled eggs, egg-based tortillas, scrambled eggs in bags, and ready-to-eat egg-based products with expiration dates up to seven weeks in the future can be found in current markets.

Dehydrated eggs (powdered) do not require refrigeration and have a longer expiration period than *shell* eggs. And dehydrated eggs can be an alternative for consumers who need precise amounts of eggs for their recipes since powdered measurements can often be more precise. The largest sub product of industrial egg usage, eggshells, can be inputs to fertilizers because they are rich in calcium.

The BNDES (2016) study argues that egg product consumption will increase at the same rate as shell eggs in Brazil, following the trend of the developing world. However, the growth rate of egg products can be divided between the increase in consumption of already existing products and the introduction of new products. As an example, companies recently introduced eggs in spray—used mainly in egg-based recipes—and pre-boiled eggs for individual consumption.

Egg products may increase penetration of Brazilian eggs around the world, as transportation and spillage become less of a problem. Increase in international trade allows countries to expanding popular brand recognition beyond national borders.

The main trend in consumption and production of eggs relates to animal welfare, with examples of governments that have enacted policies that restrict conventional practices and consumers have been willing to pay higher prices for eggs produced under animal welfare practices (Mullally and Lusk 2017, Ochs, et al. 2018). The European Union, for instance, has

already introduced specific directives regarding the welfare of laying hens¹⁰, and the bloc has been actively discussing animal welfare standards.¹¹ California, in 2015, passed animal welfare laws that allowed chickens to fully turn around and extend their wings went into place (Mullally and Lusk 2017). Chicken well-being poses a challenge to conventional forms of egg production as consumers have shown a desire to consume cage-free eggs. Led by demand, traditional production methods in developed countries are being adjusted to include alternative production methods, too. Producers have increased the use of enriched cages, cage-free, and free-range systems of production.

Under the conventional system, the size of a cage varies from 350 cm² to 450 cm² per hen, allowing an overlay of up to seven cages. According to BNDES (2016), conventional cages are easier to handle and tend to show a lower cost of production. Technology is fully adapted to the conventional system of laying. Conventional cages have fenced-angled floors, which allow eggs to roll down into a transportation tube and out of the barn. Manure falls into collecting conveyor systems, allowing for cleaner eggs and less use of labor.

In a cage-free system, birds freely move inside a barn. Benefits to birds include more natural movements and socialization between hens. Birds are required to have a minimum length of perch space and shared nests for laying. Despite efforts to mechanize collection of eggs under cage-free systems, handling chickens in this environment requires more labor.

Organic products also gained attraction with consumers that tend to perceive them as healthier and higher quality (Lee, et al. 2013, Dahlhausen, Rungie and Roosen 2018). Organic production requires that bird feed comes strictly from organic grains but other than that, organic production and conventional production of eggs can be very similar in terms of handling. The guidelines and standards used in Brazilian organic production follows Norm 17/2014 from the Brazilian Department of Agriculture (MAPA).

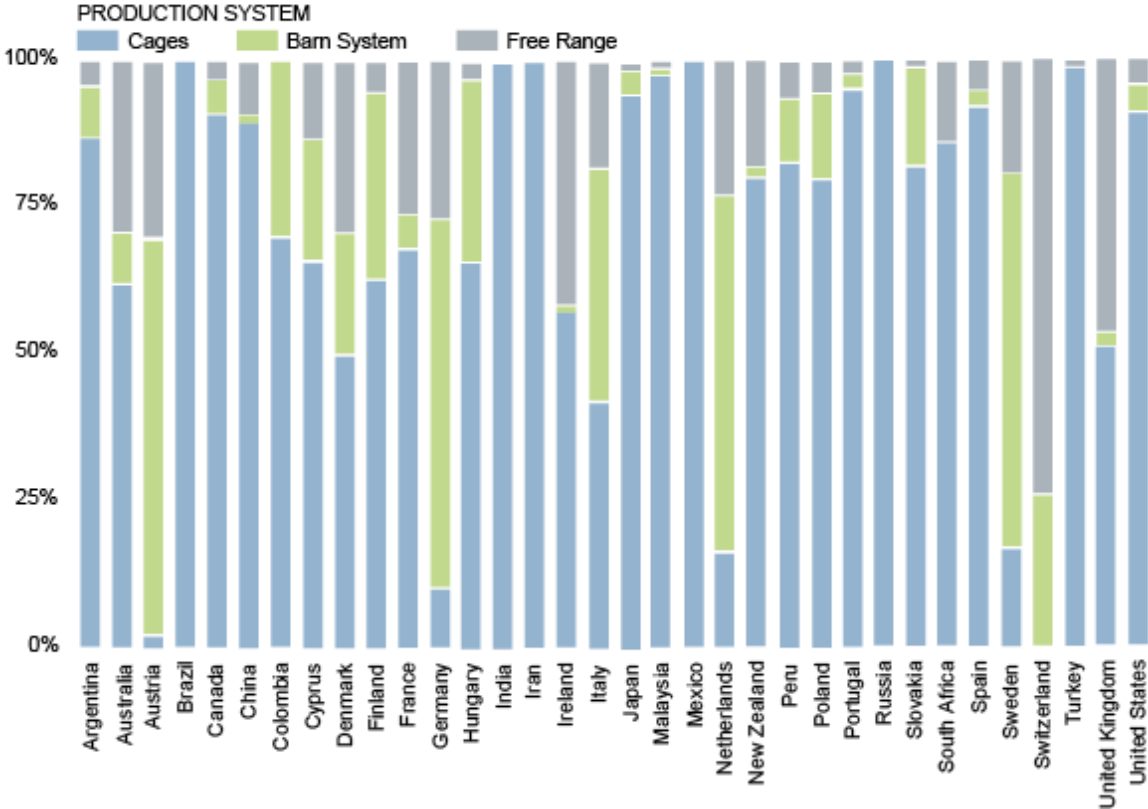
The Brazilian legislation recognizes other forms of production, identified with the traditional way of handling egg production in rural Brazil. One of them is named the colonial system of production. Under the colonial system, rustic chicken breeds are adapted into conventional production practices: birds are free to pasture in no less than 3 m² per hen, and feed comes exclusively from plant sources, with synthetic feed inputs and any sort of growth agents forbidden. Certification and enforcement of the colonial practices has been the biggest challenge under this method of production (BNDES 2016).

A slightly different version of the colonial system is used by smallholders in rural Brazil. The *caipira* eggs, as they are known, are produced under free range and pasture- or corn-fed only. They are associated with an unsophisticated production process but praised by consumers for their taste.

Trends in egg production show a clear direction toward cage-free and free-range systems, with a lower density of birds in poultry farms. Both consumers and governments have indicated a desire for more strict animal welfare standards in the industry—a pattern shown both in the buyers’ consumption behavior¹² and in government legislation.¹³

Companies wishing to diversify started to offer products made exclusively from cage-free eggs. Some announced that only cage-free eggs will be in their products by 2025.¹⁴ It became important for these processors to find suppliers who were using cage-free systems or conversely demand that traditional farmers convert their conventional systems to cage free. BNDES (2016) believes that organic and enriched eggs¹⁵ will remain as market niches in Brazil, as their growth rate has not been comparable to that of cage-free eggs.

Figure 18: Egg production system by country



Source: Mantiqueira reports, data from FAOSTAT, ICE and others

However, the market of cage-free eggs is not free from uncertainty. Commitments by processors to buy only cage-free eggs aren't necessarily accompanied by effective plans on how fast they will replace conventional eggs in their products. For instance, in a survey with egg producers, 47% of them stated that their clients have made future commitments to convert to 100-percent-cage-free eggs, but only 12% have established interim benchmarks on how to achieve that goal.¹⁶

Mantiqueira became the first company to produce cage-free eggs in Brazil. Approximately 500,000 hens owned by the company produce eggs certified by the seal Certified Humane Brasil following the international standards known as *Certified Humane Raised & Handled*.

Uncertainty can also arise from the pace of innovation for food products as the food sector tries to keep up with shifts in consumer preferences. Market specialists argue that cage-free eggs can already be obsolete in the agenda of food sustainability as proponents of the "food movement" tend to argue against animal-protein diets. In their view, plant-based diets could reduce the environmental damage associated with animal production and improve consumer health outcomes.¹⁷

The World Resource Institute (WRI) and Princeton University estimated that animal-based protein tends to emit more greenhouse gases (GHG) per gram of protein than other sources, such as plants, as shown in Figure 19. They also showed that the average person consumes more protein than the daily requirement.¹⁸ There seems to be increasing agreement between scholars, environmental agencies, and NGOs about the high environmental cost of animal protein production¹⁹ to the extent that the message has been incorporated by a niche of consumers.

For example, in 2011 Pat Brown, a biochemist and geneticist by training, founded Impossible Burger, a startup company that produces a meat-free burger which mimics the texture and taste of meat. The company is valued at approximately \$2 billion as of May 2019. The success of Impossible Burger testifies to the power of the vegetarian segment in the protein market. In fact, the company has partnered with Burger King to offer their plant-based burger in restaurants around Missouri, located in the heart of the meat country in the United States. Impossible Burger has captured millions of dollars in investments and is backed by high-profile investors, such as Bill Gates.²⁰

Figure 19: World Resource Institute Protein Score Card



Source: World Resource Institute (2019)

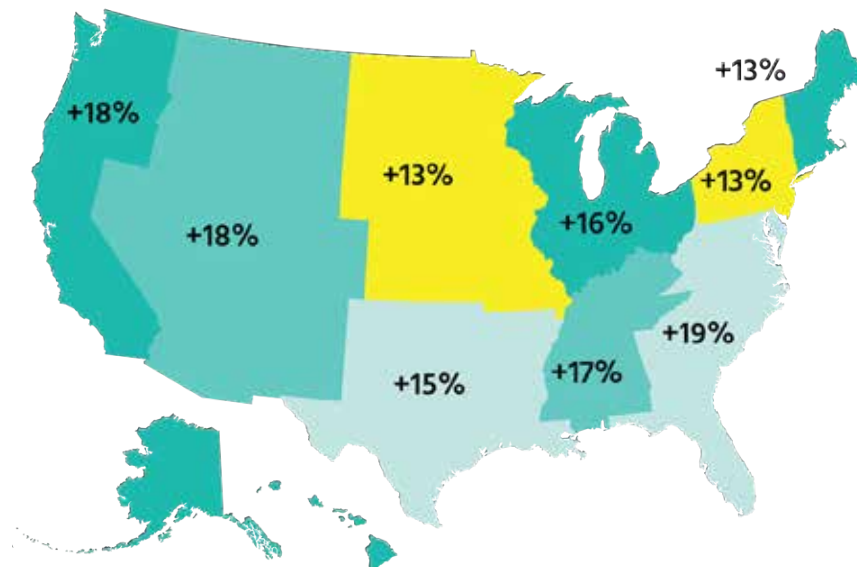
The data in Table 6 shows that the United States had \$3.7 billion in sales of plant-based products in 2018, while Figure 20 shows the increases in these sales by region from August 2017 to August 2018.

Table 6: Plant-based Category Sales (\$ million)

Category	Sales	\$ Sales changes vs. YA
Plant-based milk	1,821.9	9%
Plant-based meat	683.7	23%
Plant-based ice cream and frozen novelties	232.0	40%
Plant-based meals	209.7	25%
Plant-based yogurt	174.1	55%
Plant-based butter	168.8	6%
Plant-based cheese	133.2	41%
Plant-based creamer	124.3	62%
Plant-based tempeh	107.2	9%
Plant-based eggs and mayonnaise	42.4	15%
Plant-based ready-to-drink (RTD) coffee	34.1	-12%
Plant-based dressing, sour cream, dips	12.4	29%
Total plant-based products	3,744.7	17%

Source: Nielsen

Figure 20: Increases in U.S. sales of plant-based products by region, August 2017 to August 2018

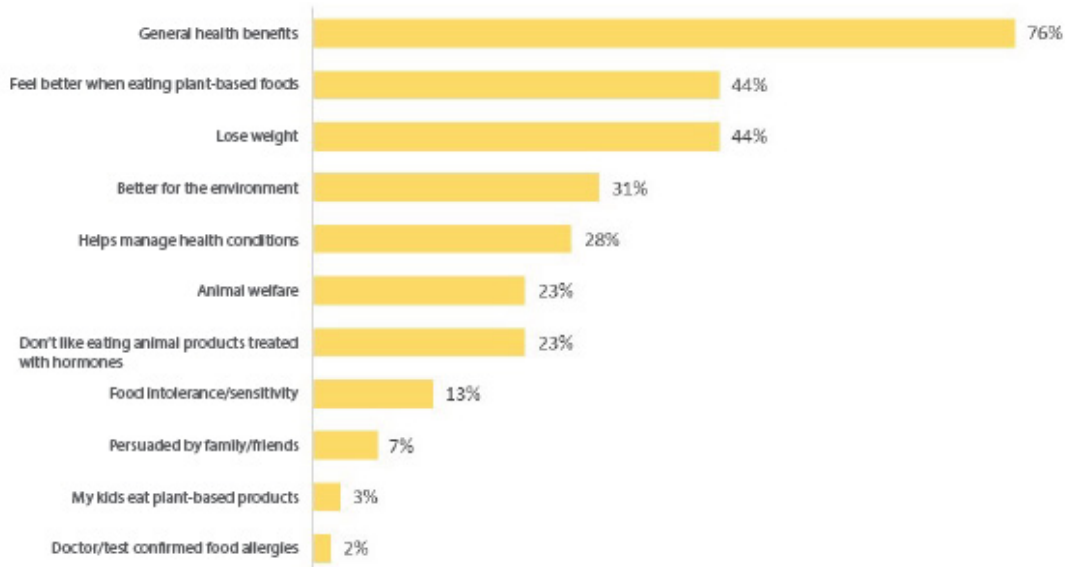


Source: Nielsen xAOC + WFM, 52 weeks ending 8/11/18.

A survey conducted by Mattson Consulting²¹, a strategic marketing company, asked 1,163 consumers about their food habits, behaviors, and beliefs in order to better understand their attitudes toward plant-based protein. The survey showed that these consumers chose to buy

plant-based products for (1) the perceived health benefits; (2) a feeling of well-being from consuming these foods; and (3) for weight loss, as shown in Figure 21.

Figure 21: Top reasons U.S. consumers reported choosing plant-based foods



Source: Mattson Consulting (2019)

This trend spills over to plant-based eggs and products that use plant-based substitutes for eggs. Mattson showed that, in 2018, 62% of retailers in the United States sold “plant-based eggs and mayo,” with sales reaching more than \$42 million—an increase of 15% compared to 2017.

In light of these trends, the future of conventional chicken eggs may be grim. Companies such as the Norwegian startup EAT²² aim to convince buyers to reduce egg consumption to two units per week per person by 2050 in order to decrease the environmental impact of animal-sourced proteins.²³ But eggs supply important nutrients to humans at a relatively low price. A single egg contains 6 grams of protein as well as vitamin B12, vitamin E, folic acid, calcium, and zinc, among other vitamins and minerals. And it can be argued that the environmental impacts of a hen are relatively small compared to its productive capacity. Laying hens produce an average of 300 eggs per year during an average life-span of two years. When taken together with improvements in the efficiency of animal feeding, such figures make eggs the most efficient animal-sourced protein in the world.

According to Clark and Tilman (2017), eggs produce 24.4 grams of CO₂ equivalent per gram of protein, which is a little more than rice (21.2 gCO₂e/gram of protein) and below all other animal-based proteins. Eggs use 0.049 square meters of land per gram of protein. In comparison, wheat uses 0.035 square meters per gram of protein, and beef needs 1.04 square meters to produce a gram of protein. Finally, eggs use 29 liters of water per gram of protein, close the average plant water use of 26 liters/gram of protein but more than grains, which use 21 liters of water per gram of protein.

Strategic Dilemmas

After the interview, Leandro Pinto is proud of his history leading Mantiqueira. He is aware that new trends in the market will challenge his company and that he will have to make difficult strategic decisions moving forward. But his belief in the power of innovation drives him to new markets and opportunities.

Mr. Pinto has reached a crossroads, but the paths may not be mutually exclusive. He must decide whether to keep branding Mantiqueira and entering new markets, and how much to invest in new systems of production, such as cage-free eggs.

Discussion Questions

1. In your opinion, what are the most important decisions (good and bad) that put Mantiqueira in their current position?
2. Consumers still perceive eggs as a commodity. Should Mantiqueira step back and return to a strategy of providing eggs with the smallest average cost, or should the company keep promoting its name and brand to supermarkets and final consumers?
3. Demand for cage-free products is growing, but it has not yet taken a large share of the market. Thus, Mantiqueira Group sells cage-free eggs with a small profit margin. Should Mr. Pinto keep investing in a caged system of production or move further into the cage-free system?
4. Mantiqueira Group has diversified its product portfolio. What other product lines make sense for Mantiqueira in the future?
5. Given the dynamics of the shifting channels for reaching consumers, what channel strategies might make sense for Mantiqueira in the future?
6. Mantiqueira currently has 2 partners. Would you recommend seeking more partners to provide capital for the company's new growth opportunities? What criteria would you advise management to consider when deciding to invite new investment partners.

Appendix

A Culture of Sustainability

The company has created a culture of sustainability. For example, the efforts to develop an environmental management system show the care taken by Mantiqueira. Today, the company is considered the benchmark for sustainability in egg production. The company treats animal waste from its farms, and the farms have permanent protection areas designed to conserve the environment. The units of environmental protection are conferred and licensed under strict environmental standards. A multidisciplinary team operates, monitors, and analyzes production sites and the waste generated by the company's activities.

Mantiqueira developed programs of selective waste collection in its restaurants to reduce excessive consumption of resources and began initiatives to combat food waste. The company is certified by Brazilian environmental non-governmental organization Instituto Chico Mendes de Conservação da Biodiversidade, which shows its efforts toward environmental care and protection.

By using the best practices of the circular economy, all animal waste in the Minas Gerais and Mato Grosso production sites is composted, processed, and transformed into organic fertilizer. This fertilizer complies with strict requirements of the Brazilian regulatory agencies, which guarantees a safe product to be handled in agricultural activities; users need not wear masks and gloves to handle Mantiqueira's organic fertilizer. Most of the organic fertilizers produced by Mantiqueira are used in horticulture, fruit production, and gardens.

Mantiqueira produces and sells approximately 5,000 tons of organic fertilizers—produced from 10 tons of bird manure—per month. Such figures put the company as a leader in fertilizers made from poultry manure in Brazil and Latin America.

Because of Mr. Pinto and Mr. Cunha's humble origins, Mantiqueira invests in socially responsible projects. The company provides equipment, uniforms, and school supplies to schools in communities around its production sites. In addition, ten percent of the revenue from the egg product line Solidarity Eggs is given to organizations dedicated to improving social outcomes in Brazil. The line was initially launched in Rio de Janeiro in 2016 under the name Solidarity Eggs for Athletes®. The sales were directed to Instituto Mangueira do Futuro, an award-winning NGO recognized by UNESCO. Revenues from the program were used to support professional development, fund athletic activities in marginalized communities, and promote social engagement.

In 2017, Mantiqueira introduced the Solidarity Eggs from the Heart®, with revenues supporting children with cardiac diseases through Pró Criança Cardíaca, a nonprofit medical institute. According to the institute, these children have received more than 24,000 consultations with doctors, more than 25,000 procedures, and 1,200 invasive procedures in Rio in the last 20 years. The partnership was so fruitful that it was extended through 2018.

The company perceived that the Solidarity Eggs® project had large consumer support and, in 2018, the project was extended to the state of São Paulo. There, Mantiqueira selected the Cancer Hospital of Barretos, known as the Love Hospital, to receive part of the project resources. The Love Hospital gained worldwide recognition for caring for more than 7,000 patients per day through doctor appointments, exams, and surgeries. The hospital has 380 doctors and 120 beds, and serves approximately 9,000 meals each day. Because of the hospital's nickname, the campaign was named Solidarity Eggs of Love®.

Another spinoff of the Solidary Eggs initiative tackled breast cancer awareness in 2018. During the month of October—known as Pink October Mantiqueira introduced Solidary Eggs: Pink October®. The beneficiary was the Laço Rosa Foundation, a nonprofit organization that raises breast cancer awareness and provides support for women and families fighting breast cancer. To mark Pink October, packaging was colored pink during October 2018.

To reach other parts of the country, the company started the first social food truck in Brazil, called the Egg Truck, to expand the social responsibility associated with the brand. The main goal was to support NGOs and nonprofits by having the Egg Truck visit several institutions. There, the truck offered omelets and egg sandwiches for free while offering consumers information about the nutritional content of eggs and their benefits.

The Egg Truck also offered support during sporting events. By offering egg-based meals, the crew had the opportunity to explain how egg products can be part of an athlete's diet. The first initiative was in 2016 in partnership with the NGO Sonhar Acordado, but the project later partnered with other NGOs including Corrente do Bem, Instituto Mangueira do Futuro, and Comunidade Jardim Gramacho.²⁴

Endnotes

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PURDUE FOOD AND AGRIBUSINESS EXECUTIVE SUMMIT

AgriGold: Disrupting the Seed Industry by Prioritizing Direct Producer Relationships

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John Kermicle just finished the phone call he was dreading with his largest seed customer. The customer, accounting for about 5% of AgriGold's annual sales, had just been acquired by a large agricultural retailer. In a parallel universe, one might have considered this a great opportunity to build a relationship with the acquiring retailer. In John's universe, AgriGold had just made a strategic decision to prioritize a direct relationship with the largest progressive multigenerational corn and soybean producers.

The leadership team at AgriGold had started to build an organization and culture to execute on this positioning statement. The right seed representatives had been hired. The right genetics for high-yielding hybrids had been developed. Access to the right traits to protect those yields had been acquired. The right strategic positioning statement and values had been circulated throughout the organization. The acquisition of the largest customer presented a serious inflection point: Was it time to accelerate the movement to exclusively direct sales? Or, did the transition need a longer horizon to ensure short-run profitability and viability?

AgriGold History

Akin Family, Akin Seeds, 1936-1973

AgriGold traces its roots to a small farmer in Southeast Illinois, Clarence Akin. Mr. Akin started the company under the name Akin Seed Company in 1936. Clarence grew 12 units of hybrid seed corn that year, selling 11 of them and keeping one for himself. As the company grew, it formed a partnership with the Funk family and was an associate grower for Funk's G Hybrids from 1936 to 1973. As growers adopted hybrid corn seed, the industry grew slowly and steadily over several decades, bringing Akin Seeds along with it. As associate growers for Funk's, the Akin footprint was restricted to a small geography in Southeastern Illinois. This limited the ability for Akin Seeds to continue to expand and pursue the growth goals it had.

Golden Harvest, 1973-1979

In 1973, six families separated from Funk's to form a new seed brand, Golden Harvest. In 1979, the Akin family decided to break off from Golden Harvest to form their own seed brand, and the AgriGold name was officially born.



AgriGold, 1979-2000

AgriGold saw tremendous sales growth from 1979 into the early 1990s. With this growth and success, and upon the untimely death of the heir to the company, Dave Akin, the family sold the brand to France-based Groupe Limagrain in 1994.



In 2000, German-based KWS formed a joint venture with Groupe Limagrain, founding AgReliant Genetics. Both KWS and Limagrain are top 6 seed companies worldwide, with KWS being the 6th largest global seed company. They are fierce competitors in most markets. In North America, however, their 50/50 joint venture as AgReliant has proven a successful model for a multi-brand strategy. AgReliant has seen consistent growth since its inception.

With this newfound ownership, AgriGold now had access to a new corn germplasm pool and genetic breeding efforts. As AgReliant began structuring and developing its corn breeding efforts, tied to a global breeding and germplasm pool through its parents, this became foundational to the strategy of AgriGold and the other brands owned by AgReliant. To leverage these breeding efforts and continue its growth, AgriGold set out on an aggressive footprint expansion plan. Over a 15-year period, AgriGold more than doubled its geographic footprint, employee base, and sales. Today, AgriGold has representation in 16 states and customers in 30 different states, primarily in the Midwest, with a presence in much of the Eastern half of the United States as well.

AgriGold's tagline for most of its existence was "The Corn Specialist," because the company only focused on and sold seed corn—no other products or services. In 2016, AgriGold celebrated 80 years in the seed business. They have maintained several key differentiators throughout their history—primarily a direct sales focus, corn-only product offering, and superior genetics and product placement. AgReliant's multi-brand strategy has proven very effective to maintain or increase loyalty to the brands and serve the different distribution channels. With a consistently expanding market area, AgriGold has focused on being a national, direct brand, putting it in a unique position in the industry. AgriGold began selling soybeans in 2017 for the first time in the history of the brand, but it has and will continue to maintain its focus on corn. This intentional concentration on corn directs time, energy, and resources in a very focused way. Additionally, with a foundation of research and genetic

breeding, AgReliant and AgriGold can continue to bring unique germplasm to the marketplace. These genetics are combined with the best biotechnology traits and seed treatments and are properly placed by AgriGold’s Key Account Specialists on a grower’s individual field based on their farming practices, environment, and goals. This has driven further farm share for AgriGold on its existing customers, higher retention, and increased corn sales. While its soybean offering is still relatively new and at a fairly immature state, it has opened several new doors and further pushed AgriGold onto the national seed industry brand scene.

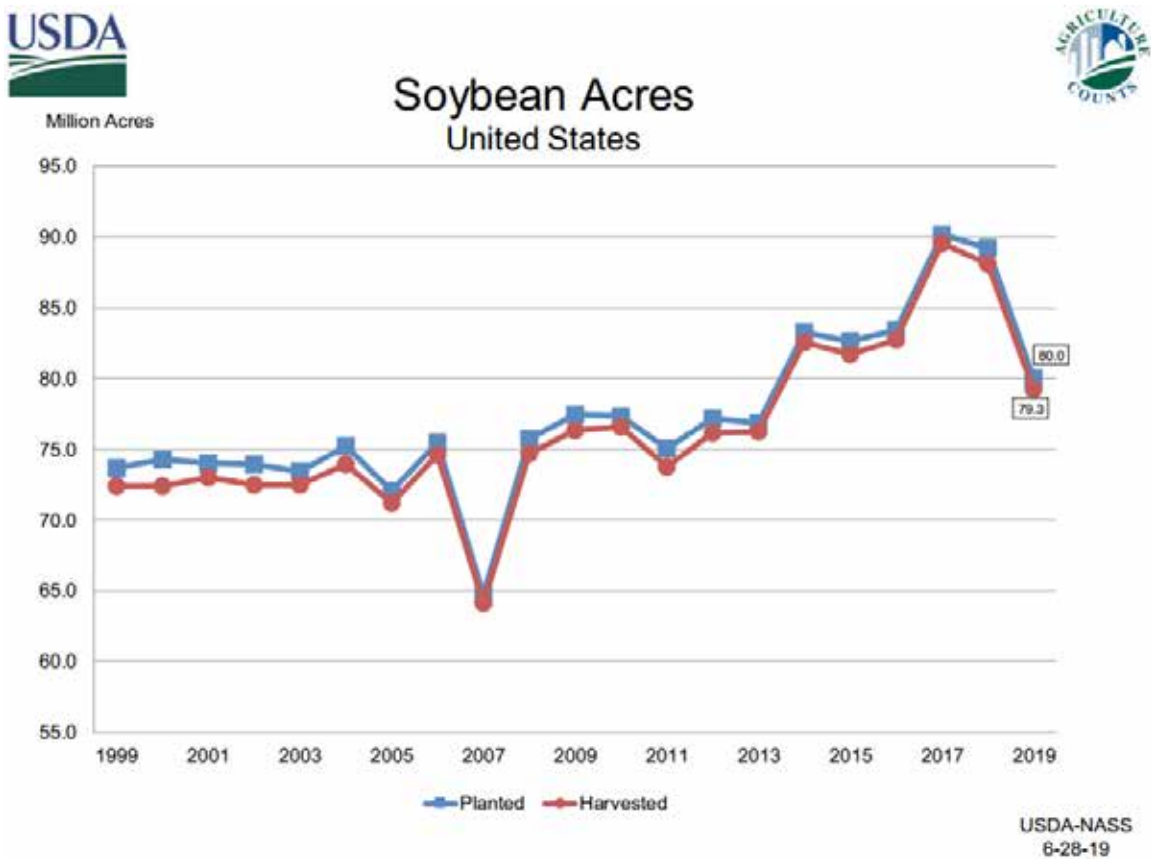


Figure 1

Recent advancements in technology have allowed AgriGold to develop a robust customer relationship management (CRM) tool and a digital agriculture platform, Advantage Acre. These tools give AgriGold sellers and customers an opportunity to create a deep relationship and shared knowledge base. Previous seed conversations involved farm-level information and a few hybrids. Now the discussion is much



more complex. With today's tools and technology, a farmer can manage the farm down to individual fields with sub-inch accuracy on every acre.

As AgriGold considers its brand's position in the future, many factors have led it to have a strategic focus on direct relationships with large, progressive, multigenerational farms. While this may seem like an obvious path, it has proven to be a challenge for many in the industry. The seed industry has changed tremendously in recent years with significant merger and acquisition activity. The farmer customer's needs have changed over time with increased usage of enhanced technology. How can AgriGold pay homage to its history, its drive to achieve results expected by owners, and reposition itself in the industry to be more intentional about its strategy?

Seed Industry Timeline

Early Years: 1930-1990

In the early years of the seed industry, most companies were focused on plant improvement and yield gain through traditional genetic breeding. Until biotechnology became a factor, most seed companies differentiated through their customer service and relationships. Product parity was widespread. Most sales growth occurred through geographic expansion, strong customer relationships, superior product placement, and sheer hard work. AgriGold General Manager, John Kermicle, often says, "In those days we were selling on our hard work (service) and good looks." Products were positioned as having advantages in yield, standability, disease resistance, drought tolerance, and other yield improving traits.

The seed industry in the United States has a rich history of competitiveness and innovation. Major breakthroughs include the development of hybrid seed corn in the 1930s and counter season production and research in South America, which began in the 1970s. The pace of adoption of hybrid seed was relatively slow but eventually led to tremendous advancements in corn genetic breeding. Farmers began realizing the benefits of hybrids with enhanced characteristics, and more rapid adoption occurred as yields increased significantly from the 1930s to the 1980s and continue to trend upward today.

This tremendous growth in corn yields gave rise to a very competitive seed corn industry. Many new companies were formed and rushed to offer the latest in hybrid seed to farmers all

across the Corn Belt. There was an approximate estimate of 400 seed companies in the 1980s. Most were independent and selling and servicing a more focused geography near main facilities and primary areas of influence. Seed was valued around \$50-\$75 per unit, and farm size remained relatively small.

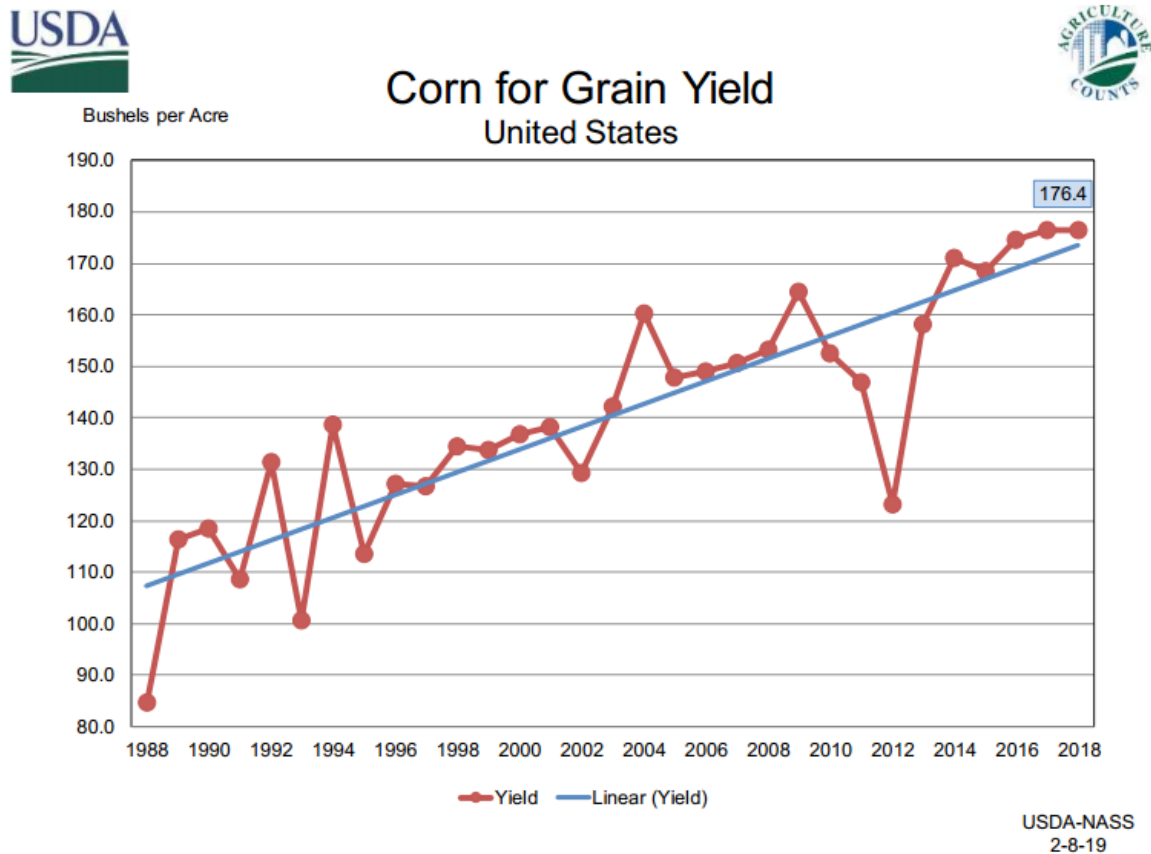


Figure 2

Influence of Biotechnology: 1990s-2000s

Biotechnology arrived in the 1990s and dramatically changed the seed industry. Biotechnology traits have driven much of agriculture’s innovations into the seed, added tremendous value, and created substantial competitive advantages for those companies who patented this technology. This created tremendous barriers to entry for new entrants and has forced significant consolidation. The number of seed companies dropped below 300 in the 1990s and is below 200 today. Genetic research and breeding have remained a foundational element of business success, but access to biotechnology traits and scale efficiencies are table stakes in today’s seed industry. Because of the significant research and development and regulatory costs associated with a biotechnology trait, very few companies even compete in this arena. Instead, the biotechnology providers have openly licensed the technology to generate increased revenue and more quickly recover their R&D costs. Cross licensing has led

to much collaboration across the industry, often between competitors, and makes for a very complex, modern seed industry landscape.

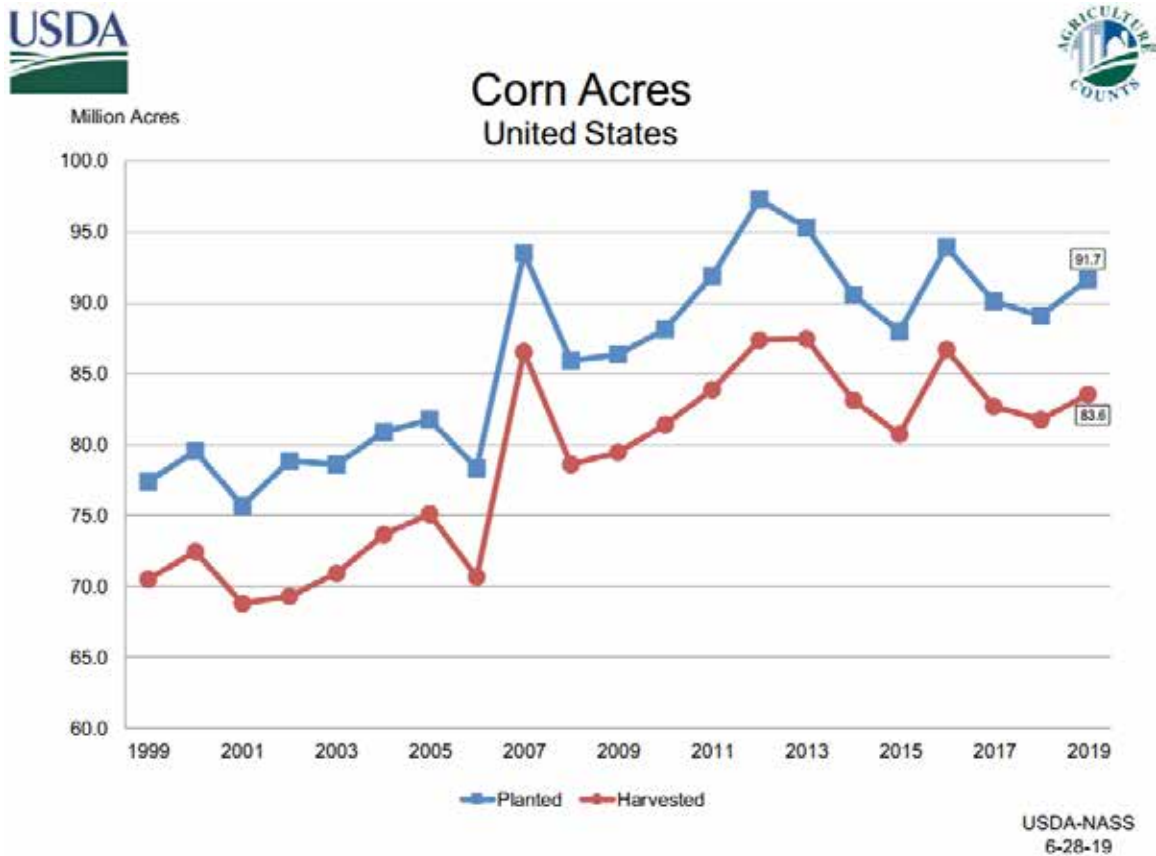


Figure 3

Today’s Seed Industry: 2010 to the Future

As consolidation occurred, many of the major players purchased companies too small to compete in this new environment. This left a few major players, many who are determining their multiple branding strategies. This is particularly challenging where companies own brands that overlap with each other. Today, seed is valued from \$150-\$350 per unit. With around 90 million acres planted in 2019, this makes seed corn a \$20+ billion per year industry.

Like many other industries, the seed industry is no stranger to consolidation. Including all current mergers and acquisitions, the four dominant organizations are Bayer, Corteva, AgReliant Genetics, and Syngenta—claiming close to a combined 80% of total market share in seed corn.

U.S. CORN MARKET SHARE

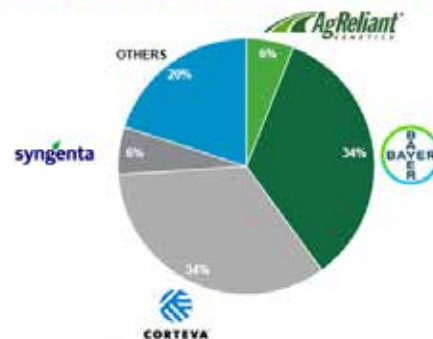


Figure 4

INDUSTRY FAMILY TREES

These five companies represent about 80% of planted corn & soybean acres in 2019.

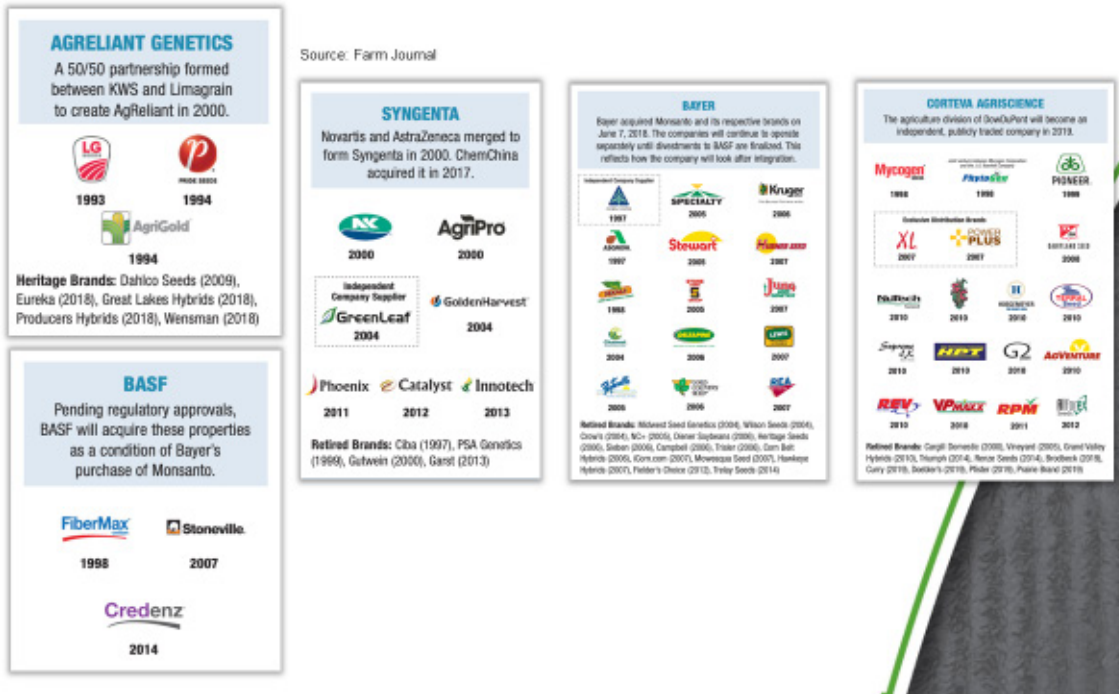


Figure 5

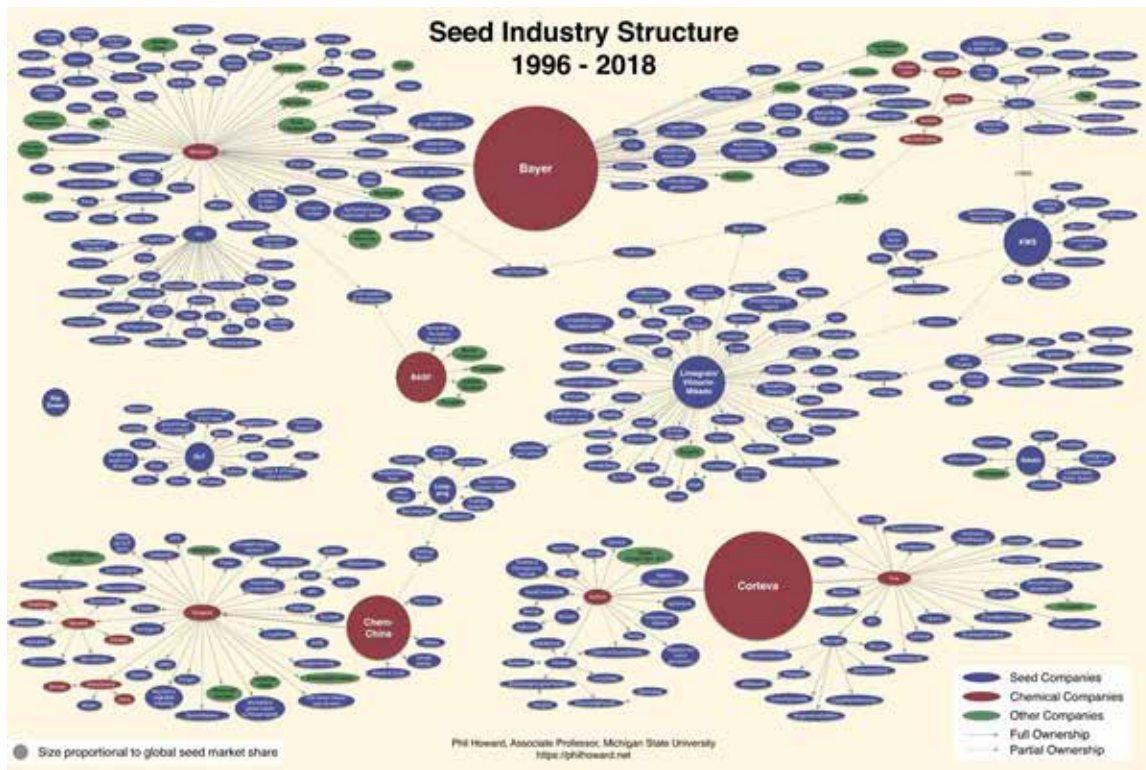


Figure 6

Farmer Customers

Seed companies sell to U.S. farmers who currently grow corn on nearly 90 million acres per year. Because many farmers rotate corn and soybeans in consecutive growing seasons, the acres used for soybean production are also nearly 76 million in 2019. As global population has increased, particularly rapid increase in the middle-class income population, the demand for corn and other grains has grown rapidly. Thus, acres of corn and soybeans have grown in the United States and globally, offering seed companies new opportunities.

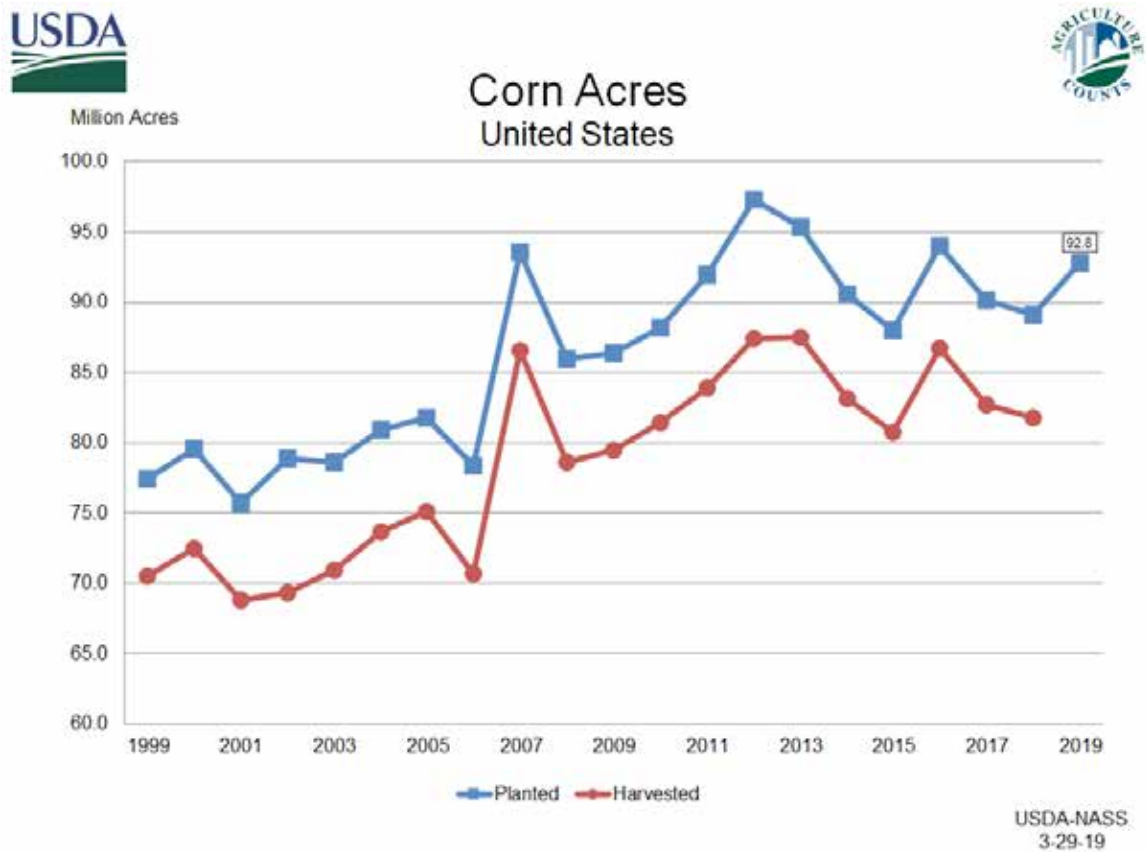


Figure 7

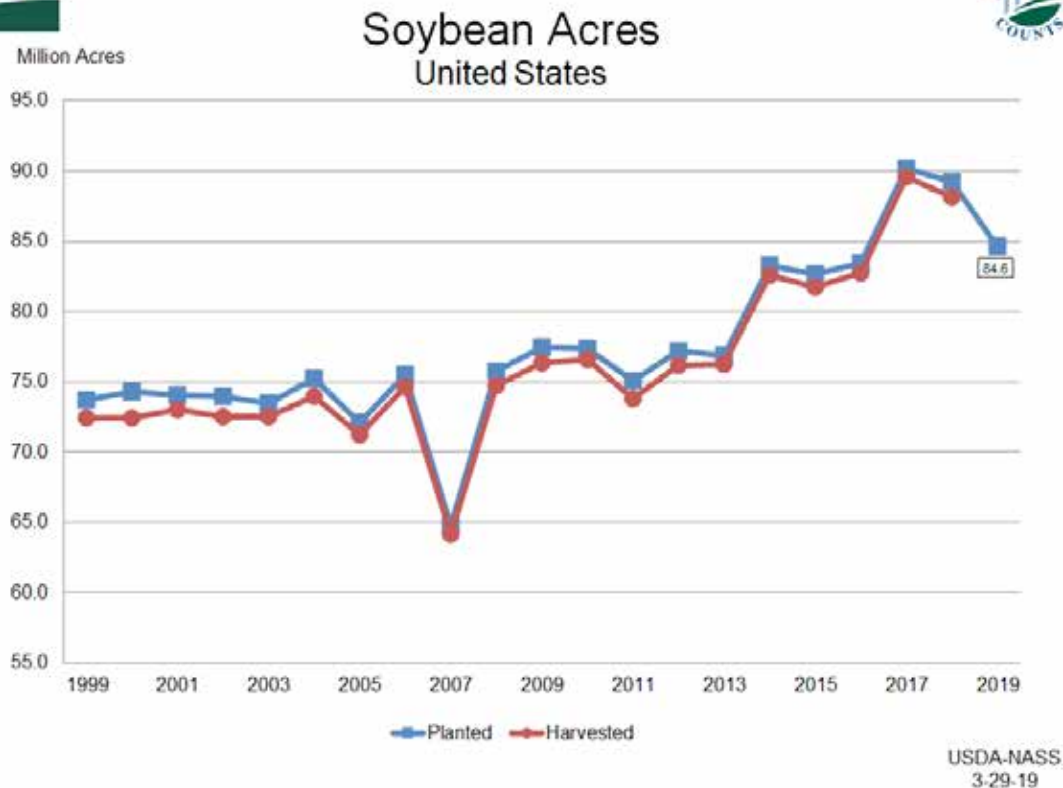
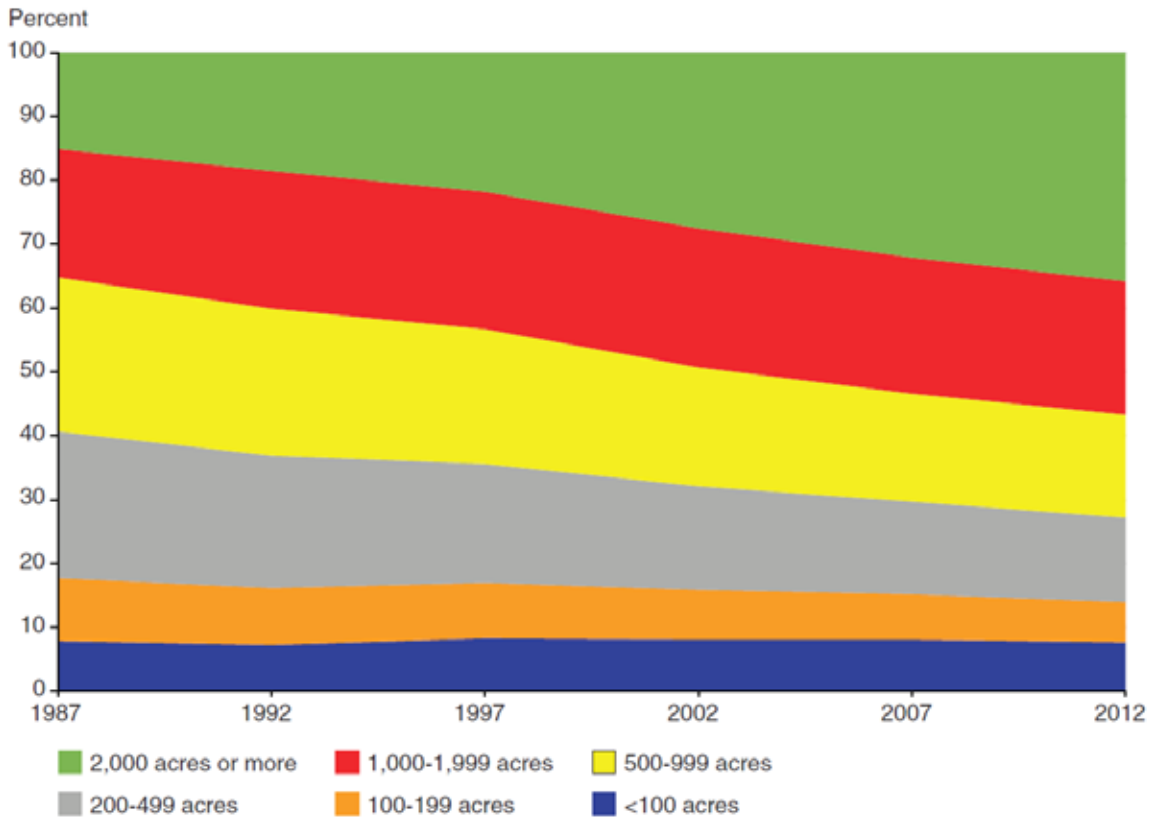


Figure 8

Farm Consolidation

Simultaneous with the growth in acres planted to corn and soybeans has been a declining number of farms. Thus, the number of decision makers to be influenced regarding which seed varieties to plant is shrinking while the market is growing. The share of farms larger than 1,000 acres has grown from about 25% of all farms with cropland to more than 50%. Improvements in technology have allowed for consolidation at the farm level paralleling the consolidation in the seed industry. Larger tractors pulling more efficient equipment has enabled farmers to plant nearly 1,000 acres in an 8-hour day, up from just 40 acres per 8-hour day in 1960.

Shifts in cropland among acreage size classes, 1987-2012
Cropland shifted to farms with at least 2,000 acres of cropland



Source: USDA, Economic Research Service, compiled from census of agriculture data.

Figure 9

Farmer Demographics

As farms consolidate, the decision-making is being concentrated among an aging set of farmers. The average age has crept up from just over 50 years in 1978 to nearly 60 years in the 2017 U.S. Agricultural Census. This shift in age is particularly concerning among the 25% who are 65 and older. The farmland operated by this set of producers will eventually need to transition to new management. In some cases, the ownership of the land and the decision-making transitions smoothly to the next generation of the same family. In other cases, ownership and decision making are split with heirs retaining ownership but having little interest in decision-making. In rare cases, the transition of ownership and decision-making are unclear and may delay transition altogether.

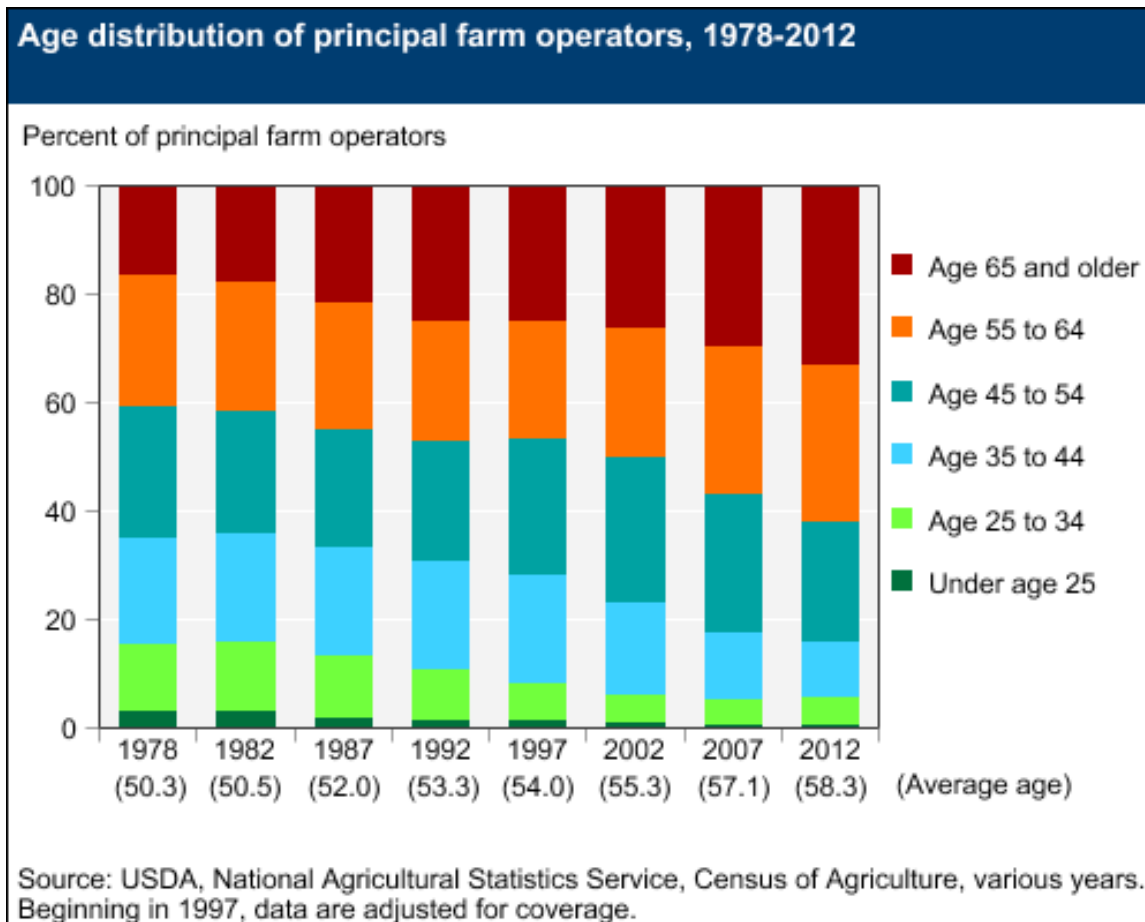


Figure 10

Farmer Buying Behavior

One challenge associated with the concentration of decision making among an aging set of producers is that these producers tends to be loyal to the brands of inputs they use. This is particularly true among the brands of seeds producers choose. According to research at Purdue University, among row crop inputs, farmers self-identify as loyal with the greatest frequency when choosing seed brands relative to other inputs, such as fertilizer and crop protection.

"I am loyal to this brand" by Primary Operation

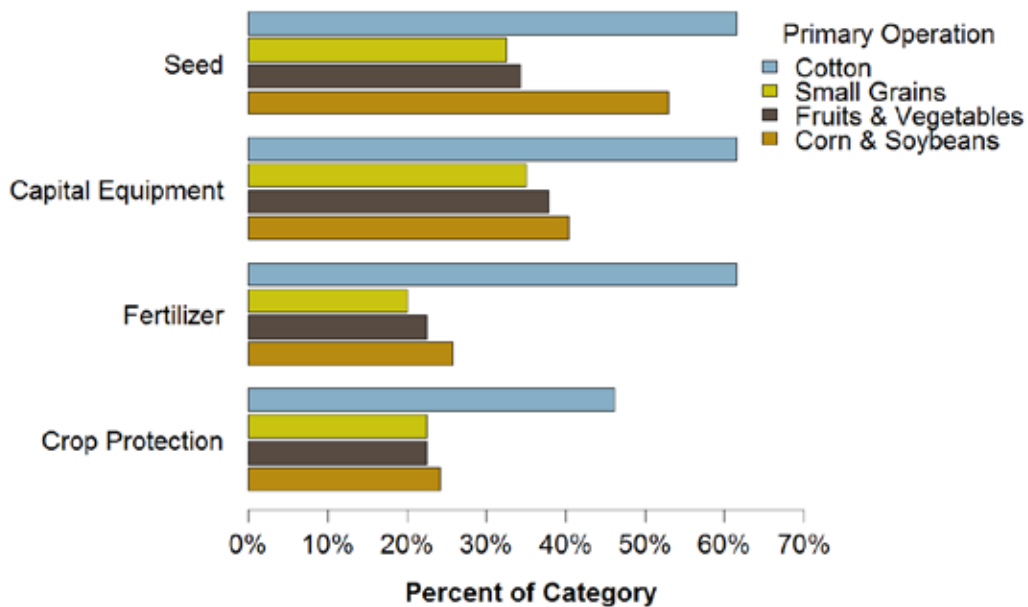


Figure 11

Trying to earn market share can be difficult in the seed industry. When considering the depth of loyalty in a relationship, one can scale from simply doing more business with a supplier to being a strong advocate by endorsing the supplier to neighbors, all the way to willing to pay short-run premiums for a product. In the case of seed, a steep price discount to win over a new customer from an existing relationship might not be enough. In Purdue’s sample, two thirds of producers would require a discount of greater than 10% to consider switching. Given the complexity of the decision regarding seed, price is the simplest part of the relationship. For more simple decisions, such as fertilizer purchases, a 10% discount would lure nearly 50% of customers.

When asked to choose among three generic purchasing considerations (lowest cost, product performance, and relationship quality), nearly all producers rank product performance as the most important consideration among the three. While a segment of the market, about one third, ranks product price as the most important consideration, nearly half rank it as the second most important consideration.

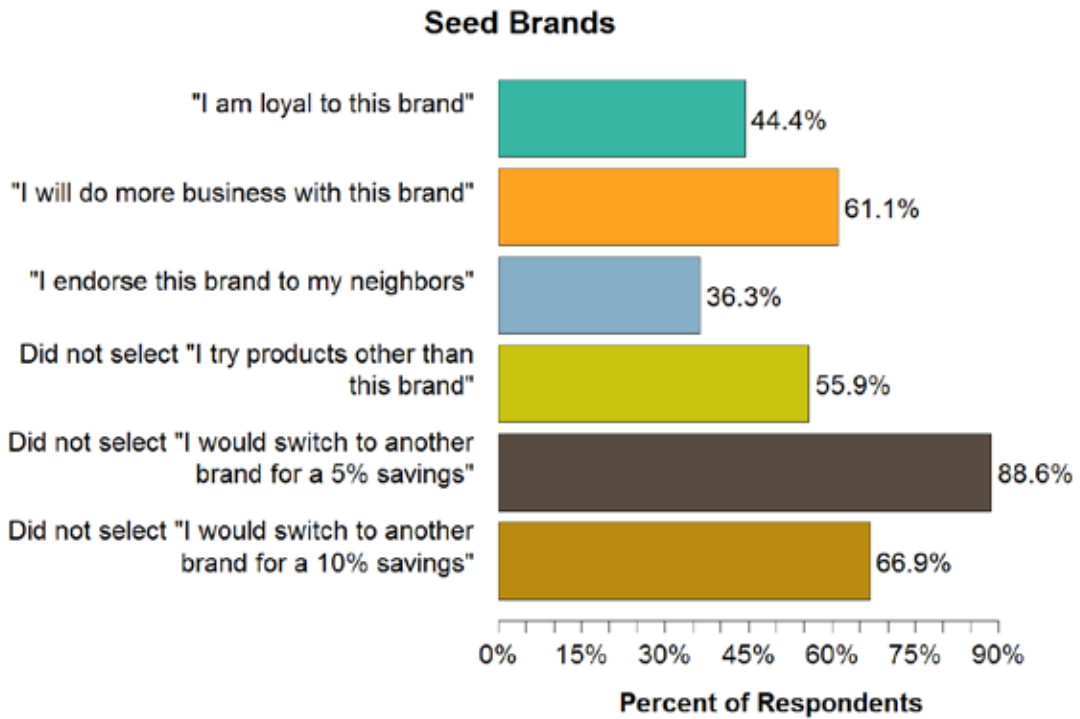


Figure 12

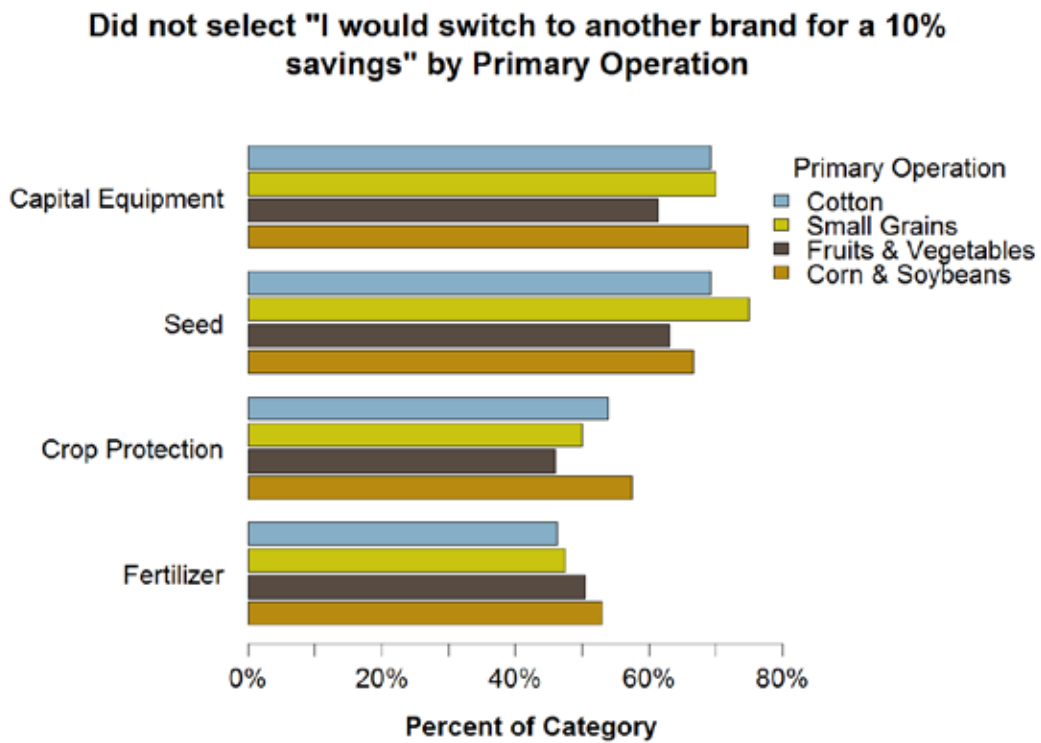


Figure 13

**Product Attribute Importance for Crop Producers: Seed
Corn & Soybeans**

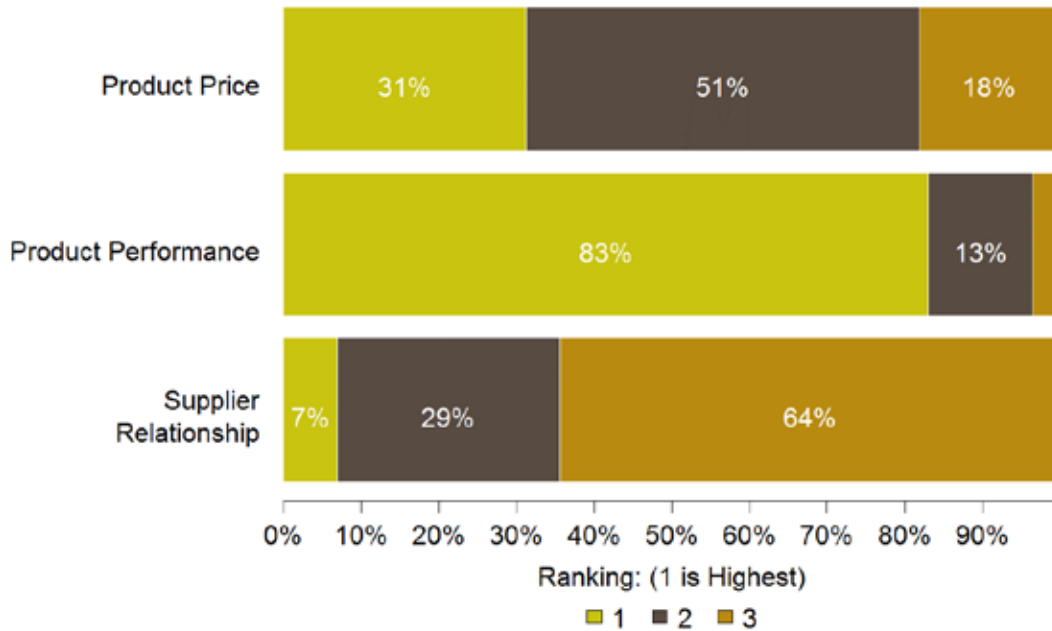


Figure 14

When a farmer is working with a key supplier, that relationship is manifest in a representative of the company—the salesperson. It is the role of the salesperson to build trust among farmer and supplier by understanding the farmer’s business, keeping the farmer’s information confidential, communicating the value the company brings to the relationship, and delivering on those commitments. When asked about the importance of these relationship characteristics, 41% of corn and soybean farmers rated maintaining confidentiality as most important. While reliability (following through on commitments) followed closely behind as the most important—nearly three fourths of producers ranked reliability first or second. Thus, the role of the salesperson is key in establishing and maintaining relationships in corn and soybean production.



Figure 15

AgriGold Future

With the new industry landscape and changing customer demographics and needs, AgriGold has reached a pivotal point in the life of its brand. To remain relevant in the everchanging seed industry, a brand must continue to adapt and grow. Growth strategies must be sustainable and aligned with the future of the industry, the vision of AgReliant Genetics, and the changing customer. As AgriGold seeks continued growth, there are multiple strategic considerations:

- **Continued Geographic Expansion** – This strategy has served AgriGold well over the past 20 years as the company sought to replicate its customer experience over a broader geography. While it provided growth and scale economies, many of the primary corn growing areas are currently covered. However, there are remaining opportunities for geographic expansion in dense corn acre areas contiguous to the current footprint. This growth would be sustainable but would require entering markets with unique and different needs than the areas currently served.
- **Intensification** – Within AgriGold’s current footprint, there are areas that are underserved by the brand. Distances between sales representation can sometimes be far. Potential

customers may perceive the distance too far for doing business with AgriGold because of a high demand for local service. Intensifying within a current sales territory would require additional salespersons and presence in a geographic area. These additional interactions might increase access to customers. The ultimate payoff would be to increase the market share in the existing geographies. The gain in market share in that small geography will compete for resources with additional geographic expansion. If not handled properly, internal challenges may arise.

- **Key Account Management** – To develop relationships with and to serve large, progressive operations directly, AgriGold may need additions to its current sales structure. A key account manager role is not new within the industry, but it is a role with which many companies have struggled. Key account management adds complexity to existing geographies and relationships. Adding a team of key account managers could enhance AgriGold’s future strategy and focus, or it could come at the expense of other expansion opportunities. This strategy could create internal strife if not structured and executed properly.
- **Enhanced Targeting of Preferred Accounts** – With farm consolidation and today’s technology, much can be known about remaining farming operations. If AgriGold has a very well-defined target grower profile, it could double down on its efforts to drive growth on these accounts. Growing preferred accounts would take additional investments in market intelligence and marketing integration. It would also help align their intentional strategy and create synergies and efficiencies for their sales force. The investments could come at the expense of other expansion opportunities. More importantly, targeting preferred accounts would challenge AgriGold’s ability to service and support other sales channels and nonpreferred customer types.
- **Acquisition(s)** – With the recent mergers and acquisitions in the seed industry, perhaps AgriGold and AgReliant should consider these activities as a growth avenue as well? AgReliant Genetics purchased multiple brands over its existence to gain access to new markets and enhance its multi-brand strategy. AgReliant could consider an acquisition to fill out remaining marketing areas for AgriGold or enhance its current position in the marketplace.

- **Additional Adjacency Opportunities** – The addition of soybeans to AgriGold’s product portfolio in 2017 has opened new doors and drove growth of farm share and many other metrics. Is it time for AgriGold to consider other product adjacencies? The next largest crops planted in the United States based on acres are wheat (45.6 million acres in 2019) and cotton (13.9 million acres in 2019). Beyond the major crops, there could be opportunities in alfalfa or other small grains that are commonly planted by their existing customer base.

While these would not be inclusive of all the growth opportunities available to AgriGold, they are part of the consideration set to drive growth forward. What other strategies could John consider as a means to push the AgriGold brand to the next level? What limitations and risks would each present? Which would provide the quickest, yet sustainable growth opportunity for the next 30 years?

Assessing the Opportunities

As John reflected on the recent phone call from their largest customer, he knew this would eventually be a defining moment in the life of AgriGold. While considering the industry context, competitive landscape, and the multitude of growth opportunities, he had a tough decision to make. Should AgriGold use this current decision to force it down a more decisive path as a brand, or can they continue to balance their different channels to the market with a more intentional strategy and direction for the future?

John thought about his options. The leadership team was confident about their views of the future of crop production but were less confident about how to navigate the transition toward that future. John was wondering how to balance the impacts on AgriGold customers, dealers, salespersons, and AgReliant’s operations and investors.

Discussion Questions

1. Given industry consolidation, is a focus on direct relationships with large, progressive, multigenerational farms likely to be sustainable in the long-run?
2. Is the success of the introduction of soybean seed to the AgriGold portfolio likely to be replicated across seeds for other row crops?
3. What sales and marketing tactics should AgriGold undertake to drive growth?
4. Are there any other strategies AgriGold should consider as a means to push the brand to the next level?
5. What are the keys to successful execution for the strategies you recommend AgriGold put in motion?

PURDUE FOOD AND AGRIBUSINESS EXECUTIVE SUMMIT

Solinftec: Creating a Foothold in the North American Digital Farming Market

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Case Summary

In 1998, seven Cuban engineers landed in Brazil to participate in a cooperative mission between the two countries in industrial automation for sugar cane mills. At that time, they were introduced to the logistical challenges sugar mills faced in producing and processing sugar cane. The group immersed itself in the realities of the largest sugar cane producing company in Brazil, Raízen, leading to the development of a series of smart telemetry solutions that greatly impacted Raízen's business.

"Our vision is to minimize the need for human judgment and interference in the agricultural operations. We learn from the data we gather and bring actionable insights to the farmer."

-Britaldo Hernandez, Solinftec's Founding Member and CIO

By 2005 Britaldo Hernandez—a founding member and Solinftec's lead technical solutions developer—considered starting a PhD program in agronomy at the University of São Paulo as a way to continue the project in Brazil but was quickly convinced by a professor that what he had was a real and significant business opportunity. Taking the professor's advice seriously, Mr. Hernandez and his six partners—after a difficult negotiation process with state authorities back in Cuba—founded Solinftec in Brazil in 2007. It started with just one customer, Raízen, plus many other prospects and in-depth knowledge of the needs of sugar mills.

Now fifteen years later, life has changed significantly for these seven partners. Solinftec has developed into a solid digital farming company. Its solutions are running in 10 different countries over more than 20 million acres with paying clients producing sugarcane, row, and perennial crops. TPG ART Circularis invested in the company, and Solinftec has also partnered with companies such as IBM and Oracle for new digital agriculture solutions (Appendix 2). Early in 2019, Solinftec signed a global go-to market contract with AGCO (Appendix 3).

In 2018, Solinftec decided to establish a foothold in the U.S. market as a beachhead for its international expansion. In its first season in the United States, Solinftec is working with 25 farmers plus 30 cooperative locations across more than 2.5 million acres. Daniel Padrão, CEO for the U.S. operations, has one very important question in his mind: "What adjustments do we need to make in our business model and implementation to reach the success level and impact we have reached in Brazil?"

Solinftec Solution

To be successful in today's digital farming market, a company must position itself to be noticed by farmers in a crowded, complex, and rapidly evolving space. More importantly, farmers—many of whom are skeptical of digital solutions—should be able to understand the functionalities and benefits the company produces.

Solinftec differential today is the ability to optimize the efficiency of on-farm mechanical operations with smart process automation. Solinftec integrates data from machinery, people, weather, and fields, and uses internet-of-things (IoT) technologies and artificial intelligence to generate real time actionable insights for farmers. The ultimate goal is to reduce production costs while maintaining high yields.

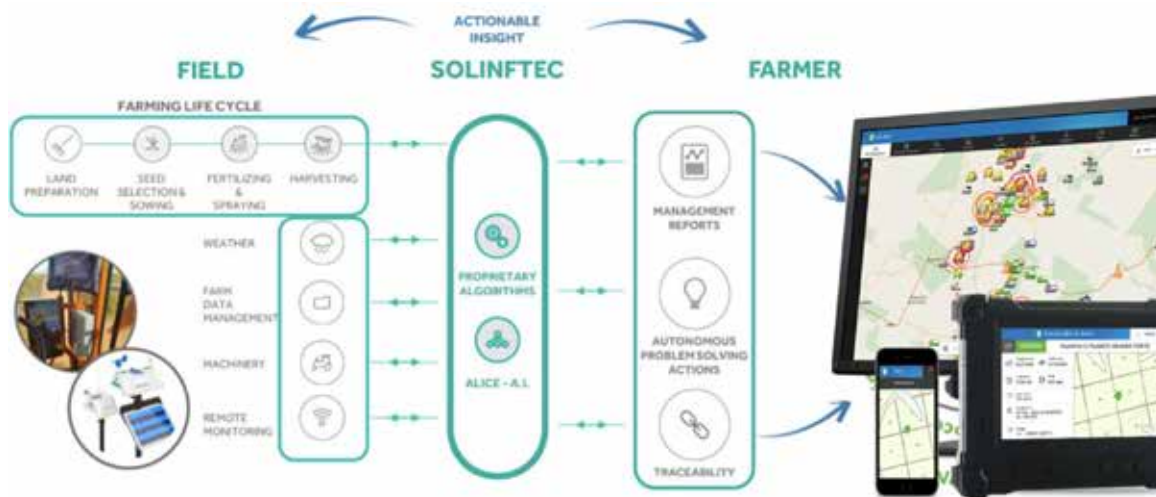
Rob Leclerc,¹ founding partner of AgFunder organization, puts it this way:

Basically, Solinftec treats farming as a manufacturing process, and they build solutions to automate this process as much as possible. Today there is a lot of manual work and their system acts as a central executive directing the process. For large integrated sugar operations that may have thousands of pieces of equipment, Solinftec was able to eliminate a lot of pain for their customers and quickly captured the market. If you walk into the command centers for these growers, you'd think you're walking into a NASA mission control room.

Solinftec solutions consist of software and hardware components that gather and integrate data from machinery used for farming activities, such as land preparation, seed selection, sowing, fertilizing, spraying, and harvesting. Additionally, weather-based information and farm data management systems are included as data sources (see Figure 1).

Hardware, such as sensors, weather stations, pluviometers, in-cab monitors, and mesh networks, are an integral part of the solution. Computerized control centers gather and share data where farmers use their computers, tablets, smartphones, and smart TVs. As software, Solinftec has developed proprietary algorithms that process the gathered information and generate the commands or insights for the farmer. Dashboards, warnings, and communication flows run inside its software, integrating different devices. Since 2018, Solinftec has been investing heavily in the progression of artificial intelligence.

Figure 1: Solinftec value proposition. Retrieved from Solinftec.



Solinftec Technology Development

Today, Solinftec’s automation solutions are tailormade for specific farm operations—a practice that began in the fields of Raízen in Brazil. Their main solution, after the company was formally established in 2007, was based on telemetry and recorded everything that was happening with planters, harvesters, and sprayers in real time. The collected information was used to improve decision making related to the working processes in the field. For example, in manually compiled reports, employees indicated that sugar cane harvesters work an average of 10 hours daily. Telemetry data generated by Solinftec showed that harvesters actually only worked an average of 6 hours per day due to idle time. Decisions for optimizing machinery usage followed that information, leading to sizable cost savings for the sugar mill.

From telemetry networks, the technology evolved into software able to indicate machine status in 2009, replacing or reducing the operator’s need to input information manually. In 2010, Solinftec’s machine status software was introduced, which identified the reasons for machine underperformance. This information helped the customer and Solinftec better understand the operating process and develop new efficiency enhancing products.

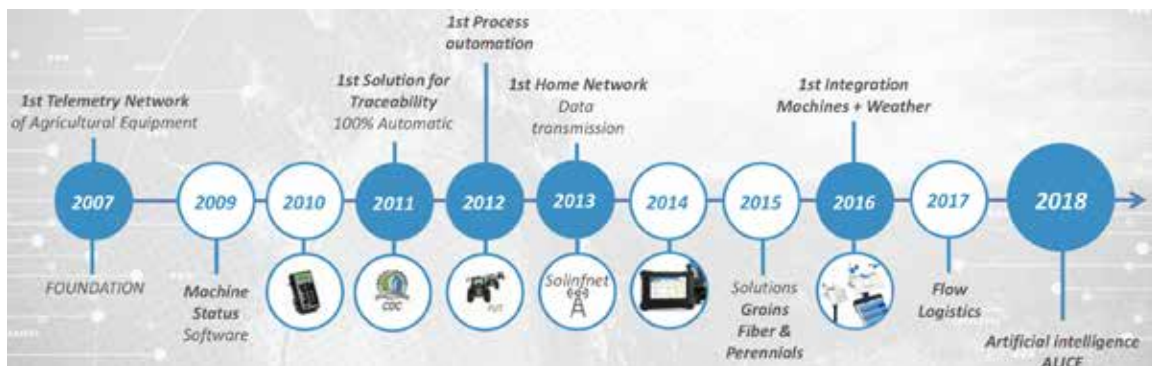
In 2011, the company provided a 100% automatic solution for traceability of sugar cane enabled by machine-to-machine communication. It could tell the sugar mills the exact plot for each load of sugar cane based on information transferred from harvester to the transshipment tractors to the sugar mill. This solution was crucial to help sugar millers pay

sugar cane suppliers accurately and also measure agronomic yields to optimize performance by field plot.

In 2012, Solinftec put in place the first automation process for a single row of transshipments (FUT –acronym for Fila Única de Transbordo in Portuguese). Every sugar cane harvester is tied with two transshipment tractors for transporting the harvested sugar cane to the sugar mill, often resulting in idle time when a sugar cane harvester is waiting for the trucks and vice versa. The company created an automatic single row concept to better sequence the work of the machinery involved, thus maximizing operating time. As a result of this solution, sugar mills saved machinery working hours and reduced operating and capital costs substantially (see video and Figure 10 within Appendix 1 for a visual demonstration on the FUT solution).

In 2013, the company created a data transmission network with their proprietary structured platform named “Solinfnet.” This network would open many possibilities to connect new devices into the network and make sure all the machinery would be connected and integrated at the same time. A proprietary weather station was introduced into the company’s solution in 2016 after its entrance into the grain and fiber markets.

Figure 2: Solinftec’s development timeline. Retrieved from Solinftec.



Solinftec’s sugar cane solutions have focused on the optimization of farm machinery logistics, and they have now been developed into off-the-shelf products to sugar mills. For grain, Solinftec solutions have been introduced at a more general level, and they have not been formatted yet into specific off-the-shelf packages. However, the initial automation processes for grain farmers have already produced significant gains.

Solinftec grain solutions focus mainly on improving decision making regarding the timing of agricultural activities, such as planting. These activities have very short windows. As a result, optimizing the use of machinery within these windows and determining the right machinery paths, speed, and the number of products to be applied becomes very critical. For example, decisions on chemical application are optimized considering wind sensors installed on sprayers, machinery operation data, weather information coming from external sources, and product label instructions.

When Solinftec started working with grain customers, the company integrated weather stations into its solutions, since ag-input application processes needed instant weather information to have optimized performance. It also introduced ALICE, an artificial intelligence assistant (inspired by Amazon's Alexa) to answer several types of questions related to the farm operations (watch ALICE video in Appendix 1).

Gradually, Solinftec is enlarging its offers, departing from a company focused solely on optimization of the logistics of farm machinery in sugar cane to a more general multicrop digital agriculture platform. As Mr. Hernandez positions Solinftec's role and its future vision:

We do not believe farmers will spend a great amount of time trying to understand large amounts of data from past operations to make decisions. They are not trained for that. Our job at Solinftec is to collect, organize and interpret the data for the farmer and, most importantly, bring decisions that need to be made at the time they need to be made.

Ag Tech Space and Solinftec Positioning Alternatives

The agricultural technology space is an exciting and growing industry. Climate Corp's sale to Monsanto (now Bayer) for \$930 million in 2013 suggests the potential value for ag tech in the future.² Investment in agrifood tech startups grew to \$16.9 billion in 2018, a 43% increase from the year prior.³ Of this, investment in "upstream" startups—those working closer to the farm and before the retailer—was nearly \$7 billion.

Despite the growth of coastal ag tech companies—California startups captured 30% of global agrifood tech investment in 2018 and 63% of U.S. investment according at AgFunder—little is known about adoption rates among commercial farmers. Researchers at Purdue University's

Center for Commercial Agriculture surveyed a representative sample of American producers about their use of a specific type of ag tech—farm data software. Respondents were asked whether they subscribe to five popular data software platforms: Climate FieldView (formerly Climate Corp.), Granular, Encirca, Trimble, and Farmers Business Network. Adoption rates range from 2% (Granular) to 16% (FieldView), while 13% of farmers report using a type of software not specifically asked about in the survey. While adoption appears limited for any one product, 40% of farmers use at least one farm data software type and one third use more than one simultaneously, suggesting some degree of complementarity across platforms.⁴

There have been many efforts to classify ag tech companies based on their solutions and functionalities. Recently, CB Insights presented a list of 100 companies that are changing the farm. It sorted ag tech companies into 10 predefined groups: farm management software, precision agriculture and predictive analytics, marketplaces, robotics and drones, sensors, plant data and analysis, smart irrigation, animal data, and next generation (Appendix 3). Together, investment in these categories grew by 56% from 2017 to 2018. But, are the opportunities for Solinftec to grow in these spaces limited by the complexity of the industry? Solinftec must properly position itself within the broader ag tech ecosystem or risk being lost in the noise.

Ag tech companies often begin as startups but are eventually acquired partially or fully by large agribusiness corporations trying to add digital solutions to their portfolio. Climate Field View was acquired by Bayer/Monsanto, Granular by Corteva, Strider by Syngenta, and Echelon and Agrible by Nutrien, just to name a few examples. Some companies remain independent, such as FarmersEdge, Farmers Business Network, Aegro, and Solinftec. Capital funds of various types and sizes are also participating, making sizable investments in many of these ag tech companies with the expectation of high returns on investment.

Regardless of how ag tech companies are categorized, the solutions offered by companies often overlap, leading to blurry distinctions between groups. Moreover, there is substantial within-group variation in the way data are collected and processed and how information or insights are delivered to farmers. The ag tech industry is best characterized as monopolistically competitive. Ag tech firms target a similar market but offer unique solutions that are not perfect substitutes for one another, and entry barriers are low. Farmers may curate a suite of functionalities from different digital platforms based on how well they

complement one another. Many companies promise one centralized platform for managing all your operations' data. For a farmer, a single integrator for all their digital needs may prove attractive.

Examples like JD Link and Operations Center from John Deere or FUSE from AGCO demonstrate this need in the market. These operations have their own systems related to the best use of the machinery they provide. These will be related to monitoring of operating hours, needed services, real-time monitoring, and other functions. Machinery companies also make available solutions for agricultural activities, such as soil characteristics, satellite imagery, and weather conditions, to include prescriptions for tillage and chemical applications, seedling, and harvest planning. Some of these applications are developed internally, while others are integrated with different partner companies.

Solinftec is unique in its promise. It is focused on agricultural process optimization for cost reduction, but external variables are also considered, such as weather, labor, and product label conditions. Solinftec's products leverage IoT and artificial intelligence technologies. The system delivers real-time actionable insights. In that sense, Solinftec can be combined with most other digital platforms. However, bringing insights to farmers the way Solinftec does with spraying, planting, harvesting, and transporting processes might become less useful if software from other digital companies are combined. Depending on who Solinftec is compared to, there will be different levels of "redundancy" on one end or "complementarity" on the other. For sure, following its vision, when Solinftec incorporates new features into its group of solutions, such as predictive models or more comprehensive farm management interfaces, it increases its overlap with other existing agricultural digital platforms.

Solinftec's Marketing Strategy in Brazil

This strategy was very successful in the Brazilian sugar cane industry since Raízen became the first client. This was how the company was created. The same strategy was used when the company expanded into grain production in 2015. For instance, Terra Santa, also a well-known grain and cotton producer with approximately 395 thousand acres of farmed land, was one of Solinftec's first clients in the grain area. These early customers received customized solutions

from Solinftec that were tailored to their specific operations. Working on a contingency basis, Solinftec only charged for its operating expenses and only if the project was successful (Box 1).

Box 1: Terra Santa Testimonial on the Experience with Solinftec at Pilot Project

Terra Santa is an agriculture enterprise in Brazil with 160 thousand hectares (about 395 thousand acres) producing soybeans, winter corn, and cotton in seven farms across the Brazilian Cerrados region. Terra Santa, headquartered in São Paulo, is listed in the Bovespa Stock Exchange.

Terra Santa is well respected in the agribusiness industry, as was its CEO, Mr. Arlindo Moura, by the time Solinftec proposed testing its solutions there. Mr. Moura was also the president of ABRAPA (Brazilian Cotton Growers Association).

Terra Santa had been working with precision agriculture for about 5 years before introducing Solinftec in its business, when Mr. Moura decided to support Solinftec's project inside Terra Santa. As Mr. Moura pointed out, Solinftec agreed to share the project risks, charging Terra Santa a lower fee, but hoped for a success fee on results if the project generated value for Terra Santa. The chosen farm for the project was the one located in the city of Santa Rita do Trivelato at Mato Grosso State.

The basic model Terra Santa operated before adopting the digital solution was to require written notes on the details of each operation (e.g., stops, working hours, reasons) from machine operators at the end of every cycle. They were trying to transfer all of the information from the machines to other spreadsheets, and then the office staff would introduce the raw data into other software for further agronomic and management analysis. That process was understood as time consuming and inaccurate.

What Solinftec did was digitalize all the information coming from several machines on the field directly to the software Terra Santa needed, thus minimizing human interference. The types and quantity of information to be inserted by the operator was reduced as much as possible. But, when manual information was still needed, it was inserted with a friendly user interface with devices such as touch screen commands and easier pre-available options.

Also, the farm and each machine could be visualized from a nicely designed screen on a real time basis, using satellite imagery. These different screens form the operational center for the farm, showing how the operation is running with data on machine speed, fuel consumption, missing or overlap spraying areas, delays, and many warnings for immediate actions when needed.

Terra Santa has also integrated the weather station and the virtual voice assistant, ALICE, backed by artificial intelligence, to get answers for several types of questions. According to Mr. Moura, the gains from working with Solinftec solutions are related to increasing machinery utilization hours, reduction in fuel consumption, more detailed information on farming operations, and, consequently, better and more precise accounting systems. From one pilot farm, Terra Santa now is rolling out the Solinftec solution to all seven farms.

Source: Terra Santa and Solinftec reports.

After a customer adopts Solinftec solutions, Solinftec implements its customer intimacy strategy. As stated by Daniel Padrão:

It has to do with being really close to the client, understanding its needs, adapting our solutions to its needs and making sure that we are generating useful information to improve decision making on a real time basis. We start with the basics and gradually we intensify the use of technology on one customer. When the evidence of gains or value creation our tools generate to the customers becomes very clear, it is very unlikely that the customer will live without us.

The Solinftec conversion rate with this prospecting strategy is about 90%, according to Solinftec's records.

The Solinftec's value proposition is to reduce costs while maintaining the customers' highest achievable yield. As Mr. Hernandez pointed out:

Producers have a hard time investing in technology hoping it will pay off in increasing yields, mainly when markets are adverse. This is the traditional value proposition coming from all ag-input suppliers. But farmers are most often risk averse. Therefore, our approach has been different. We promise we can lower the farmer's cost at the highest achievable yield. Moreover, we will be there to measure and document the gains or cost savings that have been provided by our systems.

Solinftec prices its sugar cane solutions based on monitored machinery but moved to a per-acre pricing model when the company entered the grain industry. However, the number of machines remains the fundamental variable for the final price level.

Today's Solinftec Challenges: A New Moment

Today, Solinftec is a company of about 450 employees, including 150 software developers, 150 field technicians and salespeople, and 120 administrative staff.

In Brazil, Solinftec has four main offices, one in Araçatuba and another in Piracicaba in São Paulo state—important areas for sugar cane production—and one in Nova Mutum and

another in Sinop in Mato Grosso state—important areas for grain production. One new office is located in Cali, Colombia. Finally, Solinftec has the U.S. office in West Lafayette, Indiana.

The capital leveraged from TPG ART Circularis (Appendix 2) was fundamental for Solinftec to implement three strategic business decisions: the SaaS structure, entrance and growth into the grain industry, and international expansion starting in the U.S. market.

After a successful entrance and growth in the sugar cane industry in Brazil—where over 70% of the sugar cane planted area is being monitored by Solinftec—the company felt the hurdles of being dedicated to only one industry. In 2014 and 2015, the company saw the investment capacity of sugar mills decreasing significantly due to the crises in the sugar cane industry. Solinftec needed to diversify.

In 2015, Solinftec started its incursion into the grain area, focusing on soybeans, corn, and cotton as target crops. AMaggi, Terra Santa, and Bom Futuro were the chosen customers with the goal of adapting existing solutions for sugar cane for the grain industry. Since then, the company has achieved significant growth in the grain area. In early 2019, the company was working on 6.5% of grain cropland in Brazil, corresponding to about 5 million acres. Its solution offerings in grain are evolving, and Solinftec is about to launch new solutions on product application and the optimization of equipment logistics, tailored to solving specific grain producer challenges, as it did for Brazilian sugar cane.

Another fundamental strategic decision was the conversion of its solutions into a SaaS (software as a service) model plus hardware leasing. This model facilitates the farmer's decision process to adopt Solinftec systems.

Finally, Solinftec's vision is to become a global player in the agricultural technology space. To gain this recognition, they believe they must first establish themselves in the U.S. market. This is due to both the global importance of U.S. agriculture and the fact that most successful ag techs are based in the United States, mainly Silicon Valley. "If we want to be recognized as a successful global ag tech company, we have to be in the U.S.," says Daniel Padrão.

The Start in the U.S. Market

After their decision to go global and establish a base in the United States, the company identified West Lafayette, Indiana as their headquarters for U.S. operations. As Daniel Padrão shares, “This has to do with our culture and our way of developing our technologies. We are farmer oriented and we want to develop solutions to their daily challenges. We have to be close to farmers.” West Lafayette offers an attractive environment for an ag tech company. First, the presence of Purdue University in West Lafayette was fundamental. Purdue is well known by its world class research in agriculture, and the interactions with Purdue faculty, researchers, and students were seen as beneficial to Solinftec. Additionally, Purdue has a research park where technology companies can be located and take advantage of networking activities and incentives for operational facilities.

Lastly, Solinftec was introduced to the Wabash Heartland Innovation Network (WHIN). This organization engages agriculture producers and businesses in the Wabash Valley region of Indiana and develops agriculture IoT testbeds. WHIN’s network attracts producers (currently around 40) that are considered innovators on one side to become members and be considered ag testbeds. On the other side, WHIN offers ag tech companies this network of farmers (the ag testbeds) where they can test and develop their technologies. There are currently 15 companies participating in the agriculture area within WHIN. WHIN believes the Wabash region (10 counties) can be an epicenter for the digital agriculture revolution.

In partnership with WHIN, Solinftec is developing pilot projects for 20 affiliated producers and six corporate farms in different regions. The need to work with channel partners, such as the ag retailers—primarily cooperatives like GROWMARK and MKC totaling 50 locations—has emerged as an opportunity for Solinftec.

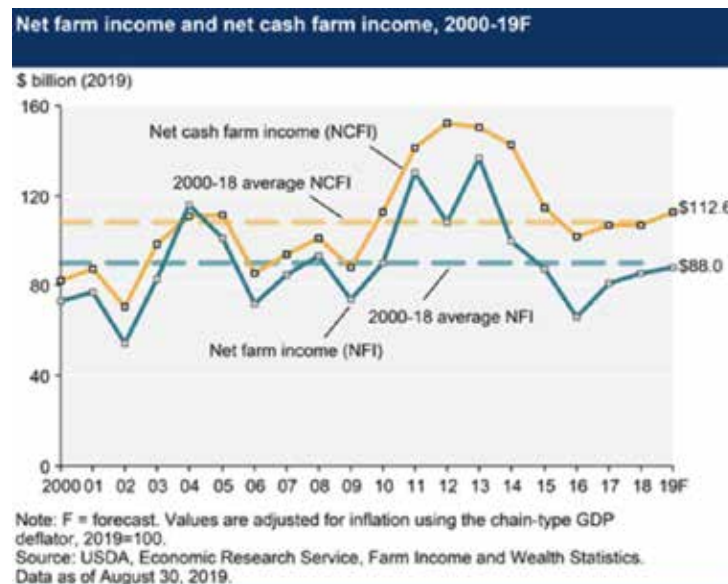
The Challenges to Grow in the U.S. Marketplace

There are significant challenges for Solinftec in the U.S. market that can be summarized as follows:

Difficult times for U.S. row crop growers: Growers in the United States have faced shrinking profits since 2013. Although this trend must be interpreted in context, it is a

serious headwind for the industry that Solinftec cannot disregard when considering its growth plan (Figure 3).

Figure 3: Net Farm Income and Net Cash Farm Income

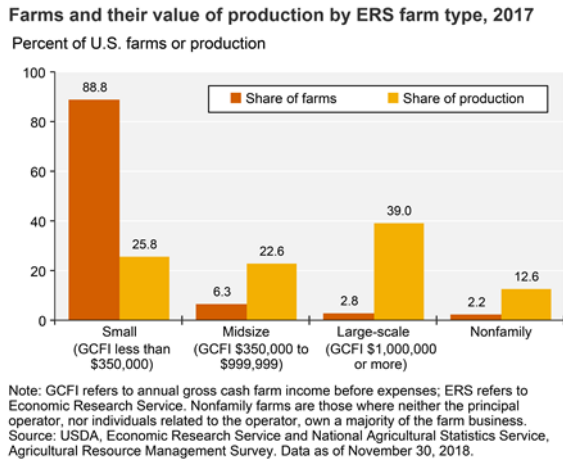


Higher market risk perception: Market uncertainty related to uncontrolled factors is another short-term challenge. First, instability in trade negotiations has impacted grain prices. The disputes with China have significantly decreased the export markets for soybeans to China, which has negatively impacted prices. Secondly, the Midwestern United States has been hit hard by historically high precipitation. In 2019, the planting season across the Midwest was delayed due to excessive rain levels. Together with the uncertainty surrounding trade, this has created a higher level of uncertainty for growers that may negatively impact farmers’ willingness to invest.

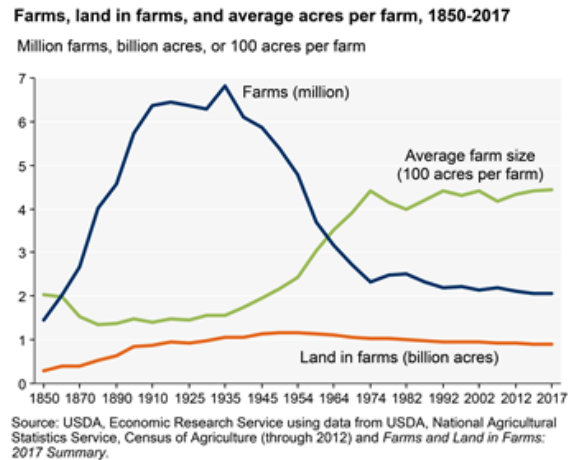
Customers’ size and profile: In Brazil, Solinftec is used to working with large farms. Sugar cane mills have agricultural areas ranging from 10 thousand acres up to 2 million acres. The largest 10 sugar mills in the country are over 300 thousand acres each of farmed area. Considering grain production, the three companies used for piloting the solution in Brazil have sizable cropland, such as Terra Santa with 395 thousand acres. Any small gain in a process may have a huge impact, considering the size of the farm operations.

Indeed, the references of what is considered a large farm operation in Brazil and in the United States are very different. However, it is worth mentioning that consolidation is rapidly advancing in the United States as well (Figures 4 and 5).

Figure 4: Farms and their value production by ERS farm type, 2017.



: Farms, land in farms, and average acres per farm, 1850-2017.



Besides the differences in size, maybe as important is the difference in profiles among the U.S. and Brazilian commercial farmers. The typical commercial grain or sugar cane producers in Brazil are not operationally involved in the production. The farm owner would most likely live in cities and have an office for managing operations with hired administrative and on-farm labor. Often times, multiple farms belong to families or corporate entities.

In the United States, the majority of grain farmers live on the farm and are fully involved in the daily production and labor, along with relatives and hired permanent and temporary labor. The U.S. farmer's routine involves performing all of the activities for every step in the farm production process. Thus, the priorities and perspectives are potentially different when comparing both profiles.

Agricultural retailers' role on custom applications: The ag retail industry in the United States is very consolidated. The three largest companies in revenue are Nutrien with over 800 locations, Helena with over 400 locations, and Growmark with over 500 locations.

In the United States, different from Brazil, ag retailers have an important role in terms of custom applications. Crop protection spraying or fertilizer application often are performed partially or fully by ag retailers under contract. For instance, Nutrien and Helena have 4% of their total retail sales represented by custom application, and Growmark has 12% (Figures 6 and 7). This means the equipment and processes on which Solinftec works are many times not under farmers' full control, like in Brazil, but are under the ag retailer's control. This might challenge any optimization initiative when multiple players are involved.

Figure 6: 2018 Ranking of the Largest Ag Retailers in the United States (based on total retail revenues)

Rank	Company	Year Founded	Retail Outlets	Number of Employees
1	Nutrien Ag Solutions	1995	854	10,000
2	Helena Agri-Enterprises	1957	436	4,000
3	GROWMARK, Inc.	1927	585	6,500
4	Wilbur-Ellis Co.	1921	160	2,808
5	Pinnacle Agriculture Distribution	2012	150	1,350
6	CHS	1929	360	6,500
7	Simplot Grower Solutions	1935	90	2,000

Source: <https://www.croplife.com/top100/>

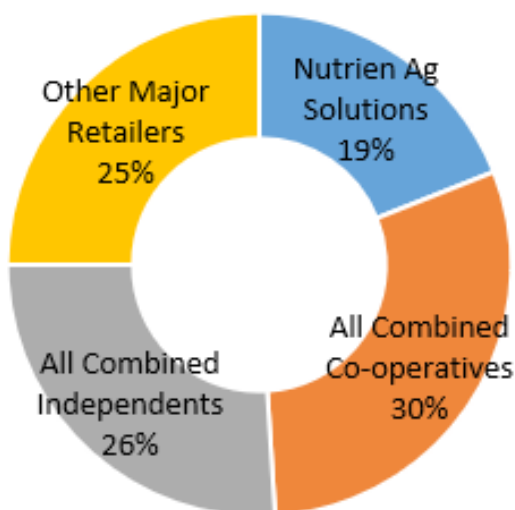


Figure 7: U.S. ag retail market share by revenue (2018). Source: CropLife and Nutrien Internal Estimates

The total sales for the top seven companies was \$20.5 billion in 2018, which is nearly 70% of all CropLife 100 sales (\$30.5 billion). Source: CropLife, <https://www.croplife.com/croplife-top-100/croplife-magazine-unveils-annual-list-top-100-u-s-ag-retailers/>

On the other hand, since ag retailers perform custom applications, they certainly have important needs for managing their fleet when scheduling and performing custom

applications. Indeed, a test with a dealer in the corn belt area showed great potential for improving the efficiency of machinery logistics (see Box 2).

Box 2: Pilot Projects in a U.S. Cooperative and Farm

One Ag retailer accepted an offer to run a Solinftec’s pilot project at one of its retail locations in the Midwest region. Solinftec connected all the trucks and sprayers through IoT and included the in-cab device for the operators to indicate the justifications for service stops. The project has been running since December 2017, and analyzing a sprayer’s working hours yielded the following results:

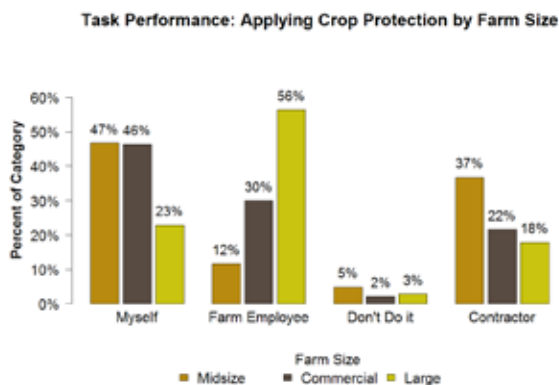
(a) Out of a total of 10 reported working hours, 3.5 hours were reported as actual product spraying time, 3.5 hours were reported as sprayer traveling time, and 3 hours were reported as idling time.

(b) Out of a total of 3 hours of idling time, about half of the time was spent on waiting for the products. The other half of the time was spent on several different internal processes, such as paperwork or applicator interaction with people at other locations.

After analyzing the data, Solinftec recommended changes on the traveling portion with regard to routes optimization, as well as the idling time portion, thereby simplifying the location internal processes. These changes would improve the total sprayer application time by almost 1 hour per sprayer, significantly increasing the total acreage sprayed per day.

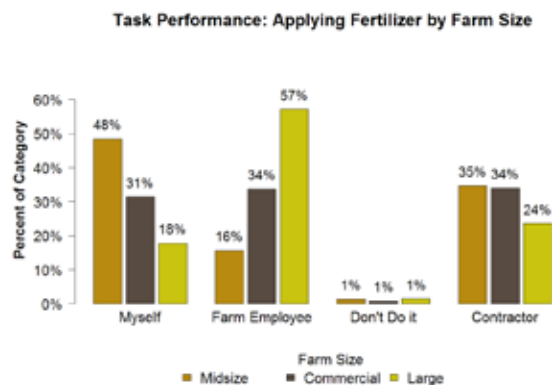
However, one important aspect to add is that as farmers grow in the US, research data have shown that they tend to use less contractors as ag retailers, but their own workforce and equipment for crop protection and fertilizer application needs (Figures 8 and 9).

Figure 8: Task performance: Applying crop protection by farm size. *Source: The 2017 Large Commercial Producer Survey, Center for Food and Agricultural Business (n=1,351)*



Midsize: Revenues from US\$ 150,000 to 999,999
 Commercial: Revenues from 1,000,000 to 4,999,999
 Large: Revenues higher than US\$ 5,000,000

Figure 9: Task performance: Applying fertilizer by farm size. *Source: The 2017 Large Commercial Producer Survey, Center for Food and Agricultural Business (n=1,351)*



Midsize: Revenues from US\$ 150,000 to 999,999
 Commercial: Revenues from 1,000,000 to 4,999,999
 Large: Revenues higher than US\$ 5,000,000

Therefore, one of the challenges for Solinftec to grow in the United States is to choose the best go-to-market strategy. While in Brazil, the company has chosen a direct sales model where they form a direct relationship with large farms and sugar millers who own their equipment and control the processes Solinftec works on, in the United States, that strategy might need to be revisited to include the ag retailer if Solinftec wants to cover a portion of the market where farmers do not do their own application.

People and organizational culture: Having the right people and maintaining the organizational culture are interrelated challenges Solinftec faced when entering the market in the United States. To ensure an appropriate labor force in the United States, the vision was to bring Brazilian technical and administrative staff and mix them with local U.S. labor. This strategy was designed to maintain Solinftec's culture and to replicate the original Brazilian customer experience on the American farm. Solinftec's culture can be characterized as customer centric, with flexibility and speed in interacting with the customer.

Case Questions

1. If you were analyzing companies in which to invest in the ag tech space today, what factors would you consider favorable and unfavorable in deciding to invest in Solinftec?
2. Considering the crowded and complex ag tech space and the different number of solutions Solinftec has offered and will offer in the near future, how can Solinftec best position itself in the U.S. marketplace? Should it build a reputation around (a) being a general digital agricultural company, enlarging its portfolio with agronomic features, and taking the role of customers' main partner and solutions integrator, or (b) being a specialized provider of efficiency in on-farm machinery processes?
3. How can you compare the value proposition of Solinftec to farmers and ag retailers in the United States? Are there specific segments of farmers or ag retailers where Solinftec's value proposition is stronger than others?
4. How should Solinftec access the market in the United States? Should it build a go-to-market strategy focusing on direct contact and sales to farmers as it does in the Brazilian market, approach channel members such as ag-input retailers, or both? What are the advantages and disadvantages of these alternatives?
5. Is the partnership with other agricultural digital companies a good way to accelerate entrance into the U.S. market? Can the AGCO global partnership be replicated to other agricultural machinery manufacturers? Are there other companies in the digital agricultural space that would be good partners for Solinftec?

Appendix 1: Videos

U.S. Videos

Solinftec Opens U.S. Headquarters in Indiana | 2018 AgriNovus Indiana Agbioscience Summit: <https://www.youtube.com/watch?v=ihvw2qTuATc&t=568s>

Brazilian Customers' Testimonials (with English subtitles)

COFCO: <https://www.youtube.com/watch?v=5QwGxdzmlDQ&t=18s>

O Telhar: <https://www.youtube.com/watch?v=5q5qtd6nDb8>

Terra Santa: <https://www.youtube.com/watch?v=ajKjKWs2y3E&t=119s>

Usina Baldin: <https://www.youtube.com/watch?v=xnw60Xkp5NY>

Solutions

ALICE – Artificial Intelligence Voice Interface:

<https://www.youtube.com/watch?v=7Jbskz15Vl4>

Solinfnet: <https://www.youtube.com/watch?v=7ONjYtkTM50>

FUT – Single Row of Transshipment Process Visualization (in Portuguese):

<https://www.youtube.com/watch?v=VCSilLdFUdE>

Figure 10: Depiction of the Automatic Single Row Concept



Appendix 2: Brazilian Digital Ag Startup Solinftec to Invest \$50m Establishing US Operations

Brazilian Digital Ag Startup Solinftec to Invest \$50m Establishing US Operations

November 29, 2018

AgFunder

Solinftec, a Brazilian digital agriculture company and an AgFunder portfolio company, announced today that it plans to invest \$50.6 million to establish its US headquarters near Purdue University, creating 90 jobs in 2019 and up to 334 high-wage jobs by 2022.

Solinftec uses a suite of technologies including proprietary hardware, a telemetry communications network, and a software-as-a-service platform to help farmers monitor the status and progress of their machines in the field based on their positioning and what activity they're undertaking. Solinftec can also give clients a verifiable record of their harvest and traceability from the farm to the truck to the mill, without any human input.

The company is currently running on over 16 million acres and monitoring 20,000 pieces of equipment with over 100,000 daily active users and 65% of the Brazilian sugarcane market.

"Solinftec has shown a passion for discovering innovative solutions to improve agriculture operations through science, engineering and more recently AI," said Daniel Padrão, Solinftec's chief operating officer. "That is why we are excited about the opportunity to work with a renowned research university such as Purdue and its College of Agriculture as we continue to expand our platforms into new geographies."

The \$50.6 million includes investment in software and computer hardware to expand its innovations to the US and increase its tech-based offerings for US customers in the agriculture industry.

Solinftec is familiar with Indiana after working with Kip Tom's Tom Farms to trial its technology on row crops in the US.

"The US Midwest is core to our strategy; we recognize its importance in the global food and its ag ecosystem. We are humbled and thrilled to launch our US headquarters out of the state of Indiana. We thank the state government, AgriNovus Indiana, Purdue University and Tom Farms for their vision on supporting this initiative and for everyone's Hoosier hospitality," said Renato Hersz, Solinftec's strategy and corporate development director.

Another factor in Solinftec's decision was the opportunity to work with the Wabash Heartland Innovation Network(WHIN), a consortium of 10 counties in north-central Indiana working to harness the power of internet-enabled sensors to develop the region into a global epicenter of digital agricultural and next-generation manufacturing. A recent \$40 million grant from Lilly Endowment established the network.

“Following on the heels of Inari’s decision to locate its Seed Foundry at Purdue, this shows that the Wabash Heartland area, with Purdue as an economic magnet, has a very real chance of becoming a world center of precision agriculture,” Purdue University President Mitch Daniels said.

“Indiana is at the center of innovation in agtech, and today’s news is yet another example of the collaborative ecosystem we’ve created here,” Gov. Eric J. Holcomb added. “Solinftec choosing to locate its first US operation, Tecsoil USA, and its headquarters in Tippecanoe County will not only create hundreds of high-skilled, high-wage jobs, but it will bolster an industry that is developing new solutions, improving agricultural products consumed around the world, and enabling farmers in Indiana and beyond to grow their operations.”

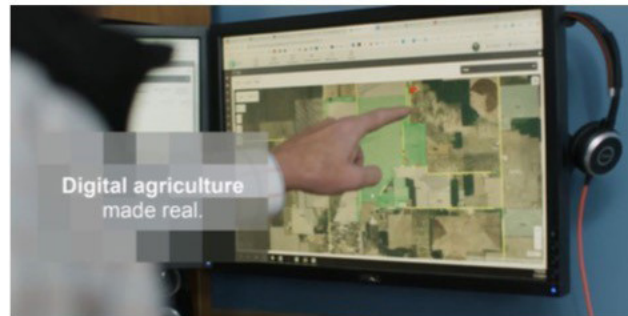
Solinftec’s first virtual assistance technology called ‘Alice’ involves installing a smart black box in agricultural equipment and sensors in the field under a user-friendly platform.

Solinftec’s first virtual assistance technology called ‘Alice’ involves installing a smart black box in agricultural equipment and sensors in the field under a user-friendly platform. The company serves large international growers such as Raízen, which reports more than 3,000 monitored equipment, the largest telemetry system in the world. Other international companies served by Solinftec include Tereos, Cofco, and British Petroleum all in the field of sugar cane crops, and Amaggi, Bom Futuro e Terra Santa, a grower in row crops.

Among the 10 largest companies in the sugar and ethanol sector, eight are customers of the company, and among the five largest producers of grains and fibers, three are in its portfolio.

AgFunder invested in Solinftec’s Series B round last year alongside private equity behemoth TPG.

Appendix 3: AGCO announces Strategic Partnership with Solinftec



AGCO Announces Strategic Partnership with Solinftec

Solinftec digital solutions will be available for AGCO customers for many crop types in multiple geographic regions

March 20, 2019

DULUTH, Ga. & ARAÇATUBA, Brazil – AGCO Corporation (<https://www.agcocorp.com/>) (NYSE: AGCO), a worldwide manufacturer and distributor of agricultural equipment and solutions, announces a commercial and technological partnership with Solinftec (<http://solinftec.com/pt-br/sucroenergetico/en/>), a world-leading developer and distributor of digital agriculture solutions. The partnership will give AGCO customers direct access to Solinftec's portfolio of solutions including on-board computers, weather stations, soil sensors, telemetry networks, proprietary algorithms and the real-time generation of actionable insights generating operational efficiency and agronomic efficacy. The new solutions will

launch in Brazil beginning in early 2019 for growers of sugarcane, soybean, corn and cotton, and will launch in the United States for the 2020 crop cycle for corn and soybean growers. Solinftec's offerings will complement the fleet and farm solutions already available through AGCO's Fuse@smart farming portfolio. (<https://www.fusesmartfarming.com/smart-farming-solutions/>)

For 11 years, Solinftec has brought solutions to its clients that capture and process data real-time and online, focusing on improving the broad operational ecosystem of a farm. Solinftec solutions are comprised of different layers of hardware, telecommunications, and software which are common across crops and regions. On top of these layers, Solinftec developed a broad suite of software and algorithmic solutions which solve challenges that are important for each specific crop and region. These solutions have substantially improved operational effectiveness and have earned Solinftec 60 percent of the sugarcane market in Brazil.

Renato Hersz, Strategy and Corporate Development director for Solinftec says, "We are humbled and thrilled by the opportunity to work with AGCO. Together we can positively impact food production on a global scale. Through technology we can definitely do more with less from an economic, environmental, and social perspective."

AGCO's partnership with Solinftec is a function of Fuse's open approach to smart farming, which includes a transparent partnering model that allows farmers freedom and flexibility in their choices of machinery, farm management and agronomic software, and service providers.

"We are happy to add such a proven innovator to our global Fuse network and to continue giving farmers choices to improve efficiency for their farm operations. This resource will be particularly valuable for our South American customers right away, but we also look forward to expanding with them to other parts of the world over the next several years," says Chris Rhodes, Business Development director, Global Fuse, AGCO.

Additionally, AGCO and Solinftec will be discussing ways to integrate the Solinftec portfolio into South America's recently launched [Farm Solutions program](https://www.fusesmartfarming.com/agco-presents-new-solutions-for-improving-yields/) (<https://www.fusesmartfarming.com/agco-presents-new-solutions-for-improving-yields/>) as well as possible integrations and APIs with other Fuse products.

To learn more about AGCO's Fuse partnering model and open approach to smart farming, visit <http://www.AGCOcorp.com/Fuse> (<http://www.agcocorp.com/Fuse>).

Learn more about Solinftec at <http://solinftec.com/en/>. (<http://solinftec.com/en/>)

Appendix 4: AgTech 100+

AG TECH: 100+ TECHNOLOGY COMPANIES CHANGING THE FARM



Endnotes

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