Course Syllabus
ISEN 473 The Future of Food and Agriculture (0.5 credit)
Northwestern University

Instructors: David Donnan MBA, P.Eng., Partner Emeritus, Kearney; President Silvertip Management
david.donnan@northwestern.edu

Office Hours: By appointment

Class Assistant: TBD
Classroom: TBD
Class Timing: Fall Quarter

Course Synopsis:
This class will investigate the future of food systems including changes in production, transportation, processing and consumption of food. It will focus on upcoming challenges and opportunities in the world of food and agriculture and the role of economics, policy, technology and climate impact. Growing and changing consumer demand, supply chain disruptions (including COVID-19 impact), modifications in farming practices, food and agtech impact and more will shape the future of food. Additionally, instructor will address the increased focus on sustainability, the influence of investors and the impact of market disruptors. No text is required. Course materials will be sourced from available research reports, company studies and other publications set out in the syllabus.

The course will focus on classroom discussions with many of the lectures pre-recorded for the students to view prior to the classroom discussions.

Course Goals: Students will build knowledge on the multitude of stakeholders in today’s food industry, disrupting forces in the food supply chain, and what changes we can expect in the future:

- **The Challenges to the Global Food System**: Students will learn about the global food systems and how they are changing to meet increased population, shifting consumer diets and constrained food supply due to climate change, trade disruptions and disease. They will be able to determine the key factors that will impact our ability to feed the world.
- **Food Production and Supply Stress Points**: Students will learn about the global food industry giants, their quest for efficiency and low cost and how the supply chain systems were disrupted during the pandemic. A discussion on the future food systems architecture will highlight the changes needed in our food systems. Students will also learn about the impact of COVID-19 pandemic on the food system.
  - **Case Study**: Maple Leaf Foods – Changing the System; and (D) Supply Chain
  - **Speaker**: Mark Baum, Chief Customer Officer FMI – The Food Industry Association
• **Food and Agricultural Technology:** Sustainable food production is the focus of innovators and entrepreneurs in food and Agtech. Students will learn on how different technologies such as plant-based proteins, vertical farming and gene editing offer better food production capabilities but also may create unexpected consequences for food access and affordability.
  - **Case Study:** AquaBounty Salmon
  - **Speaker:** Sylvia Wulf, CEO AquaBounty

• **Public Policy and Social Impact:** Upon reviewing the key food regulatory authorities as well as the impact of NGO’s on public policy and food access, the students will understand the complex interplay between government, NGO, industry and advocacy on the food system. An analysis of global policy issues such as food security, nutrition and health, international trade, farm economics and social equity will be discussed.
  - **Case Study:** Giant Foods Meat Rescue Program
  - **Speaker:** Grant Leslie, Partner Glover Park Group

• **Investments & Innovation in Food and Agriculture:** Venture Capital, incubators and accelerators have introduced new levels of innovation into farming and food manufacturing. Students will determine how new companies can attract capital and the successes and failures of new investments.
  - **Speaker:** JP Comte, President Barilla North America

Students are expected to complete readings prior to class. Please refer to the reading list for primary texts that will be used for the class. There will also be supplemental readings and films including articles and essays, that will be provided by the instructor. As part of the class, we will have a series of guest lectures by stakeholders that work in agriculture, food systems, policy and the investment community.

**Prerequisites:** Students must have successfully completed ISEN 471 Sustainable Food (offered Fall Quarter, first 5 weeks) or have the equivalent experience as approved by instructor.

**Grading/Assessment:**
Grading will be based on the following rubric:

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<thead>
<tr>
<th>Component</th>
<th>Weight</th>
<th>Details</th>
<th>Due</th>
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<tbody>
<tr>
<td>Case Write Ups</td>
<td>60%</td>
<td>Three 2-3 page (single space) write ups (800-1200 words) on key questions from case studies. Students will submit their write-ups before the class discussion session. Late submissions must be pre-approved otherwise marks will be deducted.</td>
<td>Week #2, #3, #4</td>
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<tr>
<td>Final Paper</td>
<td>30%</td>
<td>Final Paper (8-10 pages, single-spaced) that includes an analysis that relates to the future impact of policy, technology, and investment on food systems and sustainability. For example, a student may choose to look at the impact of the investment community on plant-based proteins. The analysis would look at the investors in the sector, the companies they are investing in, and the potential impact of their investments on environmental and sustainability measures. An analysis of regulatory and policy implications and potential technology applications would also be considered. Students should provide a recommendation for any changes in policy or investment thesis to provide better outcomes. <strong>Students should provide a topic to the instructor by week #2. During weeks 3 &amp; 4 students should provide an outline and use of course materials to instructor. The paper is due at the completion of the week #5 class.</strong></td>
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<tr>
<td>Preparation, Participation and Effort</td>
<td>10%</td>
<td>Based on attendance and instructor assessment of preparation and participation in class on a weekly basis. There will be ample opportunity for students to answer questions in class. Students are expected to prepare and research the guest speakers in the class and prepare suitable questions. There may be unannounced quizzes on the readings which students should be prepared to discuss.</td>
<td>Ongoing</td>
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All questions and problems regarding grades must be presented in writing within one week after the test, homework, or project has been returned. The grading scale is fixed; please do not wait until the end of the quarter if you are concerned about the direction of your grade. Grades will be assigned based on all the work you have completed during the quarter using the following scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tr>
<td>A</td>
<td>93.333 to 100</td>
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<tr>
<td>A-</td>
<td>90.000 to 93.333</td>
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<tr>
<td>B+</td>
<td>86.666 to 90.000</td>
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<tr>
<td>B</td>
<td>83.333 to 86.666</td>
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<tr>
<td>C</td>
<td>73.333 to 76.666</td>
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<tr>
<td>C-</td>
<td>70.000 to 73.333</td>
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<tr>
<td>D+</td>
<td>66.666 to 70.000</td>
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<tr>
<td>D</td>
<td>63.333 to 66.666</td>
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Course Readings:

Week 1: The Nature of Global Supply and Demand

- **UBS The Food Revolution** [Links to an external site.]
- Bitman, Mark “**Don’t Ask How to Feed the 9 Billion**” [Links to an external site.] NYT, Nov 12 2014
- **Shifting Diets for A Sustainable Food Future** [Links to an external site.], World Resources Institute, April 2016
- **National Geographic Feeding 9 Billion People** [Links to an external site.]
- Baldwin, Richard “**A Short History of Agricultural Revolution**” [Links to an external site.]
- How the Supermarket Helped America Win the Cold War, **Freakonomics** [Links to an external site.]
- Barilla Center for Food & Nutrition, **One Health Approach to Food – The Double Pyramid.** [Links to an external site.]

*Case Study:*

- No case study assignment

Week 2: Supply Chain Evolution and Revolution

- **Food Distribution 101: What Happens When the Food Supply is Disrupted by Pandemic.** [Links to an external site.] Civil Eats
- Food Supply Chains During COVID19, NCBI, Hobbs, Jill E. [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7264576/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7264576/) [Links to an external site.]

Optional Additional Reading:

- **Everyone Eats – The Future of Food in the Age of COVID-19** [Links to an external site.], S2G Ventures
Case Study

- Ingredients for a Food System Revolution (Links to an external site.), S2G Ventures

Case Study A: *Maple Leaf Foods – Changing the System*

Week 3: Future Food Systems Innovation

- Agriculture 4.0, Oliver Wyman [https://www.mmc.com/content/dam/mmc-web/insights/publications/2018/november/agriculture-4-0/Oliver-Wyman-Agriculture-4.0.pdf](https://www.mmc.com/content/dam/mmc-web/insights/publications/2018/november/agriculture-4-0/Oliver-Wyman-Agriculture-4.0.pdf) (Links to an external site.)
- Digitising Agrifood (Links to an external site.), Barilla Center for Food & Nutrition
- How Will Cultures Meat and Meat Alternatives Disrupt the Agricultural and Food Industry (Links to an external site.), Donnan et al, Kearney 2019
- Vertical Farming at PLENTY (Video) [https://www.youtube.com/watch?v=fb4xcFw2VMg&t=1s](https://www.youtube.com/watch?v=fb4xcFw2VMg&t=1s) (Links to an external site.)
- Genetically engineered salmon [https://www.youtube.com/watch?v=bco7rPyKwec](https://www.youtube.com/watch?v=bco7rPyKwec) (Links to an external site.)
- Recirculating Aquaculture Systems: [https://www.youtube.com/watch?v=pxp75Ks8GE4](https://www.youtube.com/watch?v=pxp75Ks8GE4) (Links to an external site.)
Case Study B: *AquaBounty Salmon*

### Week 4: Food Policy and Social Impact

1. **Week 5: Investments in Foodtech and Agtech** Regulations of the US Food Industry, NDSU [https://www.ag.ndsu.edu/foodlaw/safe-408-608/foodprocessingregulation](https://www.ag.ndsu.edu/foodlaw/safe-408-608/foodprocessingregulation)

### Optional Additional Reading:

5. Unhealthy and Unprepared. [https://www.strongnation.org/articles/737-unhealthy-and-unprepared](https://www.strongnation.org/articles/737-unhealthy-and-unprepared)

### Case Study

- **Case Study C: Giant Foods Meat Rescue Program**

### Week 5: Investments in Foodtech and Agtech


No case study assignment

**Supplemental Reading List**

- The Future of Food and Agriculture – Trends and Challenges, FAO, [http://www.fao.org/3/a-i6583e.pdf](http://www.fao.org/3/a-i6583e.pdf) (Links to an external site.)

**Videos and Movies (Optional)**

- **Soylent Green.** A classic 1970’s dystopian film about the repercussions of population growth and environmental disasters.
- **Food Fight** This film tells the story of the California food rebellion against big agribusiness to launch the local organic food movement.
- **Food Inc.** *Food Inc* exposes the deep and unknown parts of the American food system – especially factory farming – and how it impacts our health, farming and the environment.
• **King Corn**: Two college best friends go on a road trip to America’s heartland to learn about where their food comes from. What they discover – that everything is made from corn – shocks them.

• **Caffeinated**: Focusing on the social and cultural components of the coffee supply chain, “Caffeinated” takes viewers on a journey from the farmers responsible for growing a perfect bean to the roasters and baristas responsible for brewing a perfect cup.

• **Wasted**: The Story of Food Waste: From chef and television personality Anthony Bourdain, “WASTED! The Story of Food Waste” explores both the problem of food waste in the U.S. and possible solutions from around the globe.

**Relevant Websites for Networking and Career Interests**

- Food Navigator, [https://www.foodnavigator.com/](https://www.foodnavigator.com/)
- Food Tank, [https://foodtank.com/](https://foodtank.com/)
- Alpha Food Labs, [https://www.alphafoodlabs.com/](https://www.alphafoodlabs.com/)
- Civil Eats, [https://civileats.com/](https://civileats.com/)
- The Good Food Institute, [https://www.gfi.org/](https://www.gfi.org/)
- Naturally Chicago, [https://naturallychicago.org/](https://naturallychicago.org/)
- Specialty Food Association, [https://www.specialtyfood.com/](https://www.specialtyfood.com/)
- New Hope Network, [https://www.newhope.com/](https://www.newhope.com/)
- Center for Food Integrity, [https://foodintegrity.org/](https://foodintegrity.org/)
- Consultative Group for International Agricultural Research, [https://www.cgiar.org/](https://www.cgiar.org/)

Instructor may also assign a number of industry news services to discuss timely/current updates in markets design and regulation that are illustrative of core course topics.

**CLASS OUTLINE**

<table>
<thead>
<tr>
<th>Weekly Topic</th>
<th>Description</th>
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<tr>
<td><strong>1: The Future of Food – The Nature of Global Supply and Demand</strong></td>
<td>This module will introduce students to the fundamental global question “Can We Feed the World?”</td>
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<td>· It will discuss the global need for more food and agriculture based on population growth, changing diets, increased protein consumption and the fight against malnutrition</td>
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<td>· Constraints to our future food supply will be discussed such as climate change, soil health, biodiversity and political/trade disruptions and their impact on global food production</td>
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<td>· A discussion on nutrition, food security, and hunger will be discussed and the implication on global food systems</td>
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### A review of historical crisis in food and the various agricultural revolutions that have existed throughout history.

**Class discussion:**

What megatrend will have the biggest impact on (1) feeding the 10 billion people and (2) environmental impact. How will governments, NGO’s, corporations and consumers find solutions?

### 2: Supply Chain Evolution and Revolution

- A review of current food supply chain
  - Assessment of current players in global food supply chain
  - Global risks in supply chain
  - Concentration of power and risks

Potential disruptions to the system are studied

- Pandemics and disease
- Global Trade
- Environmental catastrophes

An analysis of potential solutions to disruptive forces will be conducted to see what economic and social tradeoffs exist.

Specific attention will be given to the COVID-19 pandemic and its impact on the food systems.

**Class Discussion**

What are the vulnerabilities in the current supply chain? How has the supply chain changed post pandemic?

**CASE STUDY A: Maple Leaf Foods – Changing the System**

*The Maple Leaf Foods (MLF): Changing the System case explores how a major food processor pivoted its vision and operations in an attempt to become the world’s most sustainable protein company.*

### 3: Future Food Systems Innovation

- A review of current issues in the food system, implications and potential solutions
  - Livestock’s impact on environment – alt meat and plant-based proteins
  - Access to water – Hydroponic and reduced water systems
  - Genetic modifications – CRISPR technology and GMOs
  - Advancing farming techniques – No till farming, precision farming, AI optimization of agriculture, and Agtech
  - Biodiversity – Underutilized species, crop diversity
  - Reduce food waste – HPP, MAP, Local foods, upcycled foods
| 4: Food Policy and Social Impact | · Nutritional impact – biofortification, NOVA classifications  

Issues and Trade-offs  
· Consumer advocacy and food justice  

Impact of technology on food (GMOs, industrial farming)  
· A discussion on consumer’s impact and advocacy for new food systems  
· Impact on diets, nutrition and economics of food.  

Class Discussion  
What technologies do you think will have the biggest impact on sustainability efforts? GHG? Water usage?  
What policy changes are needed to accelerate the adaptation of these technologies?  

CASE STUDY B: AquaBounty Salmon  
AquaBounty Technologies, Inc. (AquaBounty) was a small, U.S. biotechnology company that focused on improving productivity in commercial aquaculture.  

| A review of current regulatory agencies in US, Europe, and global (FDA, USDA, FAO, WHO, etc.) and their impact on food production and distribution  
A discussion on social impact of food policies such as hunger and food security, nutritional guidelines, farming methods and environmental impact, food waste and potential solutions  
Analyze the impact of poor nutrition and food security on GDP and economy  
Implications of the double pyramid  

Class Discussion  
Discuss the trade-offs between various policy positions such as food security, nutrition, environmental, poverty. What are the unintended consequences of recent policy decisions?  

CASE STUDY C: Giant Foods Meat Rescue Program  
The case focuses on sustainable green retailing strategies surrounding meat donations by Giant Foods in their meat rescue pilot program called "Meat the Needs."
**5: Investments in Food and Foodtech, Agtech and Innovation**

<table>
<thead>
<tr>
<th>Overview of Investment Community in Food &amp; Agriculture</th>
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<tbody>
<tr>
<td>· Key Players</td>
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<tr>
<td>· Methods of Funding</td>
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<tr>
<td>· Major Investments and how they are changing – Corporate ventures, VC funding</td>
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<tr>
<td>· Accelerators and Incubators</td>
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**Class Discussion**

Given what we learned about the global food systems, opportunities and impediments and post COVID-19 environment:

· What will be the most promising technology investments in the next 5, 10 and 20 years?
· How will food systems, consumer choice and companies change in the next 10 years?
· How will the forces of advocacy and policy interact to combat malnutrition, food security, sustainability and social justice?

**Final Paper Due**

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**COVID-19 Classroom Expectations Statement**

Students, faculty, and staff must comply with University expectations regarding appropriate classroom behavior, including those outlined below and in the COVID-19 Code of Conduct. With respect to classroom procedures, this includes:

- Policies regarding masking and social distancing evolve as the public health situation changes. Students are responsible for understanding and complying with current masking, testing, Symptom Tracking, and social distancing requirements.

- In some classes, masking and/or social distancing may be required as a result of an Americans with Disabilities Act (ADA) accommodation for the instructor or a student in the class even when not generally required on campus. In such cases, the instructor will notify the class.

- No food is allowed inside classrooms. Drinks are permitted, but please keep your face covering on and use a straw.

- Faculty may assign seats in some classes to help facilitate contact tracing in the event that a student tests positive for COVID-19. Students must sit in their assigned seats.
If a student fails to comply with the COVID-19 Code of Conduct or other University expectations related to COVID-19, the instructor may ask the student to leave the class. The instructor is asked to report the incident to the Office of Community Standards for additional follow-up.

Class Recording

This class or portions of this class will be recorded by the instructor for educational purpose and available to the class during the quarter. Your instructor will communicate how you can access the recordings. Portions of the course that contain images, questions or commentary/discussion by students will be edited out of any recordings that are saved beyond the current term.

Unauthorized student recording of classroom or other academic activities (including advising sessions or office hours) is prohibited. Unauthorized recording is unethical and may also be a violation of University policy and state law. Students requesting the use of assistive technology as an accommodation should contact AccessibleNU. Unauthorized use of classroom recordings – including distributing or posting them – is also prohibited. Under the University’s Copyright Policy, faculty own the copyright to instructional materials – including those resources created specifically for the purposes of instruction, such as syllabi, lectures and lecture notes, and presentations. Students cannot copy, reproduce, display, or distribute these materials. Students who engage in unauthorized recording, unauthorized use of a recording, or unauthorized distribution of instructional materials will be referred to the appropriate University office for follow-up.

Expectations for Class Participation

Being prepared for class is about more than just showing up, it’s also about making sure you’ve completed the readings, homework, etc. so that you are able to make thoughtful contributions during class. Sitting silently and/or being unprepared can damage your participation grade. When in a virtual class, we expect students to keep their camera and mute on as much as possible. When in the classroom, we expect students to keep their phones off and put away.

Academic Integrity

Academic integrity is taken very seriously at Northwestern. Students are responsible for reading and understanding Northwestern’s Academic Integrity policies. All suspected violations will be reported to the McCormick College of Engineering’s Dean’s Office. These include cheating, plagiarism, fabrication, unfair advantage, unauthorized collaboration, and aiding and abetting of academic dishonesty. Students found in violation of academic integrity may receive a zero on the assignment or a failing grade for the
course and may be suspended or permanently expelled from the University. See Academic Integrity: A Basic Guide for more information.

**The Writing Place**

When working on writing assignments for this class, I encourage you to visit the Writing Place, Northwestern’s peer writing center. You will work with juniors and seniors who have been trained to provide you feedback and assistance on any type of writing at any stage in the writing process. They will not edit your work. Rather, they will work with you to brainstorm ideas, organize or outline an essay, clarify your argument, document your sources correctly, or refine grammar and style.

**Accessibility Statement**

Northwestern University is committed to providing the most accessible learning environment as possible for students with disabilities. Should you anticipate or experience disability-related barriers in the academic setting, please contact AccessibleNU to move forward with the university’s established accommodation process (e: accessible@northwestern.edu; p: 847-467-5530). If you already have established accommodations with AccessibleNU, please let me know as soon as possible, preferably within the first two weeks of the term, so we can work together to implement your disability accommodations. Disability information, including academic accommodations, is confidential under the Family Educational Rights and Privacy Act.

**Illness and Medical Leave of Absence**

Review the University’s policy on missing academic work due to illness. Your instructor cannot waive an assignment missed due to illness unless the illness can be verified (e.g., by University Health Services or other licensed health professionals).

**Discrimination and Sexual Harassment**

Northwestern’s Policies on Discrimination, Harassment, and Sexual Harassment apply to all members of the University community, including students, staff, faculty, and third parties. Any student, staff, faculty member, or third party who believes that they have been discriminated against or harassed on the basis of their race, color, religion, national origin, sex, sexual orientation, gender identity, gender expression, pregnancy, parental status, marital status, age, disability, citizenship, veteran status, genetic information or any other classification protected by law, should contact the Office of Equity at (847) 467-6571. Additional information about the University’s discrimination and harassment policies, including the
campus resources available to assist individuals with discrimination or harassment concerns, is available online on the Office of Equity Website. Students, staff, and faculty who report harassment, discrimination, or sexual misconduct are also protected under the University’s Policy on Non-Retaliation.

**Sexual Misconduct and Reporting**

Northwestern University is committed to fostering an environment where students are safe and free from sexual misconduct. Confidential resources are available to those who have experienced sexual misconduct. Faculty and instructors are not confidential resources and are required to report incidents of sexual misconduct, whether discussed in your assignments or in person, to the Office of Equity, which can provide information about resources and options. We encourage students who have experienced sexual misconduct to talk with someone to get support. For more information, including how to request interim protective measures and academic accommodations or file a complaint, see the Get Help page.

**Other Resources**

Students can find useful resources for safety and security, academic support, and mental and physical health and well-being at the NUhelp website.