2022

Climate Change's Effects on New York State's Apple and Dairy Industries, and the Implications on Food Security

Kenji Salinas
Binghamton University--SUNY

Climate Change in New York State: How Agriculture and Food Security are Adversely Affected

By: Kenji Salinas
Source Project: People, Politics & the Environment

BACKGROUND:

As the climate warms throughout the world, the threat posed to agriculture and food systems becomes increasingly dangerous. Certain agriculture cannot withstand the increasing temperatures and unusual weather patterns brought about by climate change. The agriculture of New York State (NYS), like apples and dairy, naturally thrives under the cooler climate of the state, thus climate change may pose a larger threat. The damaging of agriculture and food systems poses a threat to food security, as the quantity, quality, price, and transportation of food are affected. This project analyzes the following question: how will climate change affect NYS's ability to maintain the apple and dairy industries, and how will this affect food security and the transportation of food?

RESEARCH METHODS:

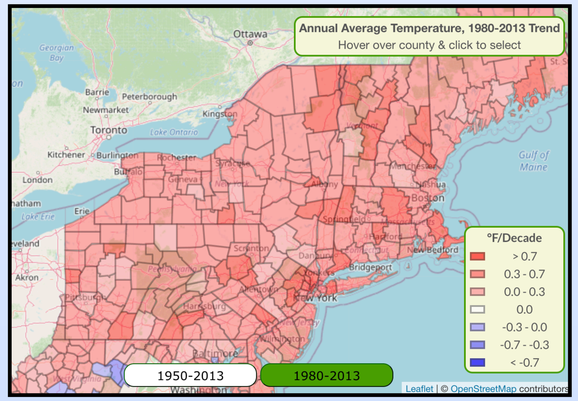
Extensive analysis and compilation of several sources:
- Analysis of scholarly articles
- Analysis of data from official sources (NYSERDA, DEC, etc.)
- Analysis of climate and weather data
- Analysis of personal accounts of farmers

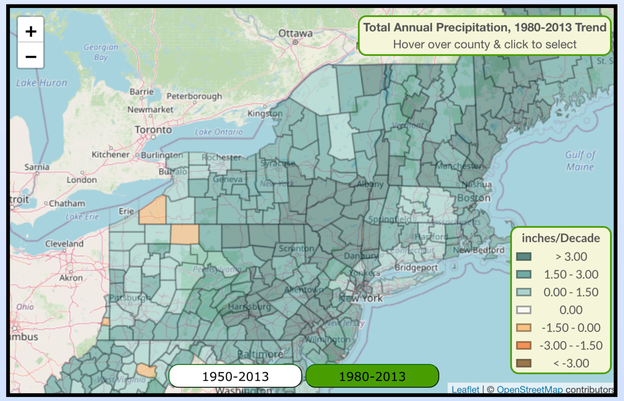
BINGHAMTON UNIVERSITY
STATE UNIVERSITY OF NEW YORK

MAIN FINDINGS:

TEMPERATURES + PRECIPITATION ARE INCREASING IN NYS

- 1980 to 2013 trend- increasing temperature; trend expected to continue up to 2080s
  - 2080s- Between 4.1˚ and 6.1˚ Fahrenheit increase in temperature
  - 2100- could rise up to 12˚ Fahrenheit
- 1980 to 2013 trend- increasing precipitation; future projections slightly unclear
  - Confirmed increase in precipitation for a few counties in NYS





CHANGES IN CLIMATE ADVERSELY AFFECT THE AGRICULTURE OF NYS

- Dairy:
  - Current trend: More dairy cows + larger farms —> Increased dairy production —> Price of dairy decreases —> Decline of dairy farms
  - Climate change will exacerbate current issues of dairy farmers
  - Cows experience heat stress —> decreased feed intake, milk production, and calving + increased risk for health disorders

Number of Milk Cows and Number of Farms With Milk Cows (2017-1997)				
Milk Cows	2017	2012	2002	1997
Number	628,245	610,712	626,455	670,003
Farms	4,648	5,427	5,683	7,388

Table 1. NUMBER OF COWS, PRODUCTION PER COW AND TOTAL MILK PRODUCTION, NEW YORK STATE, 2010 - 2020

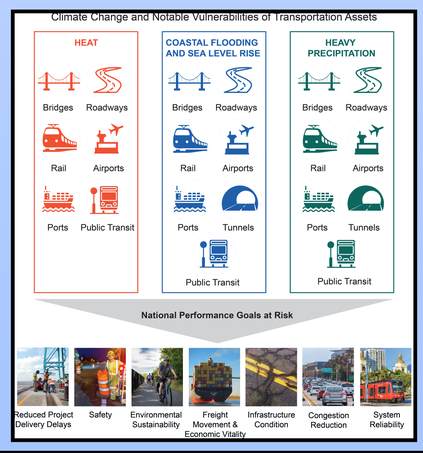
Year	Average No. of Cows (Thousands)	Production Per Cow (Pounds)	Total Milk Production (Million Pounds)
2010	611	20,807	12,713
2011	610	21,046	12,838
2012	610	21,623	13,190
2013	610	22,085	13,472
2014	615	22,339	13,739
2015	615	22,788	14,083
2016	620	23,834	14,777
2017	620	23,925	14,929
2018	625	23,888	14,882
2019	625	24,118	15,122
2020	625	24,500	15,337

Source: USDA National Agricultural Statistics Service

- Apples (SCAN QR CODE FOR DATA TABLES!):
  - Changes in quality of apples
    - 2014: higher average percentage of apples with EXCELLENT or GOOD conditions than in 2021
    - 2021: increase in the average percentage of apples with FAIR conditions than in 2014; slightly higher POOR conditions than in 2014
    - Addition of the VERY POOR condition in 2021

TRANSPORTATION INFRASTRUCTURE HARMED BY CLIMATE CHANGE

- High temperatures stress bridge integrity
- Extreme temperatures can cause delays to rail systems and air traffic
- Hot air makes it difficult for planes to generate lift
- Concrete vulnerable to high temperatures; higher temperatures may accelerate deterioration
- Increased precipitation causes more erosion of roads; increased incidents of flooding



CONCLUSION: FOOD SECURITY AND ADAPTATION

The Effects on Food Security (assuming no adaptation measures are taken):

- Food Availability:
  - Overall yield of crops affected by increased temperatures and precipitation
  - Heat stress decreases productivity of dairy cows
  - Transportation infrastructure affected by climate change; Transportation of food may be inhibited
  - Back-to-back losses of crops may force farms to close
- Food Access:
  - Decrease in supply of food drives food prices higher
- Food Utilization:
  - Lower apple and dairy quality —> loss of nutritional value

Adaptation measures:

For apple farming:
- Diversification of crops and crop varieties (more income, more heat resilience)
- Shifting of planting date

For dairy farming:
- Adjustment of feed intake for dairy cows according to changes in temperature
- Improvement of cooling capacity and cooling systems in barns

For transportation:
- Use of more heat-resistant materials
- Relocating to higher ground (wherever possible)
- Increasing capacity and effectiveness of drainage system

REFERENCES:

1. Climate smart farming decision tools. Climate Smart Farming. (n.d.). Retrieved December 15, 2021, from http://climatesmartfarming.org/
2. Observed and Projected Climate Change in New York State: An Overview – NYS Dept. of Environmental Conservation. August 2021. Retrieved March 8, 2022, from https://www.dec.ny.gov/docs/administration_pdf/ccnys2021.pdf
3. Climate action plan interim report: Chapter 7– Agriculture. Climate Action Plan Interim Report – NYS Dept. of Environmental Conservation. (n.d.). Retrieved February 17, 2022, from https://www.dec.ny.gov/energy/80930.html
4. 2020 New York State Diary Statistics Report – NYS Dept. of Agriculture and Markets. (n.d.). Retrieved February 27, 2022, from https://agriculture.ny.gov/system/files/documents/2021/10/2020dairystatisticsannualsummary.pdf
5. USDA National Agricultural Statistics Service, 2017 Census of Agriculture
6. Climate action plan interim report: Chapter 9– Transportation. Climate Action Plan Interim Report – NYS Dept. of Environmental Conservation. (n.d.). Retrieved February 17, 2022, from https://www.dec.ny.gov/energy/80930.html
7. Jacobs, J.M., M. Culp, L. Cattaneo, P. Chinowsky, A. Choate, S. DesRoches, S. Douglass, and R. Miller, 2018: Transportation. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 479–511. doi: 10.7930/NCA4.2018.CH12 (transportation figure)
8. Brown, M.E.; J.M. Antle; P. Backlund; E.R. Carr; W.E. Easterling; M.K. Walsh; C. Ammann; W. Attavanich; C.B. Barrett; M.F. Bellemare; V. Dancheck; C. Funk; K. Grace; J.S.I. Ingram; H. Jiang; H. Maletta; T. Mata; A. Murray; M. Ngugi; D. Ojima; B. O'Neill; and C. Tebaldi. 2015. Climate Change, Global Food Security, and the U.S. Food System. 146 pages. Available online at http://www.usda.gov/oce/climate_change/FoodSecurity2015Assessment/FullAssessment.pdf. Additional Technical Contributors: Mamta Chaudhari (GWU); Shannon Mesenhowski (USAID), Micah Rosenblum (USDA FAS), Isabel Walls (USDA NIFA), and Keith Wiebe (IFPRI) DOI: 10.7930/J0862DC7 http://www.usda.gov/oce/climate_change/FoodSecurity.html