



IRRIGATION PAYS IN PROTECTING VEGETABLE CROP REVENUES IN THE NORTHEAST U.S.

An Economic Case Study | Intervale Community Farm | September 2017

CLIMATE RECORDS SHOW THAT THE NORTHEAST IS EXPERIENCING MORE RAINFALL

However, much of the additional precipitation is occurring as heavy events, leaving intervening periods of hot and dry weather. With this extreme and variable wet weather taking its toll on farms, a key question is:

Does crop irrigation make sense as a farm resilience strategy given the overall increased precipitation in the Northeast?

Andy Jones, ICF farm manager, thinks it does. Andy manages the Intervale Community Farm (ICF), which is one of Vermont's oldest and largest community supported agriculture (CSA) farms. Andy has built a reputation as a leading organic vegetable grower in the Northeast. He explains, "On a 100-year floodplain, ICF soils have long been recognized as productive farmland, albeit subject to flooding. The irony is that much of the farm is composed of sandy soils, which drain well but need to be irrigated during dry periods." The impacts of climate change in the Northeast have meant an increase in extreme weather events including heavy downpours and extended dry, hot periods throughout the growing season.

The economic costs and benefits of irrigation at ICF were calculated using Andy's records from 2006 to 2016. To estimate irrigation needs in the years when data was not available, Cornell University's Climate Smart Farming (CSF) Water Deficit Calculator was used to model when plant stress was likely to occur.

FARM	INTERVALE COMMUNITY FARM
TYPE	CERTIFIED ORGANIC VEGETABLE FARM
LOCATION	WINOOSKI FLOODPLAIN, BURLINGTON, VT
SIZE	25 ACRES UNDER CULTIVATION IN 2017
IN BUSINESS SINCE	1990
FARM MANAGER	ANDY JONES

INTERVALE COMMUNITY FARM IRRIGATION

Partial Budget in 2016 Dollars (average \$/acre/year)

This analysis (on back) shows that irrigation is profitable despite on-going infrastructure costs and variable summer weather. Overall, the cumulative net benefits per irrigated acre over 11 years was \$33,121, and total farm benefits over all irrigated acres over 11 years were just over \$500,000.

The benefits of avoided crop loss were greater than the costs of irrigation in all but one year. When considering risk management, this means that if ICF can protect at least 3.5% of its crop revenues with irrigation, it will cover its costs of irrigation. Without irrigation, even in an average precipitation year, ICF would suffer diminished yields and quality without supplemental water. A range of irrigation scenarios and net benefits was also assessed in order to identify thresholds of when irrigation is needed the most and the least.



If all the years were "dry", total farm benefits due to irrigation would have exceeded \$800,000 and even if all years were considered "wet", total farm benefits still would have been almost \$70,000. Therefore, the benefits of having irrigation exceed its costs at ICF even if every year is on average "wet" given that rainfall does not always coincide with crop production needs. The main reason is that wet years still have dry periods during critical crop growth stages when irrigation provides significant benefits.

ICF'S DECISION TO INVEST IN DRIP AND SPRAY IRRIGATION OVER THE PAST 16 YEARS HAS BEEN SOUND

The benefits of reducing losses due to summer water deficits has exceeded the costs of purchasing the equipment, running the pumps, and the additional costs of labor and materials associated with managing this system. Of note is that ICF has kept their investment costs low by purchasing used equipment and using existing wells and an adjacent surface water supply. For other farms in the Northeast, the particular net benefits will depend on their particular cost inputs and other local conditions. Each farm will have its own set of site-specific cost and benefits.

INCREASES IN NET INCOME		DECREASE IN NET INCOME	
AVERAGE INCREASE IN INCOME		AVERAGE INCREASE IN COST	
ITEM		ITEM	
AVOIDED PRODUCTION LOSS	\$3,793	IRRIGATION EQUIPMENT	\$285
		ANNUAL MATERIAL (PLASTIC, DRIP TAPE)	\$227
		ANNUAL OPERATION COSTS (LABOR + FUEL)	\$269
TOTAL INCREASED NET INCOME/ACRE/YEAR	\$3,793	TOTAL DECREASED NET INCOME/ACRE/YEAR	\$782
TOTAL NET BENEFIT PER ACRE PER YEAR			\$3,011
TOTAL FARM NET BENEFITS PER ACRE OVER 11 YEARS			\$33,121
TOTAL IRRIGATION NET FARM BENEFITS (BASED UPON ALL ACRES RECEIVING SUPPLEMENTAL IRRIGATION)			\$508,705

* Total Acres Irrigated: 10 to 25 acres / Years of Data (2006 to 2016): 11 years

FARMING IN A CHANGING CLIMATE

In planning ahead for irrigation on farms, it's important to revisit how the Northeast climate has already changed and how it's projected to change. Between 1958 and 2010, the Northeast experienced more than a 70% increase in the amount of rain falling in very heavy events. Between 1895 and 2011, temperatures in the Northeast increased by almost 2°F, and precipitation increased by approximately five inches.

By 2080, warming impacts in the Northeast will be an additional 3 to 10 degrees F depending on the level of greenhouse gases emitted. The frequency, intensity and duration of heat waves are expected to increase. Precipitation is projected to increase particularly in the northern Northeast. Summers are becoming hotter and longer with seasonal drought risk projected to increase in the summer and fall as higher temperatures lead to greater evaporation and earlier snowmelt. For water management practices, there are lessons to be learned from these trends as well as significant events in the past decade. For example, during Hurricane Irene in late August 2011, very heavy rain was recorded at three inches per hour. In contrast, earlier that same summer, ICF experienced several dry hot weeks when their crops needed irrigation to alleviate plant stress.

Read full case study: www.uvm.edu/sites/default/files/media/irrigation_case_study_intervale_july_2017_0.pdf



Case study by Lynn G. Knight, NRCS and Suzy Hodgson, UVM Extension | Photographs by Jenny Brown and Suzy Hodgson, UVM Extension | USDA is an equal opportunity provider, employer and lender



Northeast Climate Hub
U.S. DEPARTMENT OF AGRICULTURE

THE UNIVERSITY OF VERMONT
EXTENSION