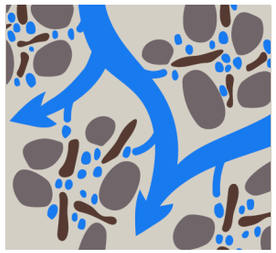
Healthy *soil structure* builds crop *resilience* to weather extremes

Permanent no-till allows soil microbes to build soil aggregates while earthworms and dead roots create drainage channels to help with infiltration and drainage during heavy downpours. No-till reduces fuel use by 5.7 gal/ac, labor by 2.75 hr/ac, a $50 savings/ac.



Soil organic matter (SOM) is an essential tool for providing water to crops during dry spells. No-till and cover crops build SOM. During the 2012 drought, corn and soybean fields with 5 consecutive years of cover crops had 10% greater yields than fields without.

Data from https://www.sare.org/wp-content/uploads/Cover-Crops-for-Sustainable-Crop-Rotations.pdf

PA farmers moving ahead

41% of harvested acres in PA is *no-till* and only 8% is intensive tillage.

53% *decline* in Indiana Co. acres using intensive tillage between 2012-2017.

33% increase between 2012-2017 in harvested acres in PA with *cover crops*.

7.4% of harvested acres in Indiana Co. have *cover crops* (compared to 15% for PA).

Data from 2017 USDA Census of Agriculture https://www.nass.usda.gov/Publications/AgCensus/2017/.

Funding *opportunities*

Environmental Quality Incentives Program (EQIP)

offers financial and technical assistance to implement conservation practices such as grazing improvements, no-till, cover crops, forest stewardship, and on-farm energy conservation. Learn more at https://www.nrcs.usda.gov/wps/portal/nrcs/main/pa/programs/financial/eqip/ or talk to your NRCS district office.

Resource Enhancement & Protection Prgm. (REAP)

offers tax credits for implementing best management practices like rotational grazing systems, no-till planting equiment, and cover crops. Learn more at https://www.agriculture.pa.gov/Plants_Land_Water/StateConservationCommission/REAP or talk to your county conservation district office.

For a current list of grant opportunities in PA visit:

http://bit.ly/2TJFBkN (from PA Environment Digest)

Local folks who want to help you build *resilience*

Indiana County Conservation District - 724-471-4751
435 Hamill Road, Indiana PA 15701
Indiana County NRCS - 724-427-3324
Penn State U. Extension Indiana County - 724-465-3880

This brochure was produced by

the Shenango River Valley Climate and Rural Systems Partnership (CRSP) with input from local farmers, extension educators, NRCS, the Carnegie Museum of Natural History, the Mercer County Conservation District, and Indiana County Conservation District. CRSP is supported by National Science Foundation awards #1906774 and #1906368. Illustrations by Bonnie McGill. We welcome your feedback, which you can send using https://carnegiemnh.org/educator/crsp-2/.

The road to farm *resilience* to weather extremes

in Indiana County, PA

A brochure from the Shenango River Valley Climate and Rural Systems Partnership

Do you ever find yourself saying:

"It's *too wet* to..."

or "This winter is *so muddy*"

or "It's *too hot* for the..."

If you answered "yes", you're right.

According to the long term weather station in Indiana, PA, which has daily records going back to 1940:

- 3 of the 5 *wettest* years on record have happened since 2010 (2018, 2017, 2011 were 11-20 inches above normal).
- 4 of the 5 *warmest* winters occurred since 1990 (1998, 1990, 2006, and 2002 were were 5-7°F above normal, as was 1949).
- since the 1960s, summer *night time minimum* temperatures have warmed by 4.9°F (±0.3°).

These changes in weather have intensified weather-related risks to Indiana County farms. Read on for info on how to build resilience into your farming practices.

(For more information about these statistics see https://tinyurl.com/723abdmy)

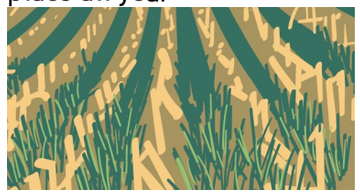
Risks to production from PA weather extremes.

Heavier downpours erode bare soils more quickly than in our grandparents' time.

In the summer, hot night time temperatures reduce milk production.

Many tried-and-true best practices can improve farm *resilience* to these risks (table below).

Cover crops hold soils in place all year



Agroforestry provides shade

Practices that build *resilience* to weather extremes

On my farm? ☑	PRACTICE	Improves crop productivity	Increases soil organic matter, provides water in dry periods	Improves soil infiltration and drainage during wet periods	Holds soil in place	Reduces flooding down slope	Improves crop resilience to diseases and pests	Reduces soil nutrient leaching	Cools livestock and buildings with shade and evapotranspiration* in hot periods	DESCRIPTION
☐	DIVERSE CROP ROTATION	☑			☑		☑	☑		A diverse number of crops in a sequence to increase soil health. For example, add a small grain to a corn-soy rotation.
☐	COVER CROP	☑	☑	☑	☑	☑	☑	☑		Such as annual ryegrass or hairy vetch. Usually involves transition to no-till system. Erosion protection, builds SOM.
☐	NO-TILL	☑	☑	☑	☑	☑		☑		Permanent no-till uses mechanical or chemical means to control weeds without disturbing the soil. Allows soil organisms to improve soil structure.
☐	LET WET SPOTS BE WET	☑			☑	☑		☑		Avoid wasting inputs and time in wet, marginal areas of fields
☐	AGROFORESTRY	☑	☑			☑			☑	Use trees within fields & pastures to cool crops & livestock during hot periods with shade & evapotranspiration*. Examples: silvopasture, intercropping, riparian forest buffers

*Evapotranspiration is the movement of heated water into water vapor in the air via evaporation and through plants breathing (transpiration).
Sources for the information in the table are provided at: https://tinyurl.com/723abdmy.