

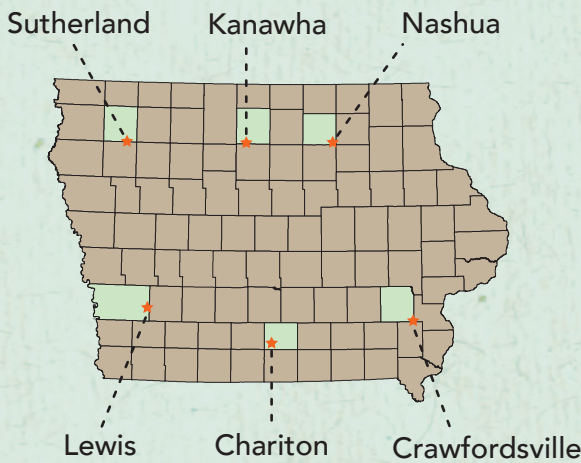
COVER CROP IMPACTS ON CROP YIELD AND WATER QUALITY: COMPARING SINGLE SPECIES TO MIXTURES

SUMMARY

Early establishment is key to maximizing the soil health and nutrient reduction benefits of cover crops. Corn and soybean yields were unaffected by the cover crops. Cover crops resulted in a statistically significant reduction in nitrate concentration in subsurface pore water, with highest levels of reduction in the single species treatments. When comparing biomass production, cereal rye and oats were most abundant. Radish, rapeseed and hairy vetch produced minimal biomass and did not justify additional seed costs.

STUDY DESIGN

6 ISU RESEARCH FARM LOCATIONS:



STUDY PERIOD: 2013-2017

MATERIALS & METHODS



All sites were in no-tillage corn-soybean rotations. Replicated strips were established with single species of cover crops, mixed species of cover crops, and without cover crops. The seeding rate was set at **1M SEEDS/AC**, as designated below.

BEFORE CORN

(SEEDED INTO STANDING SOYBEANS)

SINGLE:
(SEEDING RATE LB/AC)



OATS
(67)

MIX:
(SEEDING RATE LB/AC)



OATS
(52)



HAIRY VETCH
(10)



RADISH
(4)

BEFORE SOYBEANS

(SEEDED INTO STANDING CORN)

SINGLE:
(SEEDING RATE LB/AC)



CEREAL RYE
(67)

MIX:
(SEEDING RATE LB/AC)



CEREAL RYE
(32)



RAPESEED
(2.5)



RADISH
(3.5)

CROP YIELD



SOYBEAN YIELD ACROSS SITES ALL YEARS

TREATMENT	AVERAGE YIELD
MIX	65 BU/AC
SINGLE	64 BU/AC
NO COVER	66 BU/AC



CORN YIELD ACROSS SITES ALL YEARS

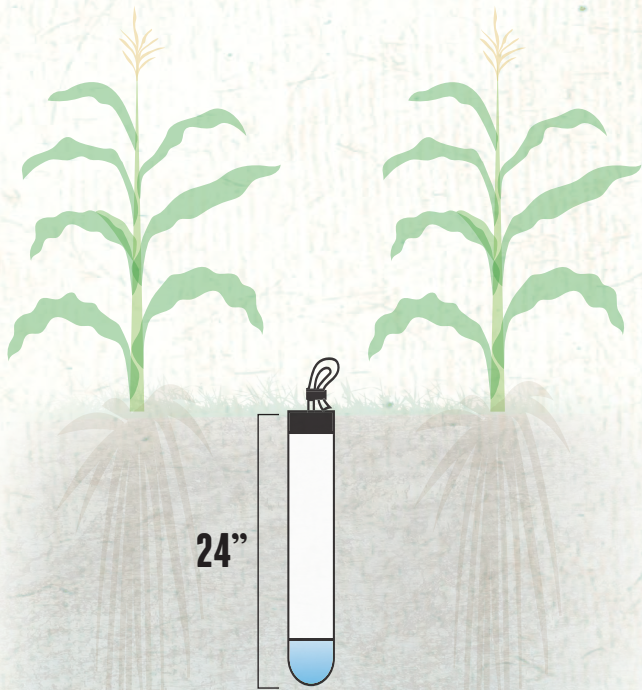
TREATMENT	AVERAGE YIELD
MIX	211 BU/AC
SINGLE	211 BU/AC
NO COVER	209 BU/AC



Across all sites and years, there was **NO YIELD DIFFERENCE** between the three treatments.



Planter settings are important to manage additional residue and minimize yield risk.



*Subsurface pore water samples were collected from suction lysimeters buried 24" deep

WATER QUALITY

Iowa soils are highly vulnerable to nitrate losses between April and June when natural nitrate production exceeds the crop demands. Over those three months, subsurface pore water samples* showed a statistically significant reduction in nitrate concentration in the cover crop treatments, with highest levels of reduction in the single species treatments.

Although the species seeded ahead of corn did not continue to grow in the spring, there was significant reduction in nitrate concentrations attributed to fall growth and nitrate retention.

SPRING NITRATE
REDUCTION IN
SOYBEAN PLOTS



61%
REDUCTION WITH
RYE



48%
REDUCTION WITH
MIXTURE

SPRING NITRATE
REDUCTION IN
CORN PLOTS



23%
REDUCTION WITH
OATS



19%
REDUCTION WITH
MIXTURE

COVER CROP BIOMASS

Above-ground cover crop biomass was collected in the fall ahead of a killing frost and spring at the time of cover crop termination.



More fall cover crop biomass production with single species (oats or rye) vs. mixture



Cereal rye was the only cover crop species to over-winter consistently



Cereal rye and oats resulted in the majority of biomass from mixture treatments



More spring cover crop biomass production with single species (rye) vs. mixture ahead of soybeans

CONCLUSION

- Rye and oats provide the best biomass return on seed investment! Single species are the way to go in Iowa.
- Corn and soybean yields were unaffected by the presence of a cover crop.
- Adjusting planter settings to manage additional residue will minimize yield risk.
- Nitrate concentrations in pore water were significantly reduced with cover crops.
- Rye and oats provide the best reduction in nitrate concentration, improving water quality.



Acknowledgements

This demonstration project was a collaboration of Iowa Learning Farms, Iowa State University Extension and Outreach, and Practical Farmers of Iowa. Funding was provided by NRCS Conservation Innovation Grant 69-3A75-13-230 and Leopold Center for Sustainable Agriculture.

Iowa Learning Farms
1201 Sukup Hall
Iowa State University
Ames, Iowa 50011-3080
515-294-5429
ilf@iastate.edu

WWW.IOWALEARNINGFARMS.ORG