

ATTACHMENT 3

Notes from Roundtable Discussion: Roundup Ready Sugarbeets on Boulder County Land Friday June 12, 2009 Boulder County Fairgrounds

Invited Participants:

Paul Schlagel, Farmer
Jules Van Thuyne, Jr., Farmer
Steven Hoffman, The Organic Center
Dr. Phil Westra, Weed Scientist, CSU
Norm Dalstead, Ag Economist, CSU

Staff:

Rob Alexander, Sr. Resource Specialist
Adrian Card, CSU Extension Agent
Phill Leffler, Resource Specialist
Luke Stromquist, Ag Resources Div Mgr
Tina Nielsen, Special Projects Manager
Ron Stewart, Director

Following introductions, Ron Stewart stated that the long-term goal is to have more organic crops on county open space land. Our goal is to have 10% of land in organic crop production by 2012, and we are pursuing a number of programs and incentives, including offering reduced lease rates, to reach our goal.

Typical Crop Rotation today:

Barley – annual rotation; goes to Coors brewing in Golden
Sugarbeets – annual rotation; delivery is near I-25 and SH66
Corn – annual rotation; markets are getting further away making silage and high moisture corn less viable as dairies and feedlots disappear from the local area. Most shelled corn is now taken to Denver or Roggen.
Alfalfa – remains planted for 5-7 years; dairy and feedlot markets are getting further away as dairies and feedlots disappear from the local area

Discussion Questions (distributed in advance of roundtable):

1. Given the facts we are operating under (large-scale agriculture that doesn't readily lend itself to organic production), growers' contractual obligations to coop, no apparently comparable markets for other crops, including organic, etc.), if not Roundup Ready sugarbeets, what alternatives would you recommend to Boulder County farmers, for long-term sustainability with viable markets?

Pinto beans:

- Have been planted in the rotation in the past.
- Not economical due to disease problems and low yield in this area.
- Commodity prices are volatile.

Organic Barley:

- Steven Hoffman: Is there a market niche with local area micro brews?
- POS Staff: Brewers buy malt, not barley. Most local microbreweries get their malted barley from the northwest. There is no local malt house

- Local demand for microbrewery malt would be insignificant relative to the supply we would grow on a large scale

Organic Wheat:

- Is there an organic milling facility to handle quantity we would produce on large scale? Staff to check prices and market.
- Follow up from Rob Alexander: Dave Liestikow used to raise organic wheat in Boulder County. He sold to a buyer that has since moved to Nebraska. He had problems overcoming problems with weeds and insects and at this point he hasn't raised organic wheat for some time. He said prices for organic wheat used to be 25% to 30% above conventional. Now it's less.
- Follow up from Rob Alexander: checked into organic wheat prices paid by Rocky Mtn. Milling. The margins between conventional and organic vary but over the long term, organic wheat prices tend to be about 30% higher. There are organic wheat buyers/mills in Denver and in Platteville. Rocky Mountain Milling in Platteville said that having on-farm storage facilities is important. Because of quality issues, wheat to be sold for milling should be tested before trucking it to an organic grain buyer. If the wheat does not meet high quality standards it could be rejected. Growers would not want to haul his wheat to the milling facility and find out there, that it does not meet quality standards.

Organic Hay and Corn silage:

- Aurora Dairy would be the local market. POS has put a significant effort into pursuing this opportunity. There is not enough of a price premium over conventional hay to make organic hay as profitable as conventional hay. Producers would be willing to grow organic feed crops if net return was equal or higher than conventional feed crops.
- Follow up from Rob Alexander: Dave Liestikow said he dropped organic certification on his hay fields because he could not get as much per ton for organic hay as he could from his horse hay market. In addition, the reduction in yields on alfalfa hay due to weevils was significant.
- Follow up from Rob Alexander: Local organic farmer Dave Asbury (a POS tenant) obtained \$140/ton for his certified organic alfalfa sold to Aurora Dairy last year. For the quality of the hay he sold them it was probably \$20 / ton higher than what he could have gotten for conventional hay. Again, Dave said weevils are his primary problem. They reduce the yield considerably. Dave continues to raise organic hay because it works for his overall operation (he raises the hay to "clean-up" his land in preparation for getting land certified organic and in his rotation with his other crops. The hay also works because Aurora Dairy is close by. Any additional, significant transportation costs to get his hay to a buyer would make the hay much less viable.

Blue Corn:

- Has been tried by quite a few farmers in the area; has not panned out
- Yields were one-third of conventional corn; tall skinny stalks fall over (lodging problem)

Popcorn:

- Steven Hoffman: Popcorn grown with good success in Eastern Nebraska; good yields in drought or flood conditions
- Norm Dalstead: Yield not close to conventional yellow field corn
- Rob Alexander: Market in Pueblo County? La Junta? Arkansas Valley Seed?
- Follow up from Rob Alexander: a local farmer did raise 20-30 acres of popcorn/year in the 1980s. Not sure why he quit.

Millet:

- POS staff: less profitable than wheat

Sunflowers:

- Best advantage when grown on dryland or marginally limited irrigated land.
- Crop is subject to bird damage, weather damage and wide price fluctuations.
- May become more viable if locally produced bio-diesel happens. Even so, profitability will determine when it is grown.
- Requires pesticide use.

Winter Squash

- Norm Dalstead: CSU used to employ a specialty crops faculty in Soil and Crop Sciences, Duane Johnson, who researched the agronomic and economic viability of many non-standard crops for Colorado (brown mustard, etc.) and none were widely adopted. Not because they were impossible to grow but because markets would not support their production from a business perspective.

Other vegetables:

- Vegetable production on the scale of sugarbeet production is impractical due to labor requirements and labor market restrictions.
2. If beets are pushed to a 3-year rotation due to lack of access to County agricultural land, what are the agronomic and potential economic negative impacts?
 - A four-year crop rotation is considered the minimum to maintain soil health. Pests are associated with different crops; rotation allows pests to die out
 - May lead to increased use of nematocides (pesticide for microscopic roundworms that can destroy root crops) on cropland for sugar beet production. Fusarium (root disease) problems may increase if pinto beans are part of a three year rotation
 - Yield (tons/acre) is negatively impacted when sugar beet rotation is shortened to three years. With net margins being tight, any drop in yield has an impact.
 3. What are the economic contributions of sugar beets to farm income on average per acre basis? Would RR sugarbeets improve this? How would farm income for these farmers be impacted without sugarbeets?
 - Paul Schlager provided a handout showing costs and net revenues under three scenarios of sugarbeet cultivation: conventional, Roundup Ready, and Roundup Ready with strip tillage. This handout is included as an attachment to these notes.

- Scenario 1 summarizes conventional practices with a 25 Ton/acre yield and \$21/acre revenue. Paul said that this low net return for conventionally raised beets is typical in today's market. When asked why he continues to raise beets with such a small margin of profit, his response was that net profits were higher just a few years ago before fertilizer prices increased dramatically (fertilizer cost is tied to the cost of petroleum). Labor prices also increased significantly in the last few years. They continued to raise beets because of their significant investment in equipment, beets work for their overall rotation, there is always the expectation that they will hit a higher than average yield and the promise of RR sugar beets on the horizon was hopeful.
 - Scenario 2 summarizes Roundup Ready practices, with 32 Tons/acre yield and \$433/ac net revenue. Seed costs are double, but herbicide costs are less than one-third. If the yield were assumed to be the same as conventional sugarbeets (25 T/ac), the profit would be \$118 per acre based on cost savings alone.
 - Scenario 3 summarizes Roundup Ready with strip tillage, with 28 Tons/acre yield and \$440/ac net revenue. Costs are lowest under this scenario due to elimination of disking, plowing, mulching and leveling. If the yield were assumed to be the same as conventional sugarbeets (25 T/ac), the profit would be \$215 per acre based on cost savings alone.
 - Hurdles in Boulder County: market, economics, technical ability, keeping same level of risk
 - Jules Van Thuyne, Jr.: Farmers take significant risks, and that's why they need the higher value crops. A model that would eliminate risk for farmers would be to put the farmers on the payroll with County, give them a paycheck. That would resolve the risk. Staff: That would also be very expensive for Boulder County. More than expensive it would eliminate the market incentive a private operator has when he works for himself.
 - Norm Dalstead: Multiplier for agriculture is 2.7. Staff: This says that the \$1.5 million revenue anticipated by the applicants leads to a \$4,050,000 revenues generated in the local economy.
4. What actions should Boulder County consider taking to support sustainable agriculture?
- Norm Dalstead: Alfalfa is the nearest thing to a sustainable agronomic crop, due to low inputs and labor. The markets are far away (mainly because of dairy markets).
 - POS staff: Alfalfa mentioned as a logical crop to use for transition into organic since it can start off with some convention practices (zero – 2 years into production) and finish as certified organic (up to 7 years of production). But where are the organic markets that would motivate a producer to do so? No answers given as to where these viable markets are for Boulder County producers. Yield losses due to alfalfa weevil damage still has to be dealt with.
 - Steven Hoffman: Tap into this resource: Organic Farming Research Association

Additional discussion:

Other GMO crop development:

- Phil Westra: coming down the road – drought tolerant corn, expected in 2012; corn that uses less nitrogen; crops that are frost tolerant

Weed seed contamination from irrigation water is a major constraint to organic production:

- Jules Van Thuyne, Jr. mentioned Eurasian Watermilfoil problem on Leggett ditch. Paul Schlager posed the question: What does treatment do to organic operations?
- Adrian Card: Representatives from Colorado Dept of Agriculture's Organic Certification Program have remarked that practices implemented off an organic producer's property boundaries beyond an organic producer's control will generally not compromise their certification status. Polyacrylimide (PAM) applications in irrigation ditches feeding organic farms were given as an example. Certifiers have the final say in any situation, but one can assume that if the inside of a ditch bank, emerged or submerged vegetation is treated with an herbicide labeled for use in that application and is done so upstream and off property of an organic operation and not by the organic producer that the PAM analogy would also hold true. Organic producers certify land and that land cannot have any synthetic herbicides applied to it.
- There are organic herbicide sprays derived from ingredients compliant with the National Organic Program (acetic acid, clove oil, etc.) The mode of action with these is to burn through the leaf cuticle of any plant and cause the contacted foliage to desiccate (dry out severely) and dieback. This may or may not kill the plant. These are non-selective and only impact plant tissues contacted and work best only on plants early in their vegetative growth and have limited impact on more mature plants. They do not translocate within the vascular system of the plant and do not have widespread impact on all plant tissues (i.e. they don't kill the root) and thus have very limited impact on biennial and perennial weeds.
- Impact of ammoniated nitrogen fertilizers on aquatic habitat? Runoff of nitrogen from fields leading to eutrophication of surface waters (algal blooms that deplete dissolved oxygen and lead to death of other aquatic organisms).
- Ditch companies and POS use weed/trash screens – this works well for low volume flows, but problems with large volume; water gets backed up. An irrigation company in south Boulder County has installed a large cleaner that is effective but very expensive. Norm Dalstead: No one is addressing urban pesticide use. Need to research alternatives.

Strip Tillage

- Strip till conserves water by leaving most of the residue of previous crop in place.
- Organic production currently can't use most conservation tillage methods. Organics must use mechanical weed control (tillage, hoeing, etc.); it's the primary weed control method available. Leads to higher water use since Tillage depletes soil moisture and destroys soil structure and organic matter that helps to store and hold water.

- Adrian Card: Questions remain about energy balance of different cropping systems. Emerging research may show that organic systems may not use less energy and may not create less Carbon footprint than convention systems that employ low input strategies such as strip tillage and herbicide resistant technologies.

ATTACHMENTS

- Paul Schlager's handout: Sugarbeet Costs and Revenues under Three Cultivation Scenarios
- Steven Hoffman's handout: Core Truths: Key Findings Behind the Benefits of Organic Food and Farming

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	CONVENTIONAL	ROUNDUP	ROUNDUP STRIP TILL
	PER ACRE	PER ACRE	PER ACRE
SHREDDING	\$12.00	\$12.00	
DISKING	\$13.00	\$13.00	
DISKING	\$13.00	\$13.00	
PLOWING	\$25.00	\$25.00	
MULCHING	\$15.00	\$15.00	
LEVELING	\$12.00	\$12.00	
LEVELING	\$12.00	\$12.00	
STRIP TILL			\$20.00
FERTILIZER	\$200.00	\$200.00	\$200.00
SEED	\$65.00	\$130.00	\$130.00
BEDDING	\$15.00	\$15.00	
PLANTING	\$15.00	\$15.00	\$15.00
NORTRON	\$30.00		
BETIMIX - STINGER - UPBEET	\$30.00		
PROGRESS - STINGER - UPBEET	\$30.00		
PROGRESS - STINGER - UPBEET	\$30.00		
ASSURE	\$15.00		
ROUNDUP		\$20.00	\$20.00
ROUNDUP		\$20.00	\$20.00
CULTIVATION	\$15.00		
CULTIVATION	\$15.00		
HAND LABOR	\$80.00		
DITCHING	\$10.00	\$10.00	\$10.00
IRRIGATION	\$100.00	\$100.00	\$100.00
SHREDDING	\$12.00		
DEFOLIATING	\$15.00	\$15.00	\$15.00
HARVEST	\$150.00	\$180.00	\$180.00
FREIGHT	\$125.00	\$150.00	\$150.00
OVERHEAD	\$50.00	\$50.00	\$50.00
TOTAL EXPENSES	\$1,104.00	\$1,007.00	\$910.00
	25 TONS @ \$45.00	32 TONS @ \$45.00	28 TONS @ \$45.00
	\$1,125.00	\$1,440.00	\$1,350.00
NET	\$21.00	\$433.00	\$440.00

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From Steven Hoffman, 6/12/09, Roundtable

Core Truths: Key Findings Behind the Benefits of Organic Food and Farming

Compiled by The Organic Center, June 2009, www.organic-center.org

Organic Food and Nutrition

- Average levels of 11 nutrients are 25% higher in organic foods compared to conventional foods, based on 236 scientifically valid comparisons. *Source: New Evidence Supports the Nutritional Superiority of Organic Plant-based Foods, C. Benbrook, et. al., The Organic Center State of Science Review, March 2008.*
- Organic fruits and vegetables are approximately 30% higher in antioxidants than conventional. *Source: Elevating Antioxidant Levels in Food through Organic Farming and Food Processing, C Benbrook, The Organic Center State of Science Review, January, 2005.*
- Increasing crop yields and animal production levels has often been achieved at the expense of food nutritional quality, the environment, and in some cases, food safety and animal health. *Source: Still No Free Lunch: Nutrient Levels in U.S. Food Supply Eroded by Pursuit of High Yields, The Organic Center Critical Issue Report, September 2007.*

Organic Food and Taste

- Organic produce is often judged tastier...than conventional produce. Organic apples store better and are tastier than conventional apples. Better taste is likely the result of reduced nitrogen levels and higher antioxidant levels. *Source: Do Organic Fruits and Vegetables Taste Better than Conventional Fruits and Vegetables, R. Theuer, The Organic Center State of Science Review, December 2006.*

Organic Food and Children's Nutrition

- Organic milk and meat enhances the nutritional quality of breast milk—up to 36% higher levels of the heart-healthy essential fatty acid CLA (conjugated linoleic acid), due to greater reliance on pasture and forage grasses in organic dairy and meat production, *Source: Influence of organic diet on the amount of conjugated linoleic acids in breast milk of lactating women in the Netherlands, L. Rist, et. al., British Journal of Nutrition, April 2007.*
- Children consuming predominantly organic dairy products (> 90% organic) in the first two years of life had more than a 30% lower risk of eczema. *Source: Consumption of organic foods and risk of atopic disease during the first 2 years of life in the Netherlands; I. Kummeling, et. al., British Journal of Nutrition, August 2007.*

Can Organic Agriculture Feed the World?

- In developed countries, organic systems produce 92% of the yield produced by conventional agriculture. However, in developing countries organic systems produce 80% more than conventional farms and could increase food security. *Source: Organic Agriculture and the Global Food Supply, Ivette Perfecto, et. al., University of Michigan, Renewable Agriculture and Food Systems, July 2007.*
- Organic agriculture has the potential to secure a global food supply, just as conventional agriculture today, but with reduced environmental impacts." *Source: Organic Agriculture and Food Security, United Nations Food and Agriculture Organization, May 2007.*

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- Organic agriculture can be more conducive to food security in Africa than most conventional production systems, and it is more likely to be sustainable in the long term. Furthermore, evidence shows that organic agriculture can build up natural resources, strengthen communities and improve human capacity, thus improving food security by addressing many different causal factors simultaneously. *Source: Organic Agriculture and Food Security in Africa, United Nations Conference on Trade and Development and United Nations Environment Programme, Capacity Building Task Force on Trade, Environment and Development, October 2008.*

Pesticides and Children's Health

- The average child in America is exposed to 10 to 13 pesticides daily in their food and drinking water. Switching to an organic diet for just five days virtually eliminates any sign of exposure to organophosphate insecticides among school-age children. *Source: Successes and Lost Opportunities to Reduce Children's Exposure to Pesticides Since the Mid-1990s, A. Greene, et. al., The Organic Center Critical Issue Report, August 2006; Dr. Charles Benbrook updated data, 2009.*
- Scientists from Spain report that children born to mothers with higher levels of the pesticide hexachlorobenzene (HCB) in cord blood were significantly more likely to be overweight and obese by the age of six. These results add to growing evidence that fetal exposure to contaminants can interfere with hormonal mechanisms that control weight later in life, thereby contributing to the worldwide epidemic of metabolic disorder. *Source: Smink A, Ribas-Fito N, Garcia R, Torrent M, Mendez MA, Grimalt JO, Sunyer J., Exposure to hexachlorobenzene during pregnancy increases the risk of overweight in children aged 6 years, Acta Paediatrica, October 2008.*
- Researchers at two major laboratories found an average of 200 industrial chemicals and pollutants in umbilical cord blood from 10 babies born in August and September of 2004 in U.S. hospitals. The umbilical cord blood of these 10 children harbored pesticides, consumer product ingredients, and wastes from burning coal, gasoline and garbage. *Source: Body Burden - the Pollution in Newborns, The Environmental Working Group, July 14, 2005.*
- Mercer Island Children's Study: The urine and saliva of 21 school-age children, ages 3-11, tested positive for residues of organophosphate insecticides, including malathion and chlorpyrifos. Within 8 to 36 hours of switching to an organic diet, no residues were detected. A distinct peak was noted in winter months due to imported fruits and vegetables. *Source: Dietary Intake and Its Contribution to Longitudinal Organophosphorus Pesticide Exposure in Urban/Suburban Children, C. Lu, et. al., Environmental Health Perspectives, Vol. 116, No. 4, April 2008.*
- "The transformation is extremely rapid...Once you switch from conventional food to organic, the pesticides...in the urine disappear. The level returns immediately when you go back to the conventional diets." – Mercer Island Children's Study lead author Dr. Alex (Chengsheng) Lu. *Source: Seattle Post Intelligencer, January 30, 2008.*
- Children born to mothers who lived near fields treated with pesticides are six-fold more likely to be inflicted with autism. *Source: Maternal Residence Near Agricultural Pesticide Applications and Autism Spectrum Disorders among Children in the California Central Valley, E. Roberts, et. al., Environmental Health Perspectives, October 2007.*
- A nationwide study found elevated risk for several types of childhood cancer for children living near fields treated with pesticides." *Source: Risk of Childhood Cancers Associated with Residence in Agriculturally Intense Areas in the United States, S. Carozza, et. al., Environmental Health Perspectives, April 2008.*
- The World Health Organization reported that the impacts of prenatal and early-life exposure to pesticides are among the most significant factors for cancer, birth defects and neurological problems. *Source: World Health Organization, 2006.*
- A team of researchers in Korea have shown that chronic, low-level exposures to atrazine—the second most heavily used herbicide in the U.S.—in rats can lead to insulin resistance, obesity and

heightened risk of diabetes. *Source: Chronic Exposure to the Herbicide Atrazine Causes Mitochondrial Dysfunction and Insulin Resistance, Soo Lim, et. al., Plos One Journal, April 2009.*

- Organic food and farming can help slow and potentially reverse the rising incidence of overweight, obesity and diabetes through mechanisms that include promoting healthy patterns of cell division and differentiation and laying the groundwork for healthy endocrine, immune system and other metabolic development; by establishing taste-based preferences in children for nutrient-dense, flavorful foods; and by largely eliminating exposure to approximately 180 pesticides known to disrupt the development or functioning of the endocrine system. *Source: That First Step, The Organic Center Critical Issue Report, C. McCullum-Gomez, C. Benbrook, R. Theuer, March 2009.*

Pesticides and Animal Health

- According to the NOAA Fisheries Service, the pesticides malathion, diazinon and chlorpyrifos jeopardize the survival of all 28 species of Pacific salmon listed as threatened or endangered in the West. The chemicals, found by the U.S. Geological Survey to contaminate rivers throughout the West, interfere with salmon's sense of smell, and at higher concentrations kill the fish outright. *Source: National Oceanic Atmospheric Administration National Fisheries Service, November 2008.*
- Researchers at the University of Pittsburgh discovered that when 10 of the world's most commonly used pesticides combine, as they regularly do in the environment, the chemicals caused a 99% mortality in leopard frogs. The study concluded that wetland communities could be dramatically impacted by low concentrations of pesticides (both separate and combined). *Source: R. Relyea, A cocktail of contaminants: How mixtures of pesticides at low concentrations affect aquatic communities, Oecologia, November 2008.*

GMOs in Food and Agriculture

- A team of scientists has found that exposure to the Cry 1 Ab endotoxin in Bt corn can alter the learning behavior of bees, as they associate odors with nectar sources. Researchers are speculating that Bt toxins in GM-corn are having some subtle effect on Colony Collapse Disorder, perhaps in conjunction with the nicotinyl insecticides used as corn seed treatments. *Source: R. Ramirez-Romeo, et. al., Does Cry 1 Ab protein affect learning performance of the honeybee Apis mellifera L., Ecotoxicology and Environmental Safety, Vol. 70: 327-333.*
- Research by a team of scientists in Mexico has again found transgenes from *Bt* corn in local varieties of maize in Mexico. The first paper reporting the presence of transgenes in traditional varieties of Mexican corn was published in *Nature* in 2001. *Source: Modified Genes Spread to Local Maize, NatureNews, November 12, 2008.*
- According to results from a long-term feeding study with mice, researchers in Austria concluded that consumption of a genetically modified corn developed by Monsanto (NK603 x MON810) may lead to lower fertility and body weight and impaired gene expression. The study has not yet been peer-reviewed but was released on Nov. 11, 2008, by the Austrian Ministry of Health, Family and Youth. *Source: Austrian Ministry of Health, Family and Youth.*
- Italian researchers found significant disturbances in the immune system of young and old mice fed GM maize (MON810), and elevated levels of a cell type known to be associated with asthma and food allergies in children. *Source: Finamore A., et. al., "Intestinal and peripheral immune response to MON810 maize ingestion in weaning and old mice," Journal of Food and Agricultural Chemistry, November 16, 2008.*
- The American Academy of Environmental Medicine, an international physicians organization, in May 2009 called for a moratorium on genetically modified (GM) foods, stating: "Avoid GM foods when possible... Several animal studies indicate serious health risks associated with GM food... There is more than a casual association between GM foods and adverse health effects. There is causation... The strength of association and consistency between GM foods and disease is confirmed in several animal studies." *Source: Genetically Modified Foods, American Academy of Environmental Medicine Position Paper, May 8, 2009.*

Animal Cloning in Food and Agriculture

- Animals involved in cloning may suffer pain and ill health linked to miscarriages, organ defects and gigantism. ...It is clear there are significant animal health and welfare issues for surrogate mothers and clones that can be more frequent and severe than for conventionally bred animals. ...It should be investigated whether consumption of meat and milk derived from clones or their offspring may lead to increased exposure to transmissible agents. *Source: European Food Safety Authority Report to the European Union, July 2008.*
- Milk and meat from the offspring of cloned livestock are entering the U.S. food supply. The number of clones is on the rise... *Source: Wall Street Journal, Sept. 1, 2008.*
- Animal cloning is not allowed in organic production under the National Organic Program (NOP) because cloning uses cell fusion, a genetic engineering technique that is considered to "narrow the gene base," while organic production relies on maintenance of a broad and diverse gene pool to better resist disease and adapt to environmental changes. Also, artificial hormones, prohibited in organic production, are used to induce labor in surrogate clone "dams." *Source: Is the FDA's Cloning Proposal Ready for Prime Time?, The Organic Center Critical Issue Report, February 2007.*

Soil, Water, Energy, Yield and Global Climate Change

- In good weather, yields for organic and conventional corn and soybeans are comparable; in drought, organic soils are 28 - 70% higher in production than conventional soils. *Source: Rodale Institute, based on 28-year field trials, www.rodaleinstitute.org.*
- Organic corn production requires 30% less energy per bushel harvested, compared to conventional chemical farming. *Source: Impacts of Organic Farming on the Efficiency of Energy Use in Agriculture, The Organic Center, August 2006.*
- 40% of all energy used in conventional corn & soybean production comes from the use of ammoniated fertilizer for corn. Using a winter cover crop, such as hairy vetch, can eliminate its use. *Source: Rodale Institute, based on 28-year field trials, www.rodaleinstitute.org.*
- Organically farmed soil is higher in rich, carbon-based organic matter; more carbon held in soil that would otherwise be released into air. *Source: Assessing Soil Quality in Organic Agriculture, The Organic Center, October 2006.*
- Organic matter cements soil particles into larger groups, increasing percolation and decreasing runoff; there is 25 - 50% more H₂O infiltration in organic soils. Also, organic soils tie up more carbon in the soil. For every pound of carbon increased in the soil you can add up to 40 lbs. of additional H₂O retention; can increase water-holding capacity of the soil by up to 40,000 lbs per year. *Source: Rodale Institute, based on 28-year field trials, www.rodaleinstitute.org.*

About The Organic Center

The Organic Center is a national nonprofit research and education organization dedicated to advancing scientific research behind the health and environmental benefits of organic food and farming. The Center works with leading universities and researchers throughout the world to compile credible information to help educate consumers, media, businesses, policy makers and others about the proven benefits of organic to human health and animal health, in helping prevent global warming, and in conserving the environment. Visit www.organic-center.org, tel 303.499.1840, info@organic-center.org.

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- View our new six-minute educational video at www.youtube.com/theorganiccenter.
- Download a free copy of our latest report: "That First Step – Organic Food and a Healthier Future."