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# Zumwalt Acres: An Intersection of Farming, Faith, and Applied Science through Youth-Led Agroforestry in Central Illinois

GLBW Case Study by Anne Queenan and Linda Meschke

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This last year and a half, the pandemic has forced many of us to take a full-stop, and re-evaluate what really matters in life. Gavi and Remi Welbel, 21-year-old twin sisters, took pause when they learned their plans for resuming undergraduate classes were limited to online learning. For Gavi, this meant a break from studying mechanical engineering and earth plant science at



Planting 1 of 2,000 trees! Credit: Gavi Welbel

Yale University. For Remi, it was neuroscience and dance at Middlebury College. After recalibrating and doing quite a bit of research, they forged a different path. **Honoring their family, their roots in Judaism, and their desire to work towards a more regenerative agriculture, agroforestry plans were initiated to restore the soil and draw down carbon on the sixth generation family farm – one that had been growing corn and soybeans for more than six decades.**

This is known today as Zumwalt Acres, a new agroforestry farm community and demonstration site in partnership with the regional Savanna Institute and Chicago-based Delta Institute. Gavi and Remi moved an hour and a half south of their home in Chicago to the family farm in Sheldon, Illinois, to begin the transition to agroforestry. Prior to moving, they succeeded in securing some supportive grants. Apprenticeships were established attracting young peers with similar interests and Jewish values, who joined them and helped build a sense of community. Eight to ten competent apprentices were recruited to rotate with each season addressing a variety of organized tasks. These are pioneers of a youth-led initiative to make farming what they want it to be.



As the next generation of farmers, Gavi and Remi will help their father, J.R. Zumwalt, bring his long-held dream to life. For years, he watched his family's farm transition from a small-scale diversified farm to industrialized monoculture agriculture. Hoping to return it to its perennial roots, he wrote to his father forty years ago, **"We could create a system of agriculture that would lay the groundwork for generations; a system that would breathe life and health back into this ground."**

As second-generation maternal descendants of holocaust survivors, Gavi and Remi have learned from their grandparents how to react to adversity with hope. Their mother has also modeled strength and perseverance throughout the COVID-19 crisis as the director of the infectious unit in Chicago's largest public hospital, John H. Stroger, Jr. Hospital of Cook County. These family members have instilled a sense of empowerment and determination in Gavi and Remi to do something about the crisis they both are deeply concerned about, the growing grip of climate change. Their Jewish faith is held close to their hearts and identity. Several Jewish agrarian practices and philosophies are interwoven throughout their efforts.

## Agroforestry

What does an agroforestry system look like on Zumwalt Acres? First, an explanation of agroforestry. Agroforestry is a land management approach that integrates trees and shrubs with plant and animal farm operations. There are generally five types: silvopasture, alley cropping, forest farming, windbreaks, and riparian forest buffers. Each practice positions a strategic portion of the area of an agricultural system into tree cover which brings great conservation benefits and increased productivity of other crops in the system. Tree crops have a high potential to store carbon in the biomass of their roots, trunks, and branches. This provides easily assured carbon sequestration. Agroforestry has been described as one of the top ten natural climate solutions. The Midwest, in particular, is targeted as the primary region for its adoption.

## Alley Cropping and Shelterbelts

On twenty acres of the Zumwalt Acres farm, alley cropping is the primary method of agroforestry. This is the planting of rows of trees and/or shrubs to create alleys within which agricultural or horticultural crops are produced. When planted as they are doing at Zumwalt Acres, the trees and shrubs become a shelterbelt, which can be used to break the wind, protect against soil erosion and protect the nearby crops. Shelterbelts date back to 1934, when they were introduced just after the Dust Bowl. The concept is to plant the tallest tree in the center row, with decreasing height of other trees or shrubs in subsequent rows expanding out from the center. Depending on the heights, closeness of the rows and positions of the plants in between each other, the direction of the wind arcs upwards, interceding the intensity and damage potential of straight-line winds. The Natural Resources Conservation Service (NRCS) supports shelterbelts and staff worked with Zumwalt Acres to enroll their shelterbelt in the Conservation Reserve Program (CRP), but that has not yet been realized.

Shelterbelts can also be used as a new means of harvest and revenue in the future with specialty nuts and fruits. At Zumwalt Acres, the shelterbelts consist of five new rows of pine, arborvitae, hazelnuts, pawpaw, and pecans. In the alleys, between the rows of the shelterbelts, they are in the process of planting and growing additional tree crops including chestnuts, pawpaw, hazelnut, serviceberry, and small grains. Serviceberry, also called Juneberry, is a small tree, or large shrub, from the apple family, native to the Midwest. Beautiful white



blossoms in the spring bear an edible fruit, purplish red berries, followed by a colorful display of leaves in the fall.

Part of the alley, approximately twelve acres, is being converted to organic hay, to prepare for future alley-crops. And in addition, they are making plans with the NRCS and their partners and fiscal agents, Delta Institute and Savanna Institute, to develop a pollinator planting or a riparian buffer on the Iroquois River near the farm.

## Food and Vegetables

As one reads the daily farm journal entries, written and posted by Remi, descriptions of mouth-watering meals whet one's appetite for home-cooking on the farm. Aromas and images resonate of whipped sweet potatoes, spaghetti squash, Kasha Varnishkes, spinach palak paneer, fried squash blossoms stuffed with mushrooms, blueberry compote, Challah bread, yellow curry, and lentil soups. The end of long work days culminate in team-prepared and shared meals that reawaken one's awareness of culinary possibilities from the garden, particularly during the weekly observance of Shabat, when there is more time for preparing a feast on a day of rest. One half acre is dedicated to vegetable production at Zumwalt Acres, where a great deal of planning, cultivating, and weeding happens in order to keep the diverse harvests, more than 90 varieties, abundant throughout the seasons.



*Apprentices consider a riparian buffer along the Iroquois River - Credit: Claire Ivey*

In addition to feeding the apprentices, the vegetables are also sold at farmer's markets. **New channels of marketing are being explored as production ramps up for distributing their harvest through a farmer's co-op and food hub in Central Illinois, Down at the Farms.** Through this service, Zumwalt Acres joins an estimated 60 farms in Central Illinois for marketing and delivery to chefs, grocers, individuals, and institutions. The farm retains its identity and has its products showcased to a larger audience that includes Chicago and downstate restaurants. Their first buyer was a popular Chicago venue, Kopi Café, who purchased a large order of their romaine lettuce.





Preparing the beds - Credit: Remi Welbel

In the Jewish faith, when it comes to harvesting, there are several tenets that have been traditionally honored to assure that food is left for the less fortunate and poor. One is referenced on Zumwalt Acres' social media. **“Leket” in Hebrew means collect. “It commands that ears of grain that fall to the ground be left in the field to make food accessible to those who wouldn’t have it otherwise.”** A portion of the vegetables and food grown at Zumwalt Acres always goes to various food shelves and food banks in the area, in observance of these values.

## Five Acres of a Food Forest

As this farm’s agroforestry plans come into fruition, food will not only be sourced from the vegetable garden and trees in the alley crops and shelterbelts. Five acres of an existing forested area on the farm are under transition to become a food forest, another agroforestry practice. Currently, the NRCS does not fund food forests unless the land is being converted from program crops like corn and soybeans. Expert guidance from the Savanna Institute, however, has helped put these plans into motion, which will

later be demonstrated so others can learn as well. **Initiatives underway are the planting of peach, apple, fig and other fruit trees within the forest. In addition, mushrooms are being cultivated. An added spot provides for the inoculation of oak logs with mushroom spawn for Oyster, Shitake, as well as native Morel mushrooms.** Additional plans include developing an apiary, or bee farm, to produce honey and wax, and ginseng, as a medicinal plant grown in the forest.

## Carbon Draw Down from Biochar and Increase in Soil Health

For a carbon draw down impact at Zumwalt Acres, 2,000 trees will have been planted by the end of this growing season. That’s just the start of it. **Gavi is applying her studies at the Earth and Planetary Science Department at Yale with on-farm field research on the use of biochar.** She received a three-year Sustainable Agriculture Research and Education (SARE) grant to study biochar use and tree health.

Biochar is a charcoal-like substance that’s made by burning organic material from agricultural and forestry wastes (also called biomass) in a controlled process called pyrolysis. It differs from common charcoal in that it is produced using a specific process to reduce contamination and safely store carbon. At Zumwalt Acres, deadfalls in the forest and farm are converted to biochar through the use of a low-cost, small-scale biochar kiln. Their kiln is a model called Kon-Tiki. It burns their organic material in an anoxic environment, meaning, without oxygen, capturing the carbon dioxide and converting it to a stable, solid form for thousands of years. The biochar is mixed with soils in the field for crop production of any type.



Biochar is being studied as an amendment that may increase the rate of carbon sequestration. The apprentices at Zumwalt Acres are learning how to measure the carbon captured through using research methods, like fluxing. Biochar also may increase soil productivity. The resulting enhancement of plant growth could in turn absorb more carbon dioxide. According to the NRCS, biochar helps reduce bulk density, runoff, soil loss, and the leaching of nitrogen. It also increases porosity, infiltration, and improves the soil's ability to resist rainfall impact, water and wind erosion.

Recent updates from the Zumwalt Acres team report producing 3,200 litres of biochar. They have collected and analyzed over 100 soil and 30 biochar samples. The team will also share their findings through webinars and publications. They presented their research at Savanna Institute's 2020 Perennial Farm Gathering, a conference with over 400 attendees.



*Zumwalt Acres research with biochar - Credit: Samm Kaiser*

## **Basalt Research for Soil and Crop Benefits**

Additionally, as part of her work at Yale University, Gavi Welbel is conducting research on enhanced rock weathering (basalt) and its effect on increasing soil fertility and crop yields. Basalt 'dust' is available from basalt mines and acts similar to lime in soils. **Applying this crushed silicate rock speeds up a naturally-occurring chemical process known as weathering.** Basalt rock has been shown to improve soil quality, increase crop yield, decrease the need for other soil amendments, and mitigate climate change. Much more research, however, is needed. The basalt used in research at Zumwalt Acres is sourced from mines in Massachusetts and Vermont.

## **Wider Application of Research**

Gavi and the team at Zumwalt Acres hope to meet the need for field-based trials to verify model-based predictions and to demonstrate to farmers how and why climate-smart practices should be implemented. Through this work, Zumwalt Acres' team hopes to model regenerative agriculture that is scalable across the Midwest and beyond.



## NRCS and Conservation Stewardship Program (CSP)

In addition to the alley cropping and shelterbelt efforts with the NRCS, the team at Zumwalt Acres is considering applying to the Conservation Stewardship Program (CSP) since they have several practices in place that minimize resource concerns on their farm. This NRCS program offers an annual payment on all acres of the farm based on conservation practices already in place. It also provides an opportunity to do additional practices and demonstrate initiatives, like the ones underway with basalt and biochar research.

## Partners and Networks

Additional partners with Zumwalt Acres include the Illinois Stewardship Alliance, Chicago Environmental Educators, and the Jewish Farmers Network.

## Productivity Followed by Rest

Mornings, afternoons, and evenings are very full and rich at Zumwalt Acres. Their network and bonds grow as they continue to innovate and find fulfillment in their work on the farm. This is described beautifully by Remi.

“Digging into the ground and rapidly growing dreams into reality, I could feel a renewed sense of hope rushing through me. I felt the agrarian roots of Judaism connecting me to the land and environment in ways I have never experienced before. The deeply instilled Jewish value of tikkun olam, repairing the world, felt visceral as I planted apple trees, burned biochar, and built an organization dedicated to revitalizing agriculture in the Midwest. Through our tireless efforts, it felt like we could seed hope, uproot broken systems, and grow meaningful change.” – Remi Welbel

Down the road, when it is time to observe another important Jewish imperative called Shmita, there will be time for another full-stop, rest, and reassessment. We look forward to learning what comes after that.

### Shmita

Shmita is the Jewish imperative to let the land rest every seventh year by leaving it fallow. The shmita year is like the sabbath of the earth.

“ ‘The land,’ says G-d, ‘is Mine; you are but strangers with Me.’  
We are guests on Earth.”

Leviticus 25:23



## Authors

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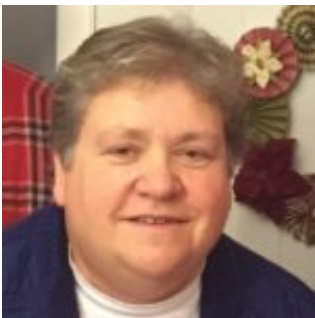


Anne Queenan writes and produces stories that inform and engage on subjects interweaving land stewardship, agriculture, science, clean water, and collaborative communities. She brings to life sweet spots of hope and curiosity with real life scenarios sharpened through her expertise in public broadcasting and communications. Her social work training amplifies the human voice and points to interconnections where systemic change can happen. She has written, produced and developed documentary short videos, articles and communications strategy for foundations,

environmental nonprofits, state agencies, educational institutions, and soil and water conservation districts. She has also co-lead and organized steering and advisory committees for co-creative outreach efforts in water quality with diverse partners. Queenan is also a photographer, videographer and drone operator. She and her dog, Coda, live on the Mississippi River in the Driftless Area where she enjoys paddling, birding and hiking through the Bluffs.

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Linda Meschke has over 35 years of experience in working on agricultural and water resource issues in south central Minnesota. Her work has been focused on projects that improve rural communities and the implementation of a variety of conservation practices and getting changes on the landscape to improve water quality. She is currently working on landscape diversification of the intense corn and soybean region in south central Minnesota to integrate more perennials and 3rd Crops and to develop agriculture-related entrepreneurial enterprises.

Green Lands Blue Waters and partners are conducting essential research, improving the genetics of old and new crops, translating knowledge into Continuous Living Cover farming systems, developing new extension and outreach capacity, working in farm fields, shaping policy, building profitable markets for new crops, and changing the narrative around what's possible through agriculture. The value of Continuous Living Cover farming comes in yields and profits, but also in improved soil health, cleaner water, new economic opportunities, diverse agricultural communities, more wildlife, reduced risk, and resiliency in the face of a changing climate.

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