

October - December 2019

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LETTER FROM THE EDITOR



Thank you for reading the October edition of WCIS magazine. The content in this fourth quarter is focused on technology in agribusiness. Agriculture has come a long way since the ox plow and drag harrow. These advancements often increase efficiency and yield, and even decrease carbon footprints. They help growers, shippers, and processors track their products and their money in new ways. But new technological advancements often come with skepticism. It is important to work with experts who truly understand the newest products to find what will be safe and effective for your needs, which is why this edition of WCIS is focused on technology in agribusiness.

In this issue, you will find information and resources regarding technological advancements in many aspects of agribusiness. Our experts will discuss issues from farm management software to alternative cooling, and from bitcoin to vertical farming in order to introduce you to emerging technologies and to help you make informed decisions for your business needs.

Our constant goal is to connect you to other professionals and experts in your industry. We hope that you stay connected to us through our website and social media channels, but you can also join us at our upcoming Safety & Maintenance Expo in Clovis, CA on October 22, 2019. We have speakers scheduled from 8:00 am until 3:00 pm, and 50+ vendors exhibiting from 9:00 am until 2:00 pm. Attendance is free, as are most of our speaker sessions. For an additional \$50, you can earn your certificate for Valley Fever, which that fulfills the regulatory requirement for AB 203, effective January 2020. We hope to see you there!

-Sheri McClure



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Emerging Agribusiness Technologies

Written by Sheri McClure



Good business leaders are always trying to do the best for their stakeholders, their employees, and their customers; but they don't always have the time to research new ways to make their businesses more efficient and sustainable. Luckily, talking to experts is what we do best. We want to share three emerging technologies that can help you streamline your agribusiness in remarkable and eco friendly new ways.

Vertical Farming

Traditional farms require mass quantities of acreage and are subject to issues like unseasonable weather, fallow land, and pests. With increasingly unpredictable weather, a growing aversion to pesticides, and an ever increasing population to feed, agricultural areas are feeling additional pressure. Vertical farms have become one way farmers can address these issues.

It may be helpful to think of vertical farming as the technologically-advanced urban cousin to traditional greenhouses. Of course, each company offers systems with different features, but the overall goal is to utilize vertical space in a safe, controlled environment that greatly lessens each farm's carbon footprint. Vertical farms can also be housed in old warehouses or other unused

buildings, which could help boost the economy of underutilized urban areas and bring fresh, local produce to these communities.

I spoke at length with Niko Kurumaa, the International Sales Manager for Netled (pronounced net led) about Vera, their closed vertical farming solution. Netled has its roots in tomato farming, but was developed as a daughter to their greenhouse business after 20 years in industry. Their primary crops are leafy greens, like basil and lettuce, and they are expanding into the cannabis industry. Netled were pioneers in LED grow lights back in 2007, and have continued to push the technology of indoor agriculture with Vera.

In general, vertical farms cut the farm's carbon footprint and transportation costs. They even allow farmers to utilize more layers of soil since most of the good soil has already been used. Vertical farms can also be housed in old buildings or even skyscrapers--urban spaces where traditional agriculture would not be possible on the same scale.

So what exactly is Vera and what prompted Netled's recent 11 million dollar contract with EU company Astwood Infrastructure? Niko began by



explaining Vera's automation benefits. "Vera uses 95% less water than traditional farming," he said. This decrease is primarily attributed to the water circulation system. The plants are watered, but when they give up additional moisture through natural processes, the AC system captures it, condenses it, and reuses it. The Netled engineering team has proven that Vera circulates 98% of the water used, which makes this type of farming more sustainable and aids in doubling average crop production. Recycling water in these closed environments also keeps chemicals out of the soil, which is helpful because the chemicals can affect future crops and contaminate drinking water.

But I believe Netled's success is about more than a great product. "We see ourselves as a technical partner, not just a technical supplier," Niko explained. The company has their own testing facility in Finland, where they are based.

(Although they are actively looking for partners in the US and an operator in Indiana.) Netled is constantly improving the product and will test their customer's crop in their own facilities to make sure everything is working optimally. In addition, Vera comes with a 10 year maintenance agreement, and their software connects all of the Netled farms globally to their tech. In other words, whether you're in Finland or California, their team can help ensure that your vertical farm is functional and efficient.

Management Software & Services

Agribusiness consists of a lot of moving parts. It is important to have reliable methods for tracking things like production, shipping, sales, and compliance. There are companies like AgriCare, located in the Central Valley, that manage some or all of these aspects for businesses. But there is

also a growing list of vertical software technology that you can manage with or without additional support to keep your business organized.

One of these resources is Chasqui (pronounced cha-ski), a platform managed by Ciclo. I met Oscar Aguilera, Co-Founder and VP of growth at Ciclo, at the NCIA's Cannabis Business Summit and Expo in July 2019. I was impressed by their services, and was even more excited to learn that their product can be customized for any type of agribusiness.

Ciclo places a huge emphasis on meeting their customers' needs. In the legal cannabis industry, there is an enormous need to remain compliant despite everchanging and dense guidelines. Their platform, Chasqui, helps to keep growers and distributors compliant. But the software can also be customized for more traditional crops and their agricultural needs.

For customers who would like additional support, Ciclo is there to provide managed services for Chasqui customers. You can use the software straight out of the box, but Ciclo wants to ensure that your and your businesses needs are reflected in your software customization and support. They begin by speaking with new customers over the phone. Their representatives want to understand your business, including its challenges, workflow, and processes, so you can customize the software to work best for you. This preliminary call is followed by hands on and face-to-face site visits, so you can feel comfortable with the product and its uses. They even have representatives who are fluent in both English and Spanish, so everyone involved in your business can have their voice heard.

Management software like Chasqui makes it easier to keep tabs on all aspects of your business from anywhere at any time. It is important to find the best product for your business needs, but finding one that marries customized software and face-to-face customer service sounds like a promising start.

Alternative Energy

Notice that this section is not called Solar Energy. Solar can be a great way to go, and there are great companies like Sunworks Solar Power in Roseville, Wildwood Pools and Solar in Fresno, and SPURR in Concord. But these days everyone knows at least something about solar energy. What you may not know is that you can take solar on or off the grid. The companies listed above can help customers learn to bank their own solar energy and use it when they need it most instead of selling it back to large energy corporations. And Dr. Micro Grid consultants can help you get off the grid entirely. But solar is not the only option.

We met the Executive Vice President and Senior Account Manager of Ice Energy at the Southern California Facilities Expo back in May, and we were fascinated by their innovative solution to the high cost of cooling commercial spaces. Instead of using a conventional HVAC unit, use ice. In many ways, their Ice Bear and Thermal Bear thermal storage AC units are the opposite of solar energy. When ambient temperatures and energy costs are lower, these units make ice. When temperatures and energy costs are higher, they use these huge chunks of ice to cool the coils that in turn cool your space.

If you are currently envisioning a large block of ice in a big bucket a la Looney Toons, think again. These are slick, HVAC sized units that easily replace traditional units. Ice Energy claims their customers can save up to 40% on their overall energy costs, and up to 95% on their peak energy usage. They also have a pretty impressive list of big name customers in agriculture, retail, and industrial, including New Belgium Brewery, Staples, AT&T, Lithia Chevrolet, and Panda Express.

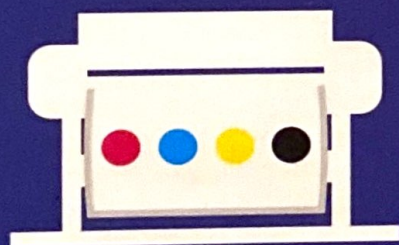
Each business is unique and requires different supporting services. We love speaking with experts about what they do, what they offer, and what they know. And we are always happy to pass along that information to our readers. Hopefully some of these new innovations piqued your professional interest and will help you learn new ways to run your business more efficiently and sustainably.

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COMPANY PROFILE



Martin McCann

Martin McCann is passionate about retirement. During his 25 years as a financial planner, he has seen clients, friends, and family members experience their golden years in very different ways. The people who plan their retirements in advance tend to enjoy active, fulfilling post-career lives. Those who did not take the time to plan end up struggling financially, and fearing overpriced long term care expenses. Martin realized how important it is to help others successfully invest for their futures, which is why his professional goal is to deliver long term guaranteed streams of retirement income for all of his clients.

Martin began his financial planning career in Lodi, California in 1994. Only nine months into his career at American Express (previously IDS Financial Services and currently Ameriprise Advisors), he was promoted to Training Manager and relocated to Fresno, California where he continued to excel in the industry. Martin was promoted again only three years into his career, but this time to Field Vice President. Shortly thereafter, Martin transitioned to Prudential, where he was ranked the #1 manager in the world.

Full disclosure, I have known Martin professionally and personally since his time with Prudential. I have always considered him kind and very knowledgeable about his industry, but I did not realize how accomplished he was until we spoke for this article. I worked with Martin towards the beginning of his 18 year career with One America, where he accumulated most of his certifications: LUTC, Chartered Financial Consultant,

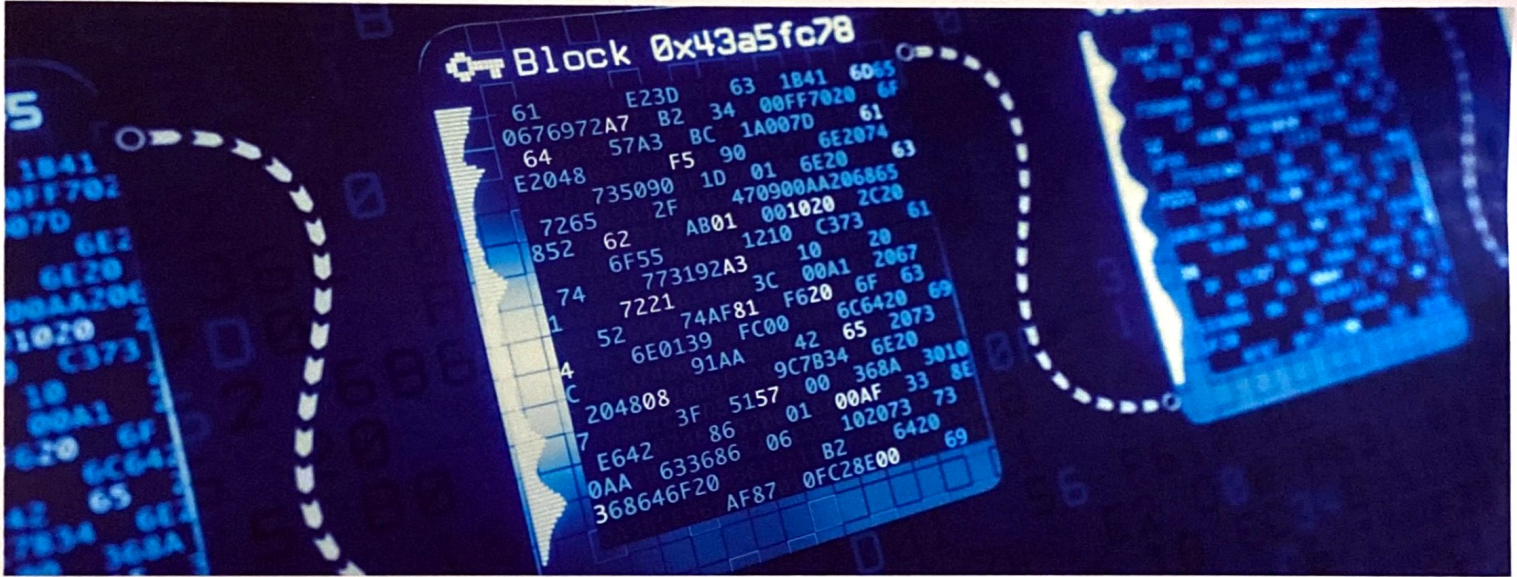
and Certified Financial Planner, to name a few. His clients always spoke well of him, and I have entrusted him with some of my own retirement needs.

In November, 2018 Martin founded McCann Asset Management, where he is currently the president and an acting financial advisor. He attributes his passion for retirement to his personal and professional experiences with the stock market crashes in the first decade of this century. The kind of instability he witnessed made him want to help others find long term financial security for themselves and their loved ones. Martin helps his clients determine how much money they need in order to support their lifestyle and long term care needs for themselves, their relatives, and their dependants after retirement.

McCann Asset Management specializes in small businesses, ideally between 10 and 300 employees, although they will happily serve businesses of any size. The goal is to help employees plan for their retirement while also protecting the business owner from retirement lawsuits. Martin developed his own retirement software to best assess retirement needs and guarantee them for life. He understands the complexities of providing these services for his clients and your employees, and he has success in defending employer's rights. Martin was recently an expert witness regarding 401ks and won 21/21 accusations in the class action lawsuit. This success got Martin featured in various law journals throughout the country.

Get Ready: Blockchain Will Transform the Legal Industry

Written by Andries Verschelden and Terri Oppelt
Originally published on armanino.com 13 June, 2019



What if someone told you that a new technology would significantly impact every law firm within the next 10 years—and would influence how your firm gets paid, the types of services it offers, and everything in between?

Consider this a wake-up call for a future that looks very different than today, thanks to the technology called blockchain. While still a nascent trend, blockchain is already proving to be a transformational force, changing how people and businesses around the world transact with each other by enhancing the trust, accountability, efficiency, and effectiveness of those transactions.

Don't assume that blockchain is only for cryptocurrency enthusiasts and specialists. It's poised to make rapid inroads into all types of industries across many different use cases beyond cryptocurrency. As such, clients will need expertise and guidance for the proper legal frameworks for using blockchain. Law firms that don't want to get left behind need to pay attention, and start gaining experience and planning their blockchain strategies now.

Defining blockchain simply

Let's start with what blockchain is not. It is not software that you can buy from a vendor nor is it "owned" by any one company. No one group or country controls it, and anyone, anywhere in the world can use it. While these characteristics can make blockchain seem complex and nebulous, when you think about it, the Internet has the very same characteristics. We don't have to understand the technical details of the Internet to know it has tremendous impact on our lives and livelihoods.

So, what is blockchain? It's open source technology that enables the creation and management of a global, autonomous network where information is secured in an immutable and transparent ledger. There are already thousands of networks in use, both publicly and privately. What's special about a blockchain network is that it gives everyone who uses it access to the same information in a way that ensures the information can be trusted.

Changing the legal industry

Because it's somewhat early days in the blockchain evolution, innovators are still identifying all the ways it can be used. Perhaps the most common application right now is for peer-to-peer transactions that transfer digital value between two parties in a trusted way without a third party involved.

However, blockchain is also being envisioned and tested to make supply chains more efficient, give artists greater control over digital ownership rights, streamline real estate transactions, manage Internet of Things networks and much more.

Because it changes the way people and businesses transact and communicate with each other, blockchain will begin to impact and evolve the way legal services such as contracts, escrow account management, transactions and much more are handled. Here are some ways blockchain is already poised to reshape how law firms work:

- **Smart contracts:** Instead of being traditional, static documents (whether digital or paper-based), contracts will evolve to be programmatic components of a blockchain network, where the terms and conditions of the contract are automatically applied.
- **Automated securities settlement:** Many of the routine change of ownership transactions handled today by law firms will be automated within blockchain networks in the future, such as transferring real estate or ownership shares in a business. Compliance and restrictions all happen automatically, as they are built into the blockchain protocol code.
- **Payments via digital assets:** As clients adapt digital assets such as cryptocurrency, it will be increasingly important to be able to accept these types of payments.
- **Escrow accounts:** Smart contracts can automatically release funds into a digital wallet at the completion of some pre-determined criteria, eliminating the need for escrow accounts in many transactions.

Establishing an essential role in the blockchain evolution

For forward-thinking law firms that have embraced the changes on the horizon with blockchain, it's already opening up new practice areas and service opportunities, which can eventually replace those that will shrink and go away. Sharp legal minds are required right now to help organizations understand the appropriate legal framework for using various blockchain networks for different use cases. There is much to do to move from physical assets to digital ones, and the legal industry must be a vital part of the effort.

Lawyers who understand the concept of smart contracts will be in high demand as more businesses begin moving to blockchain. By combining understanding of how blockchain networks function with deep legal knowledge, firms can create blockchain practices that provide legal guidance to organizations of all kinds as they both create and participate in blockchain networks.

Taking the first step

As the world evolves towards transferring assets and information digitally using blockchain, your firm must be ready to both adopt blockchain and provide legal counsel on how your clients can adopt it as well. One way to ease into the world of blockchain is to begin accepting digital assets as payment for legal services rendered. Unless you already have blockchain expertise on staff, turning to a trusted service provider can expedite your implementation while helping your firm avoid missteps.

In any case, you need to begin understanding blockchain now. If clients aren't already asking about it, they will be soon, which means you need to start establishing blockchain expertise before your competitors beat you to it.

Economics of legalising cannabis - pricing and policing are crucial



Written by Alice Mesnard

Reader in Economics, University of London

Originally published in *The Conversation* 29 July, 2019

Legalising cannabis can have major benefits for all citizens. If carried out correctly, everyone will benefit from less crime and stronger rule of law. Legalising the drug will especially help protect young people and may even lower their consumption of the drug. It is also a way of raising taxes for the state, instead of fuelling criminal organisations, which currently control the illegal market.

These benefits are increasingly recognised by the public. Crucial to seeing these benefits come about, is the way legalising cannabis is done and how the drug is priced once it is made legal. These are the findings from research I've carried out with colleagues in France. There must be a combination of getting the price level right and cracking down on illegal activities to reach the right balance between reducing criminality and avoiding increases in cannabis consumption following legalisation.

To fight the black market, the price of legal cannabis has to be relatively low. For example, it could be set around or slightly below the current illegal price. This will attract current users of the drug away from their existing dealers.

But if nothing else is done, this will not be enough to eradicate the black market. Dealers will simply lower their prices to attract customers back. They are able to do this because there is currently a high markup in the illegal market.

There is a large range of prices and cannabis products sold illegally but the average price of high-quality cannabis is roughly US\$300 per ounce in London, according to the crowd-sourced website priceofweed.com. This is up to three times as high as production costs based on evidence from the US market.

Controlling consumption

The increased competition that the legal market would bring would likely substantially increase consumption – not something most policy makers want. So as well as implementing a legal market, there needs to be a mix of policies to control consumption, including sanctions that are enforced against illegal activities. This would allow a government to price out dealers, while keeping the price of legal cannabis relatively high.

The reasoning is simple: if production or distribution costs of illegal cannabis increase, it is easier to drive criminals out of business by selling legal cannabis. My research shows that the harsher the punishments you put in place against people selling cannabis illegally, the higher you can set the price of legal cannabis to price out dealers. We call this the "eviction price".

Other instruments governments can use to increase the eviction price are to deter consumers from buying illegal cannabis through enforced sanctions or warning them against the dangers of using illegal cannabis compared to high-quality, safe products supplied on the legal market.

Viable alternatives



It's also important to introduce incentives for illegal cannabis producers and sellers to turn their activity toward the legal sector. So as well as investment in law enforcement to crack down on criminal activity, it's important that former cannabis dealers are given viable job alternatives. Otherwise they may just switch to selling alternative illegal drugs or close substitutes.

Dealers often live in deprived neighbourhoods and are trapped in vicious cycles of crime where low aspirations and job prospects push them into illegal businesses. Investment in these communities is therefore needed to support and train those that make a living from drug dealing.

The money that will be generated by selling and taxing legal cannabis should be largely redistributed towards these kinds of initiatives. Plus, legalising cannabis may enable the police to reallocate their efforts towards other crimes, improving police effectiveness against class-A drugs and non-drug crimes. This was found in the London borough of Lambeth after penalties were reduced in 2001 for those holding small amounts of cannabis.

History also shows that prohibition increases violent crimes. Famous gangsters such as Al Capone in Chicago in the 1920s profited from the imbalance between demand and supply of alcohol by establishing organised crime to supply and serve alcohol illegally in speakeasies. In illegal markets, violence is often seen as the only way to resolve conflicts and secure market power.

Our research was inspired by recent examples of cannabis legalisation in Canada and Uruguay. The stated objectives in both countries was to combat drug-related crime. It is too early to evaluate the overall effects of these policies but evidence from Canada suggests that illegal transactions linked to the black market shrunk as a result of legalisation. And we also learnt from what did not work so well there: a shortage of legal supply helped the illegal market persist. So it's important to avoid making the same mistakes and propose more effective policies to control the overall consumption of cannabis.

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Reclaiming lost calories: Tweaking photosynthesis boosts crop yields

Written by Amanda Cavanagh,

Postdoctoral Research Associate at the Carl R. Woese Institute for Genomic Biology, University of Illinois at Urbana-Champaign

Originally published in *The Conversation* 3 January, 2019

What if your ability to feed yourself was dependent on a process that made a mistake 20 percent of the time?

We face this situation every day. That's because the plants that produce the food we eat evolved to solve a chemistry problem that arose billions of years ago. Plants evolved to use carbon dioxide to make our food and the oxygen we breathe - a process called photosynthesis. But they grew so well and produced so much oxygen that this gas began to dominate the atmosphere. To plants, carbon dioxide and oxygen look very similar, and sometimes, plants use an oxygen instead of carbon dioxide. When this happens, toxic compounds are created, which lowers crop yields and costs us 148 trillion calories per year in unrealized wheat and soybean yield - or enough

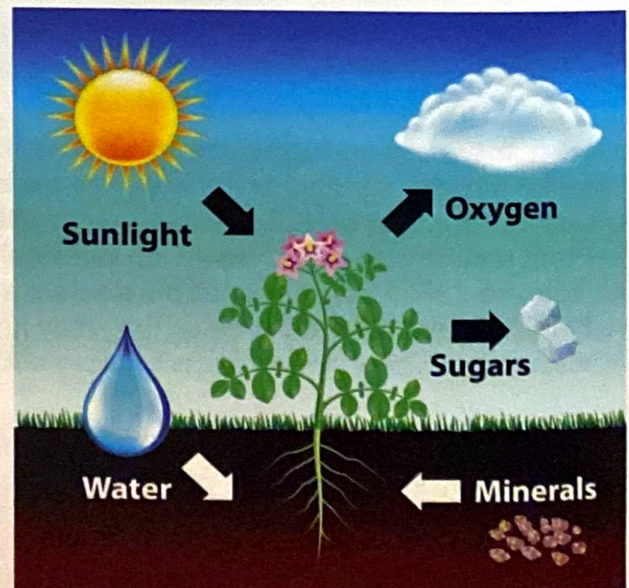
calories to feed an additional 200 million people for a whole year.

Improving crop yields to grow more food on less land is not a new challenge. But as the global population grows and diets change, the issue is becoming more urgent. It seems likely that we will have to increase food production by between 25 and 70 percent by 2050 to have an adequate supply of food.

As a plant biochemist, I have been fascinated by photosynthesis for my whole career, because we owe our entire existence to this single process. My own interest in agricultural research was spurred by this challenge: Plants feed people, and we need to quickly develop solutions to feed more people.



Amanda Cavanagh tests modified tobacco plants in a specialized greenhouse to select ones with genetic designs that boost the yield of key food crops.



In the process of photosynthesis, carbon dioxide and water are transformed into sugars and oxygen. Sunlight powers this chemical reaction

Supercharging photosynthesis to grow more food

It can take decades for agricultural innovations such as improved seeds to reach growers' fields, whether they are created via genetic approaches or traditional breeding. The high-yielding crop varieties that were bred during the first green revolution helped prevent food shortages in the 1960s by increasing the proportion of grain-to-plant biomass. It's the grain that contains most of the plant's consumable calories, so having more grain instead of straw means more food. But most crops are now so improved that they are close to their theoretical limit.

I work on an international project called Realizing Increased Photosynthetic Efficiency (RIPE), which takes another approach. We are boosting harvests by increasing the efficiency of photosynthesis – the solar-powered process that plants use to turn carbon dioxide and water into greater crop yields. In our most recent publication, we show one way to increase crop yield by up to 40 percent by rerouting a series of chemical reactions common to most of our staple food crops.

Photorespiration costs a lot of energy

Two-thirds of the calories we consume across the globe come directly or indirectly from just four crops: rice, wheat, soybean and maize. Of these, the first three are hindered by a photosynthetic glitch. Typically the enzyme that captures carbon dioxide from the atmosphere, called Rubisco, converts carbon dioxide into sugar and energy. But in one out of every five chemical reactions, Rubisco makes a mistake. The enzyme grabs an oxygen molecule instead. Rather than producing sugars and energy, the chemical reaction yields glycolate and ammonia, which are toxic to plants. To deal with this problem, plants have evolved an energy-expensive process called photorespiration that recycles these toxic compounds. But toxin recycling requires so much energy that the plant produces less food.

Photorespiration uses so much energy that some plants, like maize, as well as photosynthetic bacteria and algae, have evolved mechanisms to prevent Rubisco's exposure to oxygen. Other organisms, like bacteria, have evolved more efficient ways to remove these toxins.

These natural solutions have inspired many researchers to try to tweak photorespiration to improve crop yields. Some of the more efficient naturally occurring recycling pathways have been genetically engineered in other plants to improve growth and photosynthesis in greenhouse and laboratory conditions. Another strategy has been to modify natural photorespiration and speed up the recycling.

Chemical detour improves crop yield

These direct manipulations of photorespiration are crucial targets for future crop improvement. Increased atmospheric carbon dioxide from fossil fuel consumption boosts photosynthesis, allowing the plant to use more carbon. You might assume that that this will solve the oxygen-grabbing mistake. But, higher temperatures promote the formation of toxic compounds through photorespiration. Even if carbon dioxide levels more than double, we expect harvest yield losses of 18 percent because of the almost 4 degrees Celsius temperature increase that will accompany them. We cannot rely on increasing levels of carbon dioxide to grow all the food we will need by 2050.



Four unmodified plants (left) grow beside four plants (right) engineered with alternate routes to shortcut photorespiration. The modified plants are able to reinvest their energy and resources to boost productivity by 40 percent.

I worked with Paul South, a research molecular biologist with the U.S. Department of Agriculture, Agricultural Research Service and professor Don Ort, who is a biologist specializing in crop science at the University of Illinois, to explore whether modifying the chemical reactions of photorespiration might boost crop yields. One element that makes recycling the toxin glycolate so inefficient is that it moves through three compartments inside the plant cell. That's like

taking an aluminum can into three separate recycling plants. We engineered three new shortcuts that could recycle the compound in one location. We also stopped the natural process from occurring.

Designed in silico; tested in soil

Agricultural research innovations can be rapidly tested in a model species. Tobacco is well-suited for this since it is easy to genetically engineer and grow in the field. The other advantage of tobacco is that it has a short life cycle, produces a lot of seed and develops a leafy canopy similar to other field crops so we can measure the impact of our genetic alterations in a short time span. We can then determine whether these modifications in tobacco can be translated into our desired food crops.

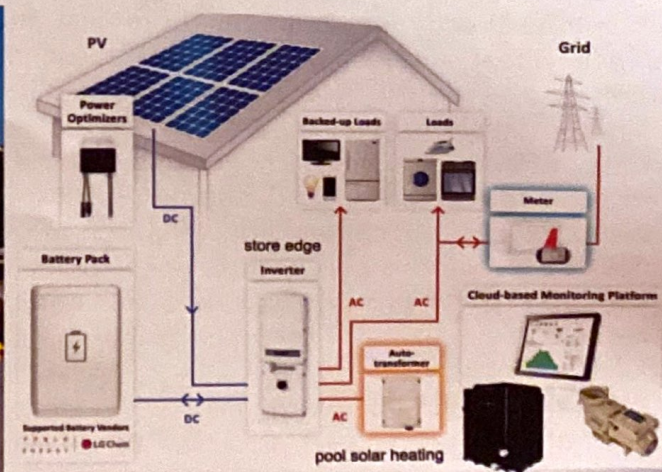
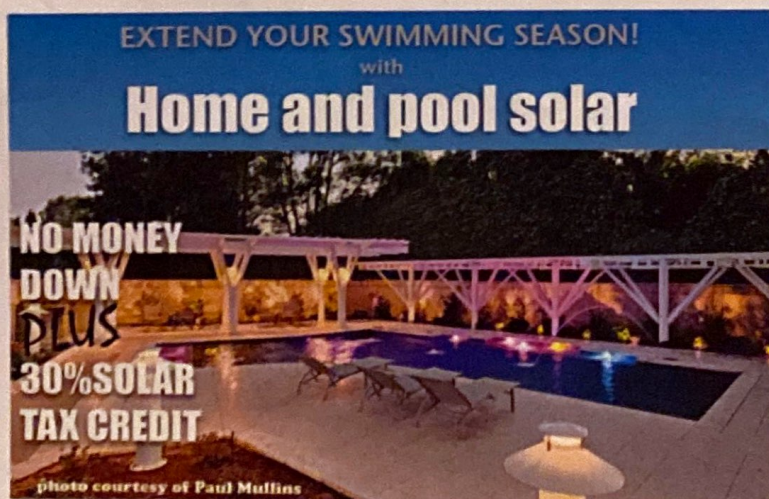
We engineered and tested 1,200 tobacco plants with unique sets of genes to find the genetic combination that recycled glycolate most efficiently. Then we starved these modified plants of carbon dioxide. This triggered the formation of the toxin glycolate. Then we identified which plants grew best - these have the combination of genes that recycled the toxin most efficiently. Over the next two years, we further tested

these plants in real-world agricultural conditions. Plants with the best combination of genes flowered about a week earlier, grew taller and were about 40 percent larger than unmodified plants.

Having shown proof of concept in tobacco, we are beginning to test these designs in food crops: soybean, cowpea, rice, potato, tomato and eggplant. Soon, we will have a better idea of how much we can increase the yield of these crops with our modifications.

Once we demonstrate that our discovery can be translated into food crops, the Food and Drug Administration and the USDA will rigorously test these modified plants to make sure they are safe for human consumption and pose no risk to the environment. Such testing can cost as much as US\$150 million and take more than 10 years.

Since the process of photorespiration is common across plant species, we are optimistic that our strategy will increase crop yields by close to 40 percent and help find a way to grow more food on less land to be able to feed a hungry global population by 2050.



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Blockchain: What is it and does it live up to the hype?



Written by Hillari Bynum

Originally published in *Innovation* 20 July, 2019

Blockchain Fundamentals

The easiest way to understand blockchain technology is to think of it as an electronic notary. A notary protects the integrity of a document by verifying the signer's identity, making sure they aren't being forced to sign under duress or intimidation and making sure they're aware of the contents of the document or transaction. So, when a document is notarized, you can feel confident the document is legitimate.

Blockchain serves a very similar function.

A blockchain is a growing list of records, called blocks, which are linked using cryptography. Each block contains a cryptographic hash of the previous block, a timestamp, and transaction data. By design, a blockchain is resistant to modification of the data. It is "an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way."

Therefore, like a notary, Blockchain protects the integrity of the information stored within each block.

Why is Blockchain such a buzzword in the Food Industry?

During a foodborne illness outbreak, one of the biggest challenges is determining where the contaminated food originated from and where it was distributed/served/sold. There is not an easy way to track down this information; which makes managing

a recall, or an outbreak, incredibly tricky, time-consuming, and dangerous.

Blockchain could change all of that.

Blockchain technology can keep a record of the entire supply chain. If Blockchain were implemented across the food industry, it would be possible to see everywhere a single piece of produce has been – from farm to plate. Consumers and food industry professionals alike would be able to see if a recall had impacted their produce or if it was from the same farm that is being investigated for a foodborne illness outbreak. Cool, right? It doesn't stop there! This enhanced traceability could also help protect against food fraud by providing a verifiable record of every stage in the supply chain.

Okay great, let's do it.

It isn't that easy. There are a lot of very real obstacles in the way, and there is no easy solution.

Slow Supply Chain Adoption

In a dream world, when helpful technology is created, people rush to adopt it because they know it is valuable. In the world we actually live in, the reality is much different. Many key stages of the food supply chain operate with very low margins. Growers, packers, slaughterhouses, wholesalers, and harvest companies have very manual processes – and they don't always have the capital to invest in technology.

The other thing these companies are short on is time for training. Successful implementation of a new system requires time, money, and desire. When you're operating with a shortage of time and money, desire is hard to come by as well. Transparency and traceability are popular ideas throughout the food industry, but when it comes time to actually turn that idea into reality, many companies have an "if it ain't broke, don't fix it" attitude.

The unfortunate reality is that people often pay the cost of food traceability at the early stage of the supply chain (growers, packers, processors) and the benefit is felt the strongest by those at the end of the supply chain (retailers and consumers). What this means is that we are asking the companies with the smallest margins to make the most significant investments – which they are often unwilling or unable to make. It is a fair point, outside of altruism, there is not a clearly defined business benefit to growers – so we are asking them to complicate their process, invest time and money, for little direct benefit.

This is particularly damaging because Blockchain won't be revolutionary if it is only protecting part of the food supply chain. To be completely effective, every piece of the food supply chain needs to be on board.

Food Fraud is big business

Experts estimate that food fraud is now a \$40 billion-dollar business. Unfortunately, the people committing food fraud are making a lot of money, and they are likely to be involved at some point in the supply chain. Blockchain and traceability technology threaten this business because of the technological ability to sound alarm bells and alert the world to food fraud. So, to protect their business model, these criminals will fight traceability implementation tooth and nail.

Too many independent systems

There are a lot of small-to-mid-sized companies offering traceability solutions, but unfortunately, these systems don't always talk to each other. Blockchain success is heavily dependent on private tech companies being open to working together and sharing their data – which historically, they are not.

Traceability is different for different groups

Traceability varies by industry and product. For example:

- **Agriculture/Farming:** Identification starts with the birth of livestock or planting and moves through the growth process, use of pesticides, nutritional records, vet records, and transportation records;
- **Food Processors:** Identification starts at the source of each ingredient and follows through the processing, packaging, distribution, and transportation process;
- **Retail and Food Service:** Identification starts with receiving receipts/invoices to identify the lot and batch information with regulations not requiring tracking "one-up" to the final consumer;
- **Transportation and Distribution:** Commingling points of contact are vectors for the spread of disease. Waybills should contain source party and target party identification. Specific locations are needed for livestock in most countries. If products are disaggregated for smaller shipments, then records need to reflect lot/batch codes of the manufacturer or processor.

Different groups have different motivations, and it may be difficult for a system to accommodate the needs of each industry or product.

So, does it live up to the hype?

The short answer is maybe. Blockchain represents immense possibility, but it also comes with equally immense challenges. If the food industry doubles down on Blockchain and can secure engagement at every phase of the supply chain, the results would be revolutionary. However, if there is only partial adoption of traceability technology, it will be far less successful.

There is a reason to be optimistic, however! The FDA recently launched the New Era of Food Safety program that looks ready to move the food industry forward into new traceability technologies.



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SAFETY

Organic food health benefits have been hard to assess, but that could change

Written by Cynthia Curl

Assistant Professor, Boise State University

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"Organic" is more than just a passing fad. Organic food sales totaled a record US\$45.2 billion in 2017, making it one of the fastest-growing segments of American agriculture. While a small number of studies have shown associations between organic food consumption and decreased incidence of disease, no studies to date have been designed to answer the question of whether organic food consumption causes an improvement in health.

I'm an environmental health scientist who has spent over 20 years studying pesticide exposures in human populations. Last month, my research group published a small study that I believe suggests a path forward to answering the question of whether eating organic food actually improves health.

What we don't know

According to the USDA, the organic label does not imply anything about health. In 2015, Miles McEvoy, then chief of the National Organic Program for USDA, refused to speculate about any health benefits of

organic food, saying the question wasn't "relevant" to the National Organic Program. Instead, the USDA's definition of organic is intended to indicate production methods that "foster cycling of resources, promote ecological balance, and conserve biodiversity."

While some organic consumers may base their purchasing decisions on factors like resource cycling and biodiversity, most report choosing organic because they think it's healthier.

Sixteen years ago, I was part of the first study to look at the potential for an organic diet to reduce pesticide exposure. This study focused on a group of pesticides called organophosphates, which have consistently been associated with negative effects on children's brain development. We found that children who ate conventional diets had nine times higher exposure to these pesticides than children who ate organic diets.

Our study got a lot of attention. But while our results were novel, they didn't answer the big question. As I told *The New York Times* in 2003, "People want to

know, what does this really mean in terms of the safety of my kid? But we don't know. Nobody does." Maybe not my most elegant quote, but it was true then, and it's still true now.

Studies only hint at potential health benefits



Health-conscious people want to buy organic for its health benefits, but it's not yet clear whether such benefits exist.

Since 2003, several researchers have looked at whether a short-term switch from a conventional to an organic diet affects pesticide exposure. These studies have lasted one to two weeks and have repeatedly shown that "going organic" can quickly lead to dramatic reductions in exposure to several different classes of pesticides.

Still, scientists can't directly translate these lower exposures to meaningful conclusions about health. The dose makes the poison, and organic diet intervention studies to date have not looked at health outcomes. The same is true for the other purported benefits of organic food. Organic milk has higher levels of healthy omega fatty acids and organic crops have higher antioxidant activity than conventional crops. But are these differences substantial enough to meaningfully impact health? We don't know. Nobody does.

Some epidemiologic research has been directed at this question. Epidemiology is the study of the causes of health and disease in human populations, as opposed to in specific people. Most epidemiologic studies are observational, meaning that researchers look at a group of people with a certain characteristic or behavior, and compare their health to that of a group without that characteristic or behavior. In the

case of organic food, that means comparing the health of people who choose to eat organic to those who do not.

Several observational studies have shown that people who eat organic food are healthier than those who eat conventional diets. A recent French study followed 70,000 adults for five years and found that those who frequently ate organic developed 25% fewer cancers than those who never ate organic. Other observational studies have shown organic food consumption to be associated with lower risk of diabetes, metabolic syndrome, pre-eclampsia and genital birth defects.

The problem with drawing firm conclusions from these studies is something epidemiologists call "uncontrolled confounding." This is the idea that there may be differences between groups that researchers cannot account for. In this case, people who eat organic food are more highly educated, less likely to be overweight or obese, and eat overall healthier diets than conventional consumers. While good observational studies take into account things like education and diet quality, there remains the possibility that some other uncaptured difference between the two groups - beyond the decision to consume organic food - may be responsible for any health differences observed.

What next?

When clinical researchers want to figure out whether a drug works, they don't do observational studies. They conduct randomized trials, where they randomly assign some people to take the drug and others to receive placebos or standard care. By randomly assigning people to groups, there's less potential for uncontrolled confounding.

My research group's recently published study shows how we could feasibly use randomized trial methods to investigate the potential for organic food consumption to affect health.

We recruited a small group of pregnant women during their first trimesters. We randomly assigned them to receive weekly deliveries of either organic or conventional produce throughout their second and third trimesters. We then collected a series of urine samples to assess pesticide exposure. We found that those women who received organic produce had

significantly lower exposure to certain pesticides (specifically, pyrethroid insecticides) than those who received conventional produce.



Often, new medical and health knowledge comes from carefully designed clinical trials, but no such trial has been conducted for organic food.

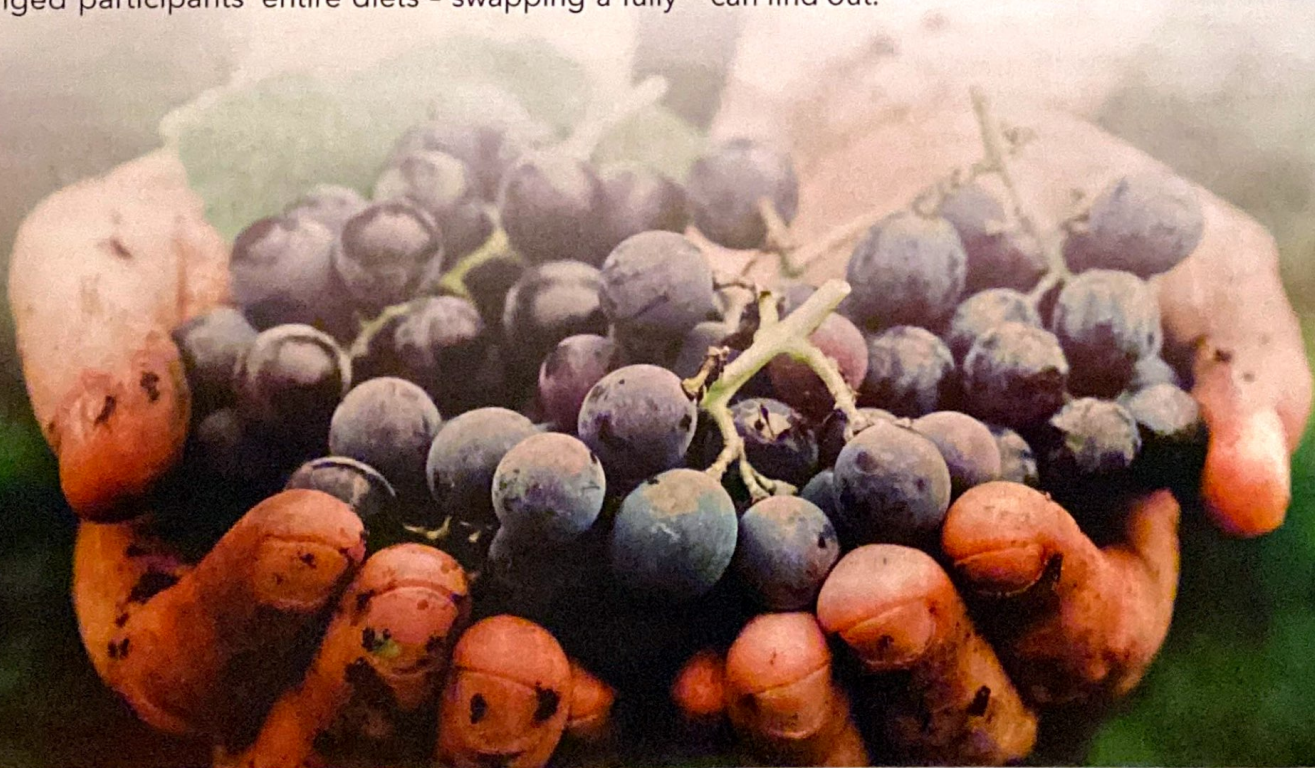
On the surface, this seems like old news but this study was different in three important ways. First, to our knowledge, it was the longest organic diet intervention to date - by far. It was also the first to occur in pregnant women. Fetal development is potentially the most sensitive period for exposures to neurotoxic agents like pesticides. Finally, in previous organic diet intervention studies, researchers typically changed participants' entire diets - swapping a fully

conventional diet for a fully organic one. In our study, we asked participants to supplement their existing diets with either organic or conventional produce. This is more consistent with the actual dietary habits of most people who eat organic food - occasionally, but not always.

Even with just a partial dietary change, we observed a significant difference in pesticide exposure between the two groups. We believe that this study shows that a long-term organic diet intervention can be executed in a way that is effective, realistic and feasible.

The next step is to do this same study but in a larger population. We would then want to assess whether there were any resulting differences in the health of the children as they grew older, by measuring neurological outcomes like IQ, memory and incidence of attention-deficit disorders. By randomly assigning women to the organic and conventional groups, we could be sure any differences observed in their children's health really were due to diet, rather than other factors common among people who consume organic food.

The public is sufficiently interested in this question, the organic market is large enough, and the observational studies suggestive enough to justify such a study. Right now, we don't know if an organic diet improves health, but based on our recent research, I believe we can find out.



Review: Authentic Southern Food in California BBQ152



Gilroy, California always makes me think of three things: garlic, roadside produce stands, and outlet shopping. I certainly didn't expect to discover quality southern style barbeque, live music, and craft beer; but that is exactly what we found.

If you have ever visited the Gilroy Premium Outlets, you've probably eaten at one of the many chain restaurants in the neighboring blocks. Little did you know that amazing barbeque was waiting just past those restaurants, yet still within one mile of the outlets. And I'm willing to bet that, if you skip the double burger and Mexican chain food just once, you'll never go back.

BBQ 152 sits just off Highway 152 on Monterey Street. It's an unassuming storefront with a large, simple black and white sign nestled between Crepe Myrtle trees on the parkway. It's not flashy, but it's easy to find and worth the trip.

My boyfriend and I opened the door to find the sound of live acoustic music carrying over the chatter of happy patrons. It was late for lunch, but the place

was more than half full and held a steady stream of customers throughout our time there. It has a family friendly vibe without being kid-centric. One little blonde kiddo was swaying to the music as his family ate. We even witnessed one man start to clear his table with one hand and continue eating with the other. The food was just too good to leave behind.

Between the two of us, we sampled three meats, three sides, two beers, and all of the sauces. It was all delicious, and every meat had that glorious pink ring you only find on expertly smoked meat. Pulled pork is my go to at any barbeque place, and theirs did not disappoint. It was tender, smokey, and melted in my mouth. It came with a side of Hogwash, which is their custom vinegar and molasses blend. It worked well with the meat, but it wasn't my cup of tea. I preferred their smoked BBQ sauce on mine.

My boyfriend ordered a three meat plate with pulled pork, tri tip, and brisket. He's pretty picky about his pulled pork, but he too approved. The tri tip and brisket were also tender and flavorful pre-sauce, but the smoky BBQ sauce brought out their flame grilled essence. And if you want sauce with a kick, try their

spicy BBQ sauce. It definitely brings heat to your meat.

What surprised me most at BBQ 152 were the sides. I grew up with a southern grandma who fried chicken gizzards and made cornbread stuffing from scratch. Although I adored her stuffing, I never could get used to her savory cornbread on its own. As a West Coast kid, I wanted the sweet stuff, preferably with honey butter. I couldn't understand why she wouldn't make it the way everyone else around here did. Let's just say that she would be happy eating the cornbread at BBQ 152. It was moist, dense, and only slightly sweet. And to my surprise, I really enjoyed it.

The beans were also more savory than I expected, with a strong underlying flavor of cumin and other Mexican spices. Definitely not the sweet baked beans often found at a California barbeque. The potato salad, on the other hand, wasn't very memorable. It didn't taste store bought, but it was somewhat bland and remarkably unremarkable.

BBQ 152 also had a nice selection craft beer to pair with your meal. They offered about a dozen mostly local California beers on tap. I opted for Professor's Patent, a smooth IPA on tap from Capitola brewer Sante Andairius Rustic Ales. It was light, but flavorful, and not too hoppy. My date chose a canned option:



Mango Shakes from San Francisco brewer Bare Bottle Co. It was lightly creamy with a noticeable mango finish. Both were delicious and rounded off our meals beautifully.

We couldn't have been more pleased with our lunch choice. It wasn't packed with tourists, despite it being a Saturday. It had a friendly atmosphere, and great food. If you are passing through Gilroy for work or a little shopping, I hope you skip those flashy chain restaurants and give BBQ 152 a try.



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Evening Events in the Valley

We are nearing the end of the summer season. The days are still long, and the nights will soon begin to cool, which means it's a great time to take advantage of some of the evening events happening around the Central Valley. Here are three that I think are worth checking out.

Gazebo Gardens Beer Garden

3204 N. Van Ness Blvd, Fresno CA
Thurs-Sat year round
5:30 pm - 9:00 pm



If you're looking for an evening of food and music in a beautiful locale, then Gazebo Gardens is your destination. They turn this nursery into a Beer Garden with food trucks and live music every Thursday through Saturday evening year round. You can grab a bottle of beer or select one of the 5-8 beers on tap at one of the two stands. Then, wander through the roses, statues, and shrubs to find seating nestled between the plants. Kids love to run through the gardens, playing tag around the trees and under the gazebo, and watching for the trains that pass by throughout the evening. There is even a raised pond to explore.

When you're feeling peckish, stroll through an assortment of food trucks. There are generally 8-12 trucks to choose from, and they rotate regularly so you can find your favorites and try new ones. We have

sampled sliders from Meltdown Bistro, chicken tikka masala from Ganesha Masala, falafel and gyros from Holy Shish, vegan burritos from El Jaca, and both creamy and boozy shaved ice from Sno Cafe. All are delicious and are made better by the friendly and relaxed environment. And did I mention the dogs? Gazebo Gardens is dog friendly and usually abounds with furry friends.

There is always a live band performing on their small stage near one of the beer garden taps. There are picnic-style tables in front, and a few more rows off to the side. Some even have inset fire pits for cooler evenings. While there are tables and chairs scattered throughout the gardens, seating can be hard to come by on more popular nights. I suggest sending a scout while you wait for your beer or dinner. Luckily, people are generally friendly and wander around when not eating, so seating eventually becomes available. And even if you can't get a spot near the band, the music carries throughout the gardens, making it a lovely evening anywhere you go.

Lindsay Friday Night Market

Honolulu St/Sweet Brier Plaza, Lindsay, CA
Fridays year round
5:30 pm - 10:00 pm



If you love a good swap meet, but hate the mornings, check out the Lindsay Friday Night Market. The small town of Lindsay is home to many Hispanic and Latino families, and their cultures shine at this event. The town square is a lively hub for the market, and is often filled with people dancing to

live music or a DJ. There are rows and rows of vendors selling both original and discounted goods. You can even shop for birds and farm animals. There are, in fact, so many vendors and rows that I almost got lost during my first visit. Luckily, I had a regular patron with me to keep me oriented.

In addition to traditional goods, art, and animals, you can find an assortment of delectable food. There are the market staples of kettle corn, pizza, and hot dogs, but the real treats are the cultural options. We endured an epic line for delicious pupusas made by hand right in front of us. My boyfriend indulged in his favorite, elote (corn). I grew up eating corn on the cob, but elote comes with a buffet of possible toppings, including mayonnaise, Tajin (seasoning powder), lime, salt, and hot sauce.

The atmosphere was friendly and lively, but not for the agoraphobic. We attended on a sweltering summer night, and the place was still packed. People were generally friendly and eager to chat, but there were long lines and crowded walkways. However, if you're not daunted by a crowd and enjoy a festive environment, add the Lindsay Night Market to your Friday night plans.

with the genre, but it was fun to watch. If you haven't witnessed it, envision people in modified tap shoes doing a cross between square and line dancing. And it was clear this group enjoyed what they were doing, despite the heat.

The Clovis Farmers Market does a good job interspersing crafters, produce vendors, local companies, and food options throughout the market. There is, however, a cluster of food stations near the main intersection along with some picnic tables which were, unfortunately, in direct sunlight. We visited our friends at FinePrint Plus, bought some organic local berries, and checked out a few handmade items. We wrapped up our evening by enjoying a second band at the far end of the market, right before embarking on a windy little off-track train ride. My son was sad to go, but declared the evening a success, and I agreed.

Clovis Farmers Market

Pollasky between 5th & Bullard, Old Town Clovis, CA
Fridays during summer
5:30 pm - 9:00 pm
Saturdays year round
9:00 am - 11:30 am

If you're looking for a laid back farmers market with plenty to explore, check out the Clovis Farmers Market. You can explore local produce, handmade items, and food year round every Saturday, but during the summer months you can also visit the market on Friday evenings. It is a nice way to wrap up the week and get some yummy produce for your weekend.

I enjoyed wandering the three blocks lined with beautiful, local produce and flowers the most, but my 5 year old enjoyed the live performances and mini train ride more. There was a band set up in the center intersection, and when they were on break a local group of cloggers called the California Ground Pounders stepped in to perform. I wasn't familiar





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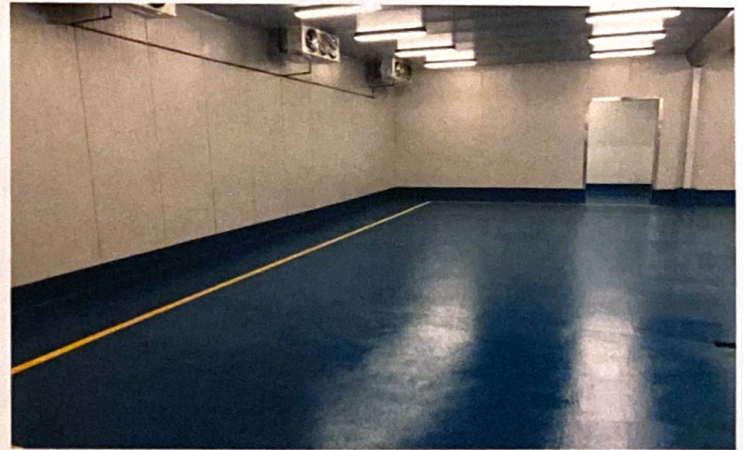
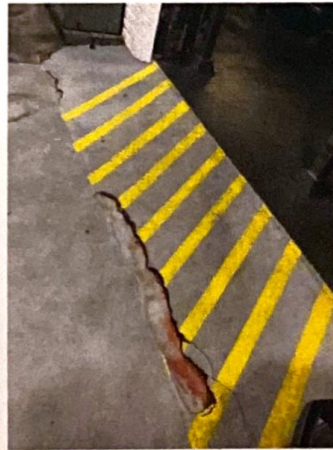


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10:15 am - 11:15 am	Free Seminar: "What It's All About, and FDA's Latest Activities" with Safe Food Alliance
11:45 am - 12:45 pm	Free Seminar: DBT: Risk Prevention with J G Parker Insurance
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