DEAR READER,

You may have missed this.

But, over summer break, there has been much ado about farming and food. In early September, Stanford University’s Center for Health Policy released a study concerning organic food and nutrition. It claimed, based on analysis of 237 individual reports, that organic food and conventionally grown food are virtually no different in terms of nutrient content. The study has sparked uproar from consumers and farmers alike. Organic growers believe the study undermines their food and angry organic lovers have petitioned to have it completely withdrawn. Stanford plans to stick to their guns.

Meanwhile this same September, the House of Representatives was not able to pass the new farm bill. Farmers in the Midwest recovering from drought reportedly are worried what this will mean for them in the coming harvests. Similarly, dairy farmers, including those in Whatcom County, have lost governmental support for milk price drops without the new regulations. Then to top it off Republicans and Democrats, respectively, cannot agree on whether they should cut or maintain the funding for food stamps within the new bill.

You might think this does not affect us too much here at Western Washington University. However, you may not know that just a bit north of our college is farmland. All the way to the very edge of the Canadian border raspberries, apples, milk and the like are all major staples of our northern sister cities. So with so much going on in the world of farming and a rich farm community so close, The Planet staff and I thought it would be prudent to talk a bit about the farmers here, in Whatcom County.

We interviewed local farmers devoted to organics, genetics, education, charity and even vodka.

However, this issue of The Planet is not just about the farmers who share our area code. In some ways, this issue is about the modern farm. The farmers within this issue are local faces, but they also represent farmers all over the U.S. who are continuously adapting to a changing world.

Enjoy.

James Rogers
Editor-in-Chief
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ON THE COVER

Drawn to the aesthetic nature of the leaves of rainbow chard, I composed this photo illustration highlighting its intricate details and patterns.

By positioning my light source below the rainbow chard, I was able to effectively backlight the chard, optimizing the details in the resulting image. The use of this lighting technique can also account for why this photograph looks like a painting.

- Jackson Lee
It’s fall; the growing season is over and the farm’s productivity is nearing its end. Volunteers sow hardy grains over the freshly tilled soil for the winter’s cover crop. The last of the large tomato plants linger in the greenhouses, their vivid green color fading to brown. The season had been labor intensive, yet productive, with 35,000 pounds of vegetables grown for the Bellingham Food Bank. However, this is the Food Bank Farm’s final season.

The formulation of the Food Bank Farm initially started in 2006 when the Bellingham food bank administered a survey that asked food bank clientele what they wanted to see from the food bank. The answers were simple: supply more produce.

However, in late October 2012, the Bellingham Food Bank board of directors made the decision to close the food bank farm. The farm provided the food bank clients with a constant supply of food throughout the growing months. The closure provides a more cost efficient way to supply bulk produce to the people who need it, said Mike Cohen, the executive director at the Bellingham Food Bank.

Pursuing the needs of their patrons, the food bank started looking for ways to get fresh produce. The vision became reality when the Cascade Christian Services offered a 2.5-acre parcel of land for $200 per month, Cohen said.

Once the farm was established, it supplied 19,000 pounds of vegetables in 2010 on its parcel of land. In 2011, the farm supplied 24,700 pounds and 35,000 pounds in 2012, Jones said.
The food bank distributes 250,000 pounds of food per month.

"That's eight fully loaded semi trucks every month," Cohen said.

In total, the Bellingham food bank serves 10,000 people every month, Cohen said. As of June 2011, Bellingham had a population of just above 80,000 people, according to the U.S. Census Bureau. The Bellingham food bank supplements one-eighth, or 12.5 percent, of Bellingham's population every month.

During the distribution hours, people wait in line outside the food bank without cover.

Aneesa Ahad is a single mother and a military veteran attending Whatcom Community College. Ahad and daughter, Nusy, wait in that line every week, passing the time with sidewalk chalk art projects. On tough months, they ration what is left of their monthly GI bill, which is about $400 after tuition, for the necessities like rent and bus passes, Ahad said.

About 21.6 percent of Bellingham's population is below the poverty line, almost double the state of Washington, at 12.1 percent, according to 2010 U.S. Census data.

However, the end of the farm will not spell the end of the produce in the aisles of the food bank. The food bank still gets produce from many different sources. Food in fair or less than fair condition is gathered from grocery stores and distributed at the food bank, he said.

The bank also receives excess produce from home gardeners with the Victory Garden program, Cohen said.

The Small Potato Gleaning Project gathers produce left behind by the harvests of commercial farmers to donate to the food bank.

According to the food bank website, volunteers collect more than 60 tons of fresh, local produce annually.

These programs can help fill the void created by the closure of the Food Bank Farm.

When the farm was up and running, the food collected from the farm by the volunteers traveled to the food bank location in Bellingham, Wash. where it was sorted for distribution.

The farm was never certified to be organic because it was a non-profit project and there are extra administrative costs associated with being certified, said Matia Jones, the Bellingham Food Bank Farm Manager.

But the farm used techniques to make the produce organic, just without the expensive label, Jones said.

These techniques, which include crop rotation, helped sustain a flow of vegetables to the food bank throughout the growing months, Cohen said.

The farm used legumes, such as winter peas, for cover crops, which add nitrogen to the soil in a process called nitrogen fixation, Jones said.

The practice of planting legumes as a cover crop is beneficial to the restoration of ammonia in the soil. Atmospheric nitrogen (N2) makes up approximately 80 percent of the earth's atmosphere.

This gaseous form of nitrogen is not available to the plants. Nitrogen-fixing bacteria reside in the roots of the winter peas and convert this atmospheric nitrogen to ammonia, which the plant is able to use, according to a New Mexico State University guide titled Nitrogen Fixation by Legumes.

The plants then get tilled into the ground where they decompose, releasing ammonia.
ABOVE: The farm’s labor was comprised of two interns, a manager and volunteers from various clubs and colleges. The farm lacked mechanized harvesting equipment, which made it difficult for managers to provide the amount of help necessary to operate the farm smoothly.

ABOVE RIGHT: About 21.6 percent of Bellingham’s population is below the poverty line, almost double the state of Washington, at 12.1 percent, according to 2010 U.S. Census data. The Bellingham Food Bank, located on 1824 Ellis Street, was established to supply alternatives to hunger.

"Without mechanized farm equipment like crop pickers, it was hard for the farm to find an adequate supply of people to work the fields."

unknown at the time of publication what will happen to the parcel of land now that the food bank is not renting it.

When the farm was in operation, Jones’ job was to keep the farm running smoothly. The biggest setback of the farm operation was the labor, Jones said. When the farm had fewer volunteers, she did the heavy lifting, which resulted in two slipped discs in her back.

The farm work was divided between the manager, two interns and volunteers. Without mechanized farm equipment like crop pickers, it was hard for the farm to find an adequate supply of people to work the fields, Cohen said.

Even without the heavy machinery, the Food Bank Farm was using $65,000 of donated grant money to operate annually, including labor costs and supplies, Cohen said. They are now going to allocate the money from the farm and use it for contract purchasing in a program called Food Bank Fresh to obtain produce from commercial organic farms around Whatcom County at a wholesale price, Cohen said.

Ahad worries that the Food Bank Fresh program will not supply the same quality of vegetables the farm was able to produce.

"The end result is that we don’t want an empty plate, we want food," Ahad said. "Nobody wants their children to go hungry."

Implementing more funds towards the Food Bank Fresh program would allow the food bank to stimulate the local economy by supporting the local organic farmers, Cohen said.

However, nothing is certain for the food bank. Year to year fund streams change, programs change. If there is an option to get fresh produce more efficiently, the Bellingham Food Bank explores it, Cohen said.

Other possible farm programs are in the works from the Bellingham Food Bank. Learning from the previous labor intensive farming process, there is a possibility of creating another farm that is more viable economically, Cohen said.

The food bank is looking into other options for a farm closer to town that can operate with a smaller capacity, Jones said. A smaller farm in town could be used as an educational instrument for the users of the Food Bank. Also, a closer location could help the farms past volunteer troubles, Cohen said.

One thing is certain; the food bank will do what it can to supply its clients with the food that they rely on, Cohen said.

"To see kids and adults going through the distribution line saying, ‘I didn’t know carrots had green tops,’ or, ‘I haven’t seen fresh broccoli in five years,’ it’s a little bit heartbreaking, but also very inspiring to keep these programs available," Cohen said.

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ORGANICS
START WITH
SEEDS

STORY KHALIC BRYANT | PHOTOS JACkSON LEE
According to the Environmental Protection Agency website, approximately 160 million acres of soybeans, corn and cotton are harvested in the U.S. annually. These crops start out, like many others, as a small seed no larger than a penny but grow into a $30 billion per year industry.

"I can't imagine a less transparent agricultural product," said Brian Campbell, co-founder of Uprising Seeds, an organic seed dispensary in Bellingham. "You don't know the history of what is in the packet of seeds when you buy it."

Ninety percent of the corn and soy and 87 percent of cotton produced in the U.S. comes from genetically modified seeds, according to a U.S. Department of Agriculture official statistic. Uprising Seeds, founded in 2006, is the first 100 percent organic seed company in the state of Washington and has over 200 seed varieties, said Crystine Goldberg, a former organic farmer turned organic seed supplier. The seeds they sell provide a healthier alternative to conventional seeds, she said.

Uprising Seeds produces 60 percent of their own seeds, the other 40 percent are sourced from organic farms in the Northwest, Campbell said. Larger seed operations often don't have this personal relationship with the seeds they produce.

Dr. William Tracy leads a breeding program at the University of Wisconsin that focuses on improving sweet corn. He works with both conventional and organic farming methods in his research and he was the keynote speaker at the 2012 Organic Seed Growers Conference in Port Townsend, Wash.

According to the organic rule, if there is not an equivalent of an organic seed variety available, the farmer can use non-organic seeds to plant organic crops, Tracy said. Those who use organic seeds want to see more organic crop varieties available, said Tracy.

Matthew Dillon is the co-founder of the Organic Seed Alliance, an organization focused on research, education and assisting in the ethical development of organic agriculture. He also co-authored a 2010 report addressing the opportunities, and challenges, of organic seed systems titled State of Organic Seed. "Organic producers in the U.S. and throughout the world are relying on conventionally bred seeds for organics," Dillon said. Although they are cheaper, these seeds are produced using large amounts of harmful chemicals, he said.

In 2011 the Environmental Health Perspectives published the results of three separate studies focused on the effects small amounts of pesticides may have on unborn children.

These studies indicate exposure to low amounts of the chemicals, such as chlorpyrifos, or organophosphates, may decrease a child's working memory and I.Q. by age seven. But this isn't the only issue.

Most of the people using organic seeds are more concerned with knowing exactly where, and how, their seeds are produced, he said.

"People think when they buy seeds from the seed company, the seed company is growing all those seeds and putting them in the packages," Campbell said. "Most of them are just paper companies that buy seeds from big conglomerates and repack them."

Organic seeds are one of the weak links in organic systems, Dillon said. Organic farming has been steadily increasing by 20 percent per year over the past 10 years, but the use of organic seeds isn't keeping pace, he said.

"The food you buy needs to come from somewhere, and that's seeds," Goldberg said. "Just like people are growing your food for you, people are growing seed[s] that farmers are buying to grow their food locally and sustainably."

Two of the main categories of seed production are seeds produced from organic farming or, the more common, conventional farming. Seeds produced by conventional farming differ from those developed through organic farming in a number of ways.

The major differences between these farming types are the use of genetically modified organisms (GMOs), synthetic pesticides and fertilizers in conventional farming. "[Genetically modified] is when a gene is taken out of one organism and transferred to another organism," Tracy said.

According to a 2001 Pennsylvania State University, two of the major benefits listed in the report are the increases in crop production and revenue. Concerns include the unknown health risks of GMOs and forced crop contamination, which is extremely difficult to contain.

GMO seeds are contaminating places that have a history of pure seeds, Goldberg said. Pollen is blown or moved by animals into these pure-seed areas.

"Once those seeds get out there there's no taking them back," Goldberg said. "They're already out there, and as far as we know you can't reverse that."

Companies often try to genetically modify seeds for specific reasons, which is potentially harmful to consumers, Tracy said.

"A classic example is where some people were trying to genetically engineer soybeans to produce a certain kind of oil," Tracy said. "The oil they wanted they got from a Brazil nut."

Unfortunately when the oil gene was transferred from the nut to the soybean, a nut allergen was also introduced into the bean. The genetically altered soybean was never used due to the detection of this allergen, Tracy said.

"If it had been widely used it would have been a problem," he said.

There are other reasons companies are modifying seeds, such as breeding into produce
traits that weren’t already there.

“People want tomatoes that are impact-resistant so they don’t get bruised up in shipping,” Campbell said.

Other seeds are modified so the size and shape of all the fruits and vegetables produced will look virtually identical, Goldberg said.

“It seems like people thrive on diversity but we want all our apples to look the same,” she said.

Organic farmers rely mostly on natural pesticides but some exceptions do apply. The USDA website has an official list of approved chemicals authorized for use on organic crops. No GMOs are allowed in the production of organic seeds, according to the USDA’s national criteria.

Campbell and Goldberg started Uprising Seeds to provide the Pacific Northwest with seed varieties that are organic and open-pollinated, Campbell said. There isn’t a lot of money in open-pollinated systems so most companies don’t use them, he said.

An open-pollinated seed system will produce the same kind of plant generation after generation, Campbell said. This is in contrast to hybrid systems, which produce unstable seeds because they have two different parents, he said.

“They inbreed the hell out of them so they are uniform to a gene,” Campbell said.

Seeds saved from the hybrid would have unpredictable traits due to acquiring traits from more than one plant, Campbell said. Companies patent these hybrids, preventing growers from using any seeds produced by the plants during seeding, he said.

“People compare it to computer software,” Campbell said. “Open-pollinated is like open source software, anybody can access it. Hybrid is more like proprietary software.”

The only way to get that same hybrid seed is to buy new ones from the seed company that produces it, according to the Penn. State study. Seeds that are genetically manipulated are patented as well.

“You shouldn’t be able to patent a seed... It’s life,” Goldberg said. 

“Studies indicate exposure to low amounts of the chemicals, such as chlorpyrifos, or organophosphates, may decrease a child’s working memory and I.Q. by age seven. But this isn’t the only issue.”
A growing trend amongst American farmers is the use of technology. From self-driving tractors to automatic calf feeders, technology is changing the farming game for a more efficient future. (Photo Illustration)

Cellphones now track users’ locations and help them find their way. Credit cards can be read with a tap of a sensor rather than a swipe. As these same technologies become more prevalent in urban areas, they too are beginning to become more common on farms.

Farmers are investing in technologies to simplify their labor practices. Using this new equipment, they can complete routine tasks faster and more efficiently.

**CALF FEEDERS**

Linda de Boer works at Bloks Evergreen Dairy located in Lynden, Wash. Bloks Evergreen is home to around 1,200 dairy cows, 87 of which are calves that receive milk substitute from automatic feeders.

The dairy has four feeding stations, each costing $25,000, de Boer said. Calves approach the feeding stands and nurse from a rubber nipple that automatically dispenses the substitute.

Each calf has a collar around its neck with a personally programmed microchip the automatic feeder recognizes. Once a calf approaches the feeding stall, its microchip activates the machine to mix the milk substitute. The machine will add just enough substitute powder and water needed for the specific calf and will only mix the formula when the calf approaches the feeder, she said.

The machine gives each calf the necessary amount of milk required for its age. This ensures each calf is given exactly the right amount and is not being fed too little or too much, de Boer said.

A computer monitors each calf’s feeding activity, and de Boer can observe on her computer how much each calf has consumed during the day.

The biggest difference between using the automatic feeders and feeding them by hand is the calves can come up five times a day instead of being fed only twice a day, de Boer said.

Eliminating the labor that went into feeding the calves by hand with a bottle or a bucket was worth installing and paying for the feeders, de Boer said. The calves look healthier than they were before using the feeders, she said.

According to Applied Animal Behavior Science, a 2009 scientific study, the health of the calves being fed by mothers was poorer than the calves being fed with milk replacer from the automatic feeders.

However the calves without any contact with their mothers had abnormal behaviors such as “cross sucking,” which is when a calf sucks the ear, mouth, scrotum, tail, udder or navel of another calf, according to the study.

Troy Lenssen owner of Lenssen Dairy Farm in Lynden, Wash. has about 500 cows who are fed by hand and bottle.
“Even if you have the robot calf feeders, you still need a good person to oversee it,” Lenssen said.

He said he is not opposed to the automatic feeding machine, but would not use one on his own farm. Apart from it costing too much money, it takes away from attention the calves need, Lenssen said.

AGRICULTURE GPS

Gary Biringer, owner of Black Crow Pumpkins, operates a corn maze and 5-acre pumpkin patch in Arlington, Wash.

Biringer uses GPS software designed for agricultural use to form his corn maze.

“It’s just like the one in your car with your little arrow going down I-5,” Biringer said about the GPS.

Biringer said it would have cost more than $4,000 to hire someone to design and cut the corn maze. The GPS unit was about $3,500 and the software was almost $850. In one season the unit has basically paid for itself, he said.

He said using the software to make corn mazes is a very small part of the program and not what it is mainly created for.

Rob Foliday is a sales manager at Ag Tech Services where they carry the GPS system.

“It is very popular,” Foliday said about the GPS. “Probably 60 to 70 percent of the farms in Washington use it in one form or the other.”

Foliday said one of the functions the system includes is the ability to auto steer. It can steer a vehicle, such as a tractor, without a person actually driving it.

berries

Mike Biringer, father of Gary Biringer, owns Biringer Farm in Arlington, Wash. The farm has 75 acres of berry fields.

From June to July, when berries are in season, about 125 seasonal employees work for Biringer Farm as berry pickers. Supervisors scan microchips on the employees’ badges to track how many buckets of berries each employee picks.

Mike Biringer said traditionally in Washington, berry farms pay their employees by how much they pick rather than by hourly pay.

The field manager of the farm, Samantha Bond, said berry pickers can see how many buckets they have filled in a day. Employees can also see their average filling rate per hour because of the scanning system.

Some employees can make up to $30 per hour, but the average is $12 per hour, Bond said.

“If we paid by hour, there’s no incentive for the pickers to pick quickly,” Bond said. “We want to reward the pickers that pick faster and are more focused.”

Before Biringer Farm tracked berry pickers using the scanners, they would have to manually input information for each person into the computer.

Bond said when she first worked for Biringer Farm 13 years ago, employees were paid in cash for each bucket they filled. She would carry a few hundred dollars in cash around with her and pay them on the spot.

“We had dollar bills and people would drop them. There were dollar bills in the berry rows, and you had these bills that had strawberry all over them,” Bond said.

With the scanning system, people do not get paid in cash daily which is a drawback, Bond said. But the system is much more efficient and clean.

CONCLUSION

Troy Lenssen said he would not use the automatic calf feeders on his farm, but still thinks farmers using new technology is a good thing.

“Technology on farms in general is awesome,” Lenssen said.
Lara Sjogren can easily list the fruits and vegetables her children like. Sjogren’s three daughters eat pears, any type of berry, lettuce, cabbage and the list goes on. She grows some of these fruits and vegetables herself and relies on the farmers market for others. But the program helping Sjogren shop at the farmers market is changing.
Sjogren and her family are one of the nearly 1.9 million families who are part of the Farmers’ Market Nutrition Program, a federally funded program established in 1992 through the Supplemental Nutrition Program for Women, Children and Infants (WIC) providing checks to purchase fresh fruits and vegetables at farmers markets.

When Sjogren gave birth to her first daughter, Stevie, in 2004, she was new to Washington and WIC, she said. Now a mother of three, Sjogren and her husband are expecting their last child. Without the program’s benefits, Sjogren said she might not have been introduced to the farmers markets in the area right away.

When federal funding was cut in 2012, the Whatcom County Health Department WIC office received 720 checks, 40 percent less than the year before, according to a Farmers’ Market Nutrition Program allocation spreadsheet. The decrease led clinics to place restrictions on who can receive checks and how many each family can have, said Kelly Molaski, Whatcom County Health Department nutrition services supervisor.

The Bellingham SeaMar Community Health Center WIC office disperses its checks to clients on a first-come-first-served basis, but limits clients to $40 per family, said Teresa Coster, WIC supervisor at the Bellingham SeaMar Community Health Center.

“As the budget shrank, we shrank with it,” Coster said.

Checks can be used at authorized farmers markets from June 1 thru Oct. 31, according to the Washington’s Farmers’ Market Nutrition Program website.

The program is tremendously popular with everyone involved and there continues to be more demand than money for the program, said Steven Garrett, Farmers’ Market Nutrition Program coordinator.

In 2012, Sjogren’s family received just $20 worth of farmers market checks because only one of her children qualified for the benefits, she said.

The program aims to have clients come back to the farmers market, even when they no longer receive farmers market benefits, Garrett said.

Garrett said growers at Sullivans’ Homestead, one of the Olympia Farmers Market’s most popular vendors told him they see customers who were former WIC clients graduate college, find jobs and become regular customers.

The checks allow people who would not ordinarily shop at the farmers market to see what it is like and return if they enjoyed the experience, Sjogren said.

When people use their $20 checks at the market and decide they like it, if they are a low-income family, they can use their food stamps as well, Sjogren said.

“[WIC] gives them that information too because I think a lot of people do not know that their food stamps work there either,” Sjogren said.

In 2010, American farmers markets redeemed over $7.5 million from the Supplemental Nutrition Assistance Program (SNAP) also known as food stamps, according to SNAP’s Benefit Redemption Division’s annual report.

The program acts as a learning tool for people who do not know where their food comes from and introduces them to local farmers, Sjogren said.

“I definitely think people would survive without [the program]. But do I think it is a good idea not to have it? ‘No,’” Sjogren said.

People may never find a farmers market or even know they exist if not for the benefits they receive through WIC, Sjogren said.

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BOVINE HARVEST

STORY DAN LANGAGER | PHOTOS MARYANNE MURRAY
In 1997, Mark Van Mersbergen extracted a fertilized egg from a cow on his farm in Lynden, Wash. Then he froze it. The embryo resided in a liquid nitrogen tank at minus 320.8 degrees Fahrenheit until September 2011, when Van Mersbergen thawed it and implanted it into a surrogate cow. In June 2012, the surrogate gave birth to a healthy calf named Lucky. This means it was a seven-day-old fetus for 14 years, Van Mersbergen said.

“So in essence, its life was on hold for that period of time,” he said.
“We make milk, we pick berries and we sell genetics. We’re kind of a three-headed demon.”

Since the late 1970s, a process called embryo transfer has gained popularity among dairy farmers and beef producers in the U.S. and around the world, according to a 2002 report by Glenn Selk.

Embryo transfer refers to the collection, handling and transferring of fertilized eggs from a donor cow into a recipient using a nonsurgical recovery method called flushing, according to an article published in Animal Reproduction Science by John F. Hasler. The industry has grown rapidly both in the number of practitioners and of donor cows flushed. Today about a dozen farms in Whatcom County use the procedure.

Van Mersbergen, a third-generation Whatcom County farmer, began putting his cows through the embryo transfer process in 1980. Along with producing milk and growing raspberries, it has become an important part of the farm’s livelihood.

“We make milk, we pick berries and we sell genetics,” he said. “We’re kind of a three-headed demon.”

Van Mersbergen’s farm, Markwell Holsteins, now exports frozen embryos to countries around the world. He said he has infiltrated between 25 and 30 countries with his Holsteins’ genetics, including Brazil, Canada, China, Denmark, England, France, Ireland, Italy, Japan, Germany, Mexico, Norway, Spain, Switzerland and a few countries in Central America. His primary customers come from Canada, Germany and other European countries.

Embryo transfer technology has proven economically successful for both the veterinarians providing the services and the farmers who sell offspring for a profit, according to an article published by the Journal of Dairy Science by G.E. Seidel Jr. Cows bred from embryo transfer have a higher reproductive rate because farmers only use the most valuable offspring. This has resulted in a sharp increase of prices for top cows.

The value of the embryo depends on the genetic quality of the calf. The extracting process costs about $100 per embryo, Van Mersbergen said. The average sale price of Markwell embryos runs between $600 and $1,000, but they can sell for as low as $250 or as high as $5,000 per embryo.

In 2010, North America produced over 380,000 embryos, about 35 percent of the total worldwide production, according to the International Embryo Transfer Society.
trend toward more frozen than fresh embryo transfers has held constant since the mid 1990s.

Susan and Bud Van Dyk, owners of Van Dyk-S Holsteins in Lynden, Wash., hosted some of the first embryo transfers in Whatcom County on their farm in 1979. The Van Dyk's do not export their embryos; they transplant them into recipient cows, or occasionally freeze them for later use.

Susan Van Dyk said the best results come from implanting the fresh eggs immediately. Freezing allows them to keep extra embryos when no cows are ready to be impregnated, she said.

Controlling the genetics of cattle breeding has several specific benefits, according to the article by Seidel. With embryo transfer, high pregnancy rates can be achieved, as well as increasing and maintaining the genetic quality of the entire herd.

Landon Van Dyk, son of Susan and Bud Van Dyk, said it is through the practice of embryo transfer that cows give more milk today than they did 50 years ago. As a commercial dairy farm, their revenue is based mainly on milk, which they sell to Darigold. The farm has about 800 milking cows and 11 bulls. He said they do genetics as a hobby mainly to prove the quality of their herd.

"We're not genetically modifying the cows," he said. "We're just picking the better cows and breeding those."

Van Mersbergen said the average pregnancy rate for recipients is about two-thirds when using embryo transfer. With six eggs, maybe four pregnancies will occur that actually produce a calf. He said that is similar to the pregnancy rates when using frozen semen to breed a cow to become pregnant.

The milk and the genetics go hand in hand, Van Mersbergen said. Cattle that are more proficient, both productively and rep­roductively, have a higher sale value. He said he selects those cows for an embryo program.

Blake Bostrom, a veterinarian specializing in embryo transfer, said flushing one cow on average provides six fertile embryos. Donors are given a shot of naturally occurring hormones to make them produce multiple eggs. Once he confirms a donor to be pregnant, Bostrom allows the eggs to gestate for 7 days within the donor so they have time to get down through the oviducts and into the uterus, where they are flushed out.

The flushing process involves running a saline solution into the horn of the uterus and back out, bringing the embryos with it. Bostrom typically gives the donor an epidural shot to desensitize the last nerves in the spine without impairing motor function.

"When the rectum of the cow is relaxed,
I can grab hold of the uterus, just like I'm reaching through a blanket, and feel the ovaries," Bostrom said with his arm inside a cow.

He then transfers the fluid to a dish and locates the eggs under a microscope. It takes him about three hours to flush the donor, find the embryos and either freeze them or implant them in recipient heifers, young cows that have not had their first calf.

"A human embryo would look just about identical after seven days as a bovine embryo," he said.

Bostrom conducted his first embryo transfer at the Van Dyk farm in 1979. Now he has performed more than 5,000 flushes in Washington, Oregon, California and Texas. Since the industry has expanded all over the U.S., Bostrom now works primarily in Whatcom County.

The two main reasons to flush a cow are having a market to sell embryos and selling breeding stock to other farms, Bostrom said. Yet, he tries to discourage farmers from doing it purely from an economic standpoint. If the cow does not have high genetic value, the financial return will not be enough to offset the initial costs. He said it is impossible to know what he will get at any one time until he does the procedure.

"I tell people, and they don't like to hear this, but it's like fishing," Bostrom said with a laugh. "You can go to one place and it's good, you go there the next day and you can't catch a thing."

Susan Van Dyk said although there are risks, like flushing a cow and receiving no viable embryos, the costs usually tend to average out. She said while genetic quality is important, so are certain physical attributes.

A good cow needs to have a good set of feet and legs, a good rib cage so she can eat a lot and produce milk and a high udder with proper teat placement, Van Dyk said.

"We're in this business for a lifetime and so we need to make cows that we know are going to work and continue to work," Van Dyk said.

There is always risk to the donor, Van Mersbergen said. Select cows go through the steps to produce embryos, but there are times when they will never conceive again. A donor may be flushed for several years and continue to make offspring, but may lose the ability to carry a calf itself. The embryo transfer process allows donors to produce 50 to 60 eggs in their lifetime.

"They need to be physically in proper condition. The nutrition on the farm and being disease-free is on my shoulders," Van Mersbergen said.

Bostrom said although the process of embryo transfer has not changed much since he started were non-surgical implants and improvements in embryo freezing. He said another shift occurred when methods and equipment became standardized.

"The procedure got simpler and therefore less costly [for farmers]," Bostrom said. "The freezing was big for the marketing and sale of embryos."

Van Mersbergen said without selling embryos, he wouldn't be able to milk cows at all. The size of his farm, about 30 calves and heifers and 25 cows, would not have survived with just milk.

"I love the challenge of genetics and lining up blood lines and trying to help get the next generation to supersede the one before," Van Mersbergen said. "It's always been intriguing and that's why I do this."
THE PERFECT BERRY

STORY KATY VERWEST | PHOTOS TIM SEGUIN
Falling red raspberries
found in grocery stores across the United States are the result of a 14-year-long process of attempting to create the perfect berry in Washington. While bees in the raspberry fields of Whatcom County pollinate growing buds at random, plant researchers are pollinating buds with pollen from specially chosen raspberry breeds.

Farmers in Whatcom are partnering with Washington State University Puyallup to create the best possible berry. These researchers hope to create a strain of raspberries that will not only yield a more flavorful fruit but can also better withstand Northwest weather conditions.

According to the Whatcom Farm Friends website, more than 85 percent of Washington’s red raspberries and more than 65 percent of the nation’s red raspberries are grown in Whatcom. The County has 99 red raspberry growers, stretching out over 7,200 acres of farmland, raising the largest per capita crop of red raspberries in the world.

The amount of land used for raspberry production in the state has increased by about 200% between 1980 and 2006, according to an article in the International Journal of Fruit Science in 2009.

Patrick Moore, a plant breeder specializing in small fruit breeding and genetics at the Washington State University Puyallup Research and Extension Center, has been attempting to find and produce the perfect berry for years.

Some of the traits Moore looks for in a perfect berry are: flavor, firmness, appearance, a high yield, machine harvestable, root rot tolerant and resistance to raspberry bushy dwarf virus.

Raspberry bushy dwarf virus is a naturally-occurring, pollen- and seed-born virus that will infect vulnerable strains of raspberries and result in significant loss of production, according to an article in the Journal of Phytopathology by J. Spak and D. Kubelkova.

The virus will infect the whole plant in the course of a year, Moore said. It doesn’t change the appearance of the plant, but it does cause partial sterility of the flower and will produce fruit that’s crumbly or smaller than desired. Growers will have to replant their crops every 5 to 6 years rather than the average 10 to 12.

Ralph Minaker, a berry farmer in Everson, Wash, is one of the growers in the county who is raising new strains along with his annual crop.

The older varieties tend to weaken after many years and will start losing their productivity, Minaker said.

Researchers, such as Moore, identify 20 to 30 parents he wants to use each year and grows seedlings from those crosses. About 1 percent of the seedlings he makes are selected for evaluation.

After the parent plants are chosen, Moore will pollinate one of the raspberry buds with pollen from the other parent plant. A bag is then placed over the bud to keep any unwanted pollen from contaminating the plant. After a week, the buds begin to look like green raspberries.

The berry is then picked and placed into a vial with pectinase, an enzyme that will aid in the cleaning of the seed. Over the course of a day the seeds from the berry will fall off and settle to the bottom. These are the seeds of a potential new strain of raspberries.

Moore said the goal is to get 200 seeds per pollination and 100 actual seedlings.

“We don’t always do that but we sometimes get more than we need,” Moore said. “We’ve averaged roughly around 7,000 seedlings a year, and that’s about 4 acres.”

The seeds are then cleansed and planted in a greenhouse. The ones that do well are taken out to a WSU farm in Puyallup.
Two years after planting the young plants, the evaluation process really begins. Moore walks up and down the rows of raspberries evaluating each one individually.

"Given where we are, they need to have some level of root rot tolerance," Moore said. The farm has naturally high levels of root rot, so raspberries that survive are more likely to be resistant to root rot.

Along with looking for healthy and vigorous plants, Moore will evaluate the fruit based on color, size and appearance.

"All this is more or less while I’m walking down the row," Moore said. "Then I’ll actually touch a fruit, and judge the firmness and how well the fruit releases from the plant."

The raspberry bushes that pass his evaluation go into tissue culture so they can be multiplied quickly for additional testing.

"Sometimes he’ll say they’re resistant and they might not be. We’ll graft a couple plants just to make sure."

The new berry plants are first planted with a grower to see how well they machine harvest. Moore then travels to Whatcom weekly to evaluate the plants for adaptation to machine harvesting. At this point, the number of selections is reduced from about 100 to between 5 and 10. These are analyzed for their resistance to root rot and raspberry bushy dwarf virus.

To find out if a plant is resistant to raspberry bushy dwarf virus, it goes through a grafting process in a greenhouse. This process shows how susceptible the strain is to the virus. The terminal leaflet coming from the shoot of the new strain is cut out, and replaced with a leaflet from an infected plant. A pop bottle is placed over the plant to maintain high humidity for 2 weeks.

The plant remains in the greenhouse for another 4 weeks, and is then shipped down to a virus specialist in Corvallis, Wash. The virologist will then test the plants for the virus and be able to tell whether the strain is infected with the virus or not.

"Sometimes he’ll say they’re resistant and they might not be," Moore said. "We’ll graft a couple plants just to make sure."

When the plants come out clean, they are planted with a cooperating grower, and Moore will travel to Whatcom and evaluate the plants on a weekly basis during the summer.

From here, more strains are discarded while those that meet specific standards are brought back to tissue culture again. If the strains continue to meet expectations, they’re released to commercial growers and consumers who in turn introduce the new raspberries to the public.

The average time from when the pollina-
Researchers use cross-pollination to produce these new experimental strains that will be tested for disease resistance and other important characteristics. Researchers will cross hundreds of strains, but only about five will ultimately be tested in the field.

Small raspberry plants like these are raised in greenhouses before being transplanted by researchers into experimental fields. New strains of raspberries are typically tested for years before they are released to commercial farmers.

Moore said.

Cascade Delight, Cascade Bounty and Meeker are all strains created at the WSU Puyallup Research Center. Meeker, a strain released in 1967, is still the most commonly planted raspberry strain in both Washington and British Columbia, according to the article published in the International Journal of Fruit Science.

Even though the strains are being controlled and created, it's a fairly natural process for the berry plants to be made. "We're not genetically modifying," Minaker said. "That is a no-no in our industry."

Genetic modification is a process used to create new strains by altering the DNA of the plant itself. The new strains made in Puyallup are considered natural and not genetically modified.

"It's a whole can of worms that nobody wants to open," Minaker said. "There's one researcher that's [genetically modified plants] in Oregon and he's advised people to stay away from it."

Anu Singh-Cundy, a professor specializing in plant physiology and molecular biology at Western Washington University, said genetically engineering a plant is actually easy to do. In this process, the DNA from a favorable gene is actively put in the plant.

"We might take a gene for an antifreeze protein, a gene that makes a fish live in very, very cold water, and we can take the antifreeze protein and put it in a plant," Singh-Cundy said. "It's been done with strawberries and it makes the strawberry resistant to cold temperatures."

However, the method being used in Washington with raspberries is considered traditional and involves crossing plants that Mother Nature made, Singh-Cundy said.

"The genetic altering has been done but it's been absolutely taboo," Minaker said.

With the raspberry industry flourishing in Whatcom, researchers are continuing to look for a red raspberry strain that will fit all their expectations.

"They're looking for the perfect berry that might not ever happen, but we do look for something," Minaker said.

KATY VERWEST is a visual journalism major who has written for The Western Front and Klipsun magazine. She loves the universe and has an interest in astronomy.

TIM SEGUIN is a junior at Huxley College. He is pursuing a degree in environmental photography in conjunction with Western's art department.
Cloud Mountain Farm Center is a 20-acre farm in Everson WA. Founded as an apple orchard and garlic farm in 1978, the center has over 1,000 varieties of ornamental trees, fruits and vegetables crops grown using organic practices.
Cloud Mountain Farm was established on 20 acres of land in Everson, Wash. in 1978 by Tom and Cheryl Thornton. On July 1, 2011, Cloud Mountain Farm became a non-profit organization called Cloud Mountain Farm Center, a working farm dedicated to education, crop research and workshops for farmers and home gardeners.

In 2007, farmers between the ages of 23 and 34 operated 6 percent of the farms in Whatcom County according to the latest USDA agricultural census compiled in 2007 and released in 2009. Farmers also spent an average of 20.2 years working on their current operation. If nothing changes, according to these statistics, about 94 percent of the agricultural community in Whatcom County will be over the age of 50 in the next 15 to 20 years.

In order to address this age gap, the center is now training new and existing farmers as well as providing educational workshops for community and commercial farmers.

“Our focus really has become a lot more about education, which it always was – but as a for-profit business we didn’t really have the time to put into expanding programs or formalizing more of the education programs,” Thornton said.

Derek Long, executive director at Sustainable Connections and a board member for the center, said programs are open to farmers and the public, such as the Fall Fruit Festival in October. The community is invited to come out to the farm for a weekend of music, fun and fruit. This program really helps to solidify the value of local food and local farming through intimate interaction with a local farm. This is an opportunity for the public to come out to the farm and learn about, taste and enjoy over 200 fruits and fruit products.

Along with events like the Fall Fruit Festival, the center offers workshops on Saturdays. The workshops include topics such as growing fruit trees, growing stone fruits, making hard cider, organic fruit growing and orchard management. The center suggests a donation of $10 per workshop; all proceeds go directly back into the educational programs.

In addition to the workshops, the center offers 6- and 8-month internships for individuals wanting to learn farming techniques. Riley Gabriel, a former intern at the center, said interns spend about 8 hours per day on the farm 5 days a week learning skills and obtaining knowledge critical to the business of farming.

The current internship program is informal and is not a fully academic setting, she said. As of now the center has a list of topics the interns learn about through hands-on experience. In order for the program to be more successful, more structure is required, Gabriel said. The center plans on developing a more structured internship curriculum before winter 2012.

“That is definitely one of the things that I had to say to them when I was leaving,” Gabriel said. “I wished [the internship program] had been more structured.”

Though the program lacked structure, it provides a lot of one-on-one learning opportunities, Gabriel said.

There is also an individual project the interns are responsible for managing. This responsibility helps the interns take charge of their
learning, Gabriel conducted a strawberry propagation project, in which the strawberries were in pots and the runners hung down and were then cut and put into plugs, this increases production in comparison to bare-root strawberry plants, Gabriel said.

The center is still dealing with the transition from a fully working farm to a non-profit learning center, Gabriel said. Some of the staff at the center were more interested in their internship than others and stepped up to the plate, taking on teaching roles, Gabriel said. The internship program is a learning curve for everyone at the center, Gabriel said.

In addition to the internship program, which includes new farmer education, the center works with the public and existing farmers who need more resources such as technological assistance and crop trial information, Morange said. Farmers in Whatcom are already successful, but he said there is always room for improving business and business relationships.

The center works with existing farms and people involved or interested in agriculture to determine what topics people want to learn about most, he said.

The center maintains the working business production along with education and is currently pursuing crop variety trials for growing produce in the shoulder seasons, which are fall, winter and spring.

They are researching the yield per plant of different varieties during the shoulder seasons and looking for heartiness and their potential to be sold, Tom Thornton said, executive director at the center. Cloud Mountain Farm Center is working with Community Food Co-op, Whatcom Community Foundation, Washington State Department of Agriculture and Washington State University on their current research.

"There is a need for new crop trials to figure out which crops of which varieties, grown in which ways, can be the most productive and potentially most profitable for local farms," Long said.

People in Whatcom are right to think buying local foods from local farmers benefits them, Long said. Some of these benefits include healthy and nutritious food, economically supporting local farmers, preserving agricultural lands and keeping those lands economically viable.

"Consumers are eating it up," he said.

Cloud Mountain Farm Center played a critical role in working with about eight other farms to create a Community Supported Agriculture (CSA) program. The program serves large companies such as St. Joseph Hospital, Long said. Community Supported Agriculture is a way for the community to support local agriculture by purchasing a CSA subscription for $20 to $25 per week. Farmers bring you a selection of seasonal products harvested every week including produce and sometimes other food as well.

"That is opening a market that no single farmer could open on their own," Long said.

Education, public programs, internships, crop trials and CSAs are all things that Cloud Mountain Farm Center has been able to add since becoming a non-profit.

"It has been really great for Tom and me to know that it will continue on without us," Cheryl Thornton said.

SUSANNE LONGANECKER has attended Southern Oregon University and Western Washington University during her undergraduate studies. She is now applying to Huxley College to pursue a degree in environmental studies.

BILLIE WELLER is a visual journalism student at Western Washington University. She aspires to become a photojournalist and has taken photos for The Western Front.
Compost is a mixture of organic material, air, water and bulking agents commonly used as a soil additive. Compost has the potential to be contaminated with herbicides, leading to diminished growth or crop failures.

GHOST IN THE SOIL

STORY CARLA GALLAND | PHOTOS TIM SEGUIN

The Ghostbusters knew exactly how to use a dematerializer if they ever came across a ghost. Unfortunately, farmers in Whatcom County had no one to call when their own ghost came to visit.
In 2009 and 2010 Whatcom farms were hit hard when herbicides, chemicals intended to kill pest plants, were accidently mixed into various composts. According to ecological risk assessment final reports for the United States Department of Agriculture (USDA), aminopyralid and clopyralid are herbicides commonly used in weed management programs. These herbicides were sprayed in hay fields and the hay was sold to dairy farms to feed their livestock. The manure from the livestock was then used in compost and sold to various farms and gardens. Once there, the chemical-based herbicidal residue damaged plants sensitive to its effects, like tomatoes, beans and sunflowers to name a few.

A local grower, Mary Dumas, said she was very surprised at what happened to her plants. As a gardener for the last 32 years, she had never experienced something like this before.

"The beans were distorted but still producing fruit," she said. "The tomatoes were distorted."

Dumas said she uses compost because bringing in nutrients is an annual issue. She gets her compost from a local supplier in Whatcom. "I've used their [compost] before and I've used their [compost] after," she said.

However, this was the only time she ever had an issue.

Dumas said she still uses the same composter for her garden and strongly believes the situation to be an anomaly. Until this incident she had never thought about the lack of control the composters have over what is inside their compost sources.

Soil scientist Craig Cogger of the Washington State University (WSU) Puyallup Research and Extension Center said compost is a mixture of organic material with air, water and other decomposable materials. The organic material used is typically made up of waste such as manure, plant and yard debris. The result is rapid high-temperature decomposition. After a period of time, the end product is a fairly biologically stable humus-like material, which is a good soil additive; it is light and encourages growth in the soil, he said in an email interview.

Manure is one of many possible sources for composting, Cogger said. The benefits of using livestock manure include a large volume of organic matter of good particle size and it is fairly stable. The product either sustains or enhances oxygen availability in the soil while maintaining a high nutrient content. However, the process of composting manure results in a high temperature and low oxygen environment, he said.

When aminopyralid and clopyralid are in a composting environment, they are more resistant to breaking down.

"Leaves grew deformed and curled and production was heavily reduced or badly disfigured."
The popularity stems from a variety of factors, Cogger said. They are effective at low doses, their effects last a long time and there are few non-target species effects where they are typically used.

According to Clopyralid Effects on Yellow Starthistle and Nontarget Species, published in Weed Science, clopyralid was highly effective against invasive species and even though some non-target species were initially affected, they recovered. The study found the herbicide is exceedingly efficient and useful in management of certain types of pest plants, particularly in agricultural fields.

According to the ecological assessments mentioned earlier, these herbicides do not readily metabolize in mammals unless the dosage is in obscenely high concentrations. The LD50, which is the dosage of a given substance it would take to kill 50 percent of a set population, has not been reached due to the cap on usage set by the Environmental Protection Agency. The impact in this case is intended against plants.

What happened in Whatcom involved a lot of different steps, Cogger said. The herbicides were sprayed on the grass pastures which were used as feed for the dairy farms. From there the chemicals got into the manure. Composters then unknowingly used the manure in the compost.

“A lot of people noticed problems and it was fairly easy to trace it back [to the compost],” Cogger said.

Dumas said she found the blame toward the composters to be unfair. She still attests that this was an isolated incident and not the fault of the composter.

“I’ve been getting [my compost] from a local supplier that I really like and have never had any problem with, so this was an anomaly in my experience,” she said.

Cogger said even though the chemicals reduce production, farmers do not have to think of it as the end of their crops or soil.

“[The herbicide] will breakdown in the soil so it’s not permanent damage,” he said.

The research done at WSU Puyallup showed plants affected by clopyralid recovered back to normal production within two years.

Another soil scientist, Ian Burke of the
Soil scientist Craig Cogger compares different types of compost. When produced correctly, compost is a valuable soil additive.

EMU Topsoil's composting facility in Kingston, Wash. conducts quarterly tests for a broad spectrum of contaminants including E. coli, salmonella and herbicides.

WSU main campus in Pullman, has studied aminopyralid. He said in an email interview aminopyralid has a similar degradation rate as clopyralid.

An option to farmers, if they catch the contamination early on, is to grow non-sensitive plants since these herbicides attack broad-complex leaf plants, Cogger said.

According to the Clopyralid in Compost study, crops like corn, berries and fruit trees would not be affected by the herbicides.

Finding accountability for the contamination is not something easily done, Cogger said. They change hands many times between farmers, ranchers, truckers and plants. It is really akin to trying to track a ghost, he said in an email interview.

Some companies try to take preventative measures. EMU Topsoil's composting facility in Kingston, Wash. conducts quarterly tests for a broad spectrum of contaminants including E. coli, salmonella and herbicides. Diana Smith, the office manager, said it is especially important when they are producing anywhere from 500 to 1000 tons of compost per quarter.

A lack of accountability with chemical usage in agriculture is a root problem. Cogger said. There is no centralized database for those in the agriculture business to see what fields are using what chemicals.

Australia's Department of Sustainability, Environment, Water, Population and Communities has a website where users can go and search for regions where certain chemicals are applied. In addition, it lists the types of crops these chemicals are being used in. This set up could be an example the U.S. could follow. The USDA already has the National Agricultural Statistics Service website which does list chemical usage on various crops but it isn't narrowed by region.

If a centralized database was established in the U.S., it could possibly reduce chain contamination and even help specialized growers such as organic farms, Cogger said. Farmers would have more information about products used in their fields and how to properly steward them. This way "ghosts," like aminopyralid and clopyralid, would have no places to haunt.

CARLA GALLAND is a senior studying environmental science through Huxley College. She splits time between her field, military reserves and fictional writing. This is her first non-fiction work.

TIM SEGUIN is a junior at Huxley College. He is pursuing a degree in environmental photography in conjunction with Western's art department.
FROM THIN AIR: HARVESTING CO2
STORY CHRIS JESPERSEN | PHOTOS MARYANNE MURRAY

Western Washington University graduate student Zachary Thammasongsy has discovered a process that converts carbon dioxide into carbon monoxide using iron, one of the cheapest and most abundant metals on the planet. Working alongside Dr. John Gilbertson, his research was published in Inorganic Chemistry. His discovery could potentially lead to a new source of fuel.

HARD APPLES: BOBBING FOR VODKA
STORY ASHLEY SMITH | PHOTOS JACKSON LEE

BelleWood Acres, an apple orchard located in Lynden, Wash., recently ventured into the distilling business. Their first product: vodka made from apples. With over 25,000 trees in production, a portion of their harvest is put through a process of juicing, fermentation, distillation and bottling.

ON THE WEB

Visit the Planet website at http://planet.wwu.edu for exclusive online stories, additional photographs and other content!
“When tillage begins, other arts follow. The farmers, therefore, are the founders of human civilization.”

Daniel Webster