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Senior Capstone Class 2014

2015 SFBS Program Update

In the Spring of 2015, SFBS had 90 students enrolled, and 50 alums. We have had numerous student success stories, and are looking forward to hearing more from our most recent graduates. Please see the alumni update at the end of this newsletter to see what your former classmates are doing.

The curriculum is ever evolving to continuously expand and improve. Our learning outcomes emphasize systems thinking, critical thinking, problem solving, practical skill development, effective communication, the development of agency, and the development of a sustainable food and bioenergy systems body of knowledge.

Towne's Harvest is ending its 9th season. In 2014 it was named an Exemplary Project by the Association of Land Grant Universities. We are very proud of the impact THG has had on the Bozeman community since being initiated by students in 2006. Get ready for the 10th anniversary celebration of Towne's Harvest in 2016. This will be a great opportunity for an SFBS alumni reunion! See our website for current THG news: <http://townesharvest.montana.edu>.

The SFBS Advisory Committee is considering the need for future graduate programming in SFBS, how to contribute to additional interdisciplinary efforts at MSU, and how to continue bridging alternative and conventional approaches in agriculture and food systems.

Anna Diffenderfer is the current Program Coordinator for SFBS (anna.diffenderer@montana.edu). Alison Harmon is currently serving as the Interim Dean for the College of Education, Health, and Human Development at MSU, and will of course remain involved in SFBS. Patrick Hatfield has been selected to be the Department Head for Animal and Range Science. SFBS majors continue to be advised by Bill Dyer, Mac Burgess, Bruce Maxwell, Perry Miller, Carmen Byker Shanks, Selena Ahmed, and Patrick Hatfield.

See our website for current SFBS news: <http://www.sfbs.montana.edu>.

The Sustainable Food and Bioenergy Systems (SFBS) B.S. degree program is an exciting, innovative interdisciplinary program from Montana State University that promotes the sustainable production, distribution, and consumption of food and bioenergy. You will experience collaborative learning, directed coursework, and hands-on training as you progress through one of four program options:

•*Sustainable Food Systems Option*

Topics include food preparation and processing, distribution, nutrition and health, food access and policy.

•*Sustainable Crop Production Option*

Topics include agronomy, crop production, soils, horticulture, pest management, and greenhouse production.

•*Agroecology Option*

Topics include agroecosystem management, environmental policy making, applied ecology, climate change, and current issues at the intersection of agriculture and the environment.

•*Sustainable Livestock Production Option*

Students in all four SFBS options take a core curriculum of six courses designed to provide broad exposure to key principles of sustainable food and bioenergy systems. In addition, coursework in each option is specifically designed to create more detailed and subject-specific knowledge in your area of specialization. Students take complementary coursework in political science, economics, business, Native American studies, and engineering. Two internships allow you to gain exposure to 1) hands-on learning in market garden agronomy and food distribution, and 2) an in-depth internship with an experienced mentor in your chosen career field.

The SFBS Program at Montana State University combines classroom learning, research opportunities, and meaningful field experiences to prepare the next generation of leaders to take their places in the future of food and energy production in Montana and beyond.



Faculty photos top to bottom: Carmen Byker, Bill Dyer, Alison Harmon, Chaz Holt, Bruce Maxwell, Mac Burgess, Anna Diffenderfer

SFBS 2014 Capstone Project: Sustainable Strategies to Reduce Food Waste Using an Evidence-Based Approach

The 2014 SFBS 499 (Capstone) students embarked on a research and outreach journey to address one of the most pressing food system issues of our times: reducing food waste. They first developed partnerships with campus stakeholders and conducted a literature review to understand the importance, costs, and undesirable environmental impacts of food waste. They then developed a research study to measure pre- and post-consumer food waste in Miller Dining Hall, followed by the design and implementation of a food waste reduction intervention program. Research methods used in their study included quantification of food waste, observational analysis, administration of a behavioral survey, and quantitative and qualitative data analysis.

The baseline assessment found that, over a three-day sampling period, almost 18,000 lbs of food waste were generated from Miller Dining Hall alone. In an educational intervention program, students then distributed posters and flyers to educate Miller diners about the unnecessary costs and impacts associated with food waste, and that the diners themselves were a major part of the solution. Subsequent measurements following this intervention showed that the total amount of food waste was successfully reduced. Finally, Capstone students developed recommendations for reducing food waste on campus, including: incorporate an auditing program to optimize food usage, reduce portion sizes, conduct educational outreach, and initiate a compost program with pre-consumer food waste. Their results were presented to various stakeholder groups and at the Board for International Food and Agricultural Development (BIFAD) meeting held at MSU in April 2015, and several of their recommendations are already being implemented across campus. This project is thus an excellent example of students addressing and helping to solve a serious problem facing communities around the world.

2014 Senior Capstone Outreach Articles

The Value of Food

Aly Russel

It was my first big trip away from home and the first time I'd ever needed a passport. It was time to see a completely different corner of the world! I traveled to a quaint little village in High Atlas Mountains of Africa. The community of Zawaya Ahansal in Morocco became my home away from home for five weeks. This experience will forever reside in my heart.

I was one of thirteen students that had the incredible opportunity to travel to this purely spiritual place. In this remarkable community we experienced old-world farming first hand. We participated in the day-to-day lives that the people of this village without the luxuries of machinery and with minimal inputs. This community takes complete responsibility for their members' needs for food and other necessities. People here know how to provide for themselves by growing, preparing and storing food without any modern equipment. Their knowledge has all been passed through the generations and has an incredible amount of stories and culture tied to it. The biggest realization I had while I was in Morocco was the amount of food that is wasted – or lack there of. There was absolutely no food waste. All scraps and slightly spoiled foods are fed to livestock. Skins, bones, and organs of animals are used as tools. There was never food that was simply discarded as it is in our western culture here in the United States. Food is the result of their hard work and is cherished as such. The members of the community take care of one another. If anyone is short on food, other members pitch in to help. No one is left behind.

Compare the food system of Zawaya Ahansal to the United States. Hunger in America 2014 found that more than 46 million people rely on feeding programs of the Feeding America food banks every year (Stermer, 2014). An astonishing forty-six million people. Food waste now has risen to 1,400 kcals per



person per day or 150 trillion kcals per year (Hall, 2009). Food waste was found to have risen by 50% in the U.S. per capita since 1974. The issue of whether there is enough food to feed the world should not be blamed on the rising population completely, but the attitudes of the population to food such as how food is treated and respected. The disconnection between much of the U.S. and their food may be the reason for this lack of respect for food and what goes into producing it. If each of us took a part in thrashing wheat by our own hands to feed our families for the winter, we may think twice about throwing out 150 trillion kcals per year (Lappe, 2014).

If we began to take responsibility for our own food and worked hard to get it to our tables, would we respect it more and reduce our waste levels? Would we have a higher value put on our food if our own time and energy had gone into its presence? Witnessing a community that truly values their food was life changing for me. Such as community should be a model for our food system towards

sustainability. I look at the community of Zawaya Ahansal as a model for how food should be cherished and respected. I will always refer back to this community for how we all should embrace our food.

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Food as Medicine

Jacqueline Lebel

“You are what you eat,” a commonly used phrase that holds a lot of truth and weight when you compare the food and health system. With increasing costs of health care, the maintenance of our nutrition, diet, lifestyle, and overall health are becoming even more important. The professional field of natural medicine is one that I wanted to learn more about and explore its opportunities for nutrition and lifestyle counseling, to better improve overall health. Can food be treated as preventative medicine? And is poor quality food the root cause for illness and medicine demand? How has processed foods filled with synthetic ingredients, preservatives, and chemicals affected or endocrine system, hormones, and regulatory glands that orchestrate our health and well-being?

During the Summer of 2014 I interned with Dr. Breanna McElgunn at Gallatin Valley Natural Medicine based out of Bozeman, Montana as part of my SFBS 498 Internship. Here I gained a better understanding of the relationship between food systems health and human health. Through my experience, tasks and observations in the clinic, I learned a tremendous amount about natural medicine, private practice, and the increasing patient demand for alternative health options. While interning, we received numerous new patient requests daily. The majority of patients, were interested in a health care provider that looked at alternatives to synthetic medications, and had an awareness for preventative medicine and lifestyle enhancement. Dr. Breanna treated many different ailments ranging from mental disorders such as mood and depression, to endocrine and hormone

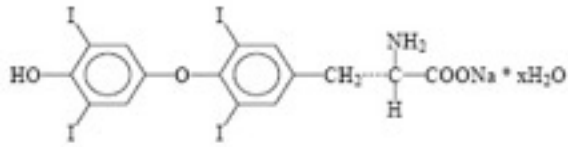
imbalance, to Lyme’s disease and parasitic infection. Although patient cases and treatments varied tremendously, the majority of patients treated were women with poor endocrine health. Estrogen, progesterone, and testosterone levels were assessed and treated with herbal, nutritional, dietary, and natural hormone replacements in the form of desiccated animal (specifically swine) glands. In addition to prescribing natural remedies, Dr. Breanna focused on lifestyle enhancement and preventative medicine. This is where my interests lie as I had a want to incorporate healthy food choices and sustainably conscious lifestyles to improve women’s health. Many patients suffering from hormone imbalances or glandular function failure had low levels of vitamins, minerals, and essential fatty acids over their lifetime due to a poor diet. Helping address and supplement for these deficiencies was a huge part of my internship. I created weekly handouts informative of foods high in certain vitamins and minerals. Additionally, each handout had a sustainability section, referencing local producers of vitamin rich vegetables and dairy products.

My internship work and external research increased my curiosity in the relationship between food and health evolution. In addition to the general evolution of the healthcare system, I also wondered if the transition of natural to synthetic medicines has been detrimental to overall well being and health in affected patients?

Like, agricultural systems, medicine and health care systems have changed drastically over time, mostly for the better. There is no question that hospitals with high-tech equipment is necessary for many emergency situations but, when it comes to lifelong ailments, more and more people are turning toward natural medicine. In a 1994 study done by American Druggist, Americans spent over 14 billion dollars on natural and alternative medicine for ailments such as bronchitis, arthritis, rheumatism, heart disease, pain, and high blood pressure (4).

Many natural remedies can treat common ailments such as endocrine system imbalances, hormone balance, anxiety, and depression. Along with herbal remedies, proper food and lifestyle choices can have a positive impact on health. These practices and remedies have been used long since technological improvements gave headway to western medicine. For many conditions that can be treated naturally, there are now synthetic options that are prescribed by physicians. One example that I observed extensively during my internship was thyroid medication used to treat hypothyroidism. Hypothyroidism is when the thyroid gland no longer

produces enough thyroid regulatory hormones. The thyroid's main function is to regulate metabolism. The



pituitary gland and the hypothalamus both control the thyroid. When T3 and T4 levels drop, the hypothalamus releases the TSH releasing hormone which alerts the pituitary gland to produce TSH. This chain of reactions initiates the production of thyroid hormones (5). Hypothyroidism can also be treated with a synthetic medication, levothyroxine. Long before levotyroxine was used, natural thyroid medication in the form of desiccated swine glands was used as a replacement medication, primarily due to their anatomical and physiological similarities to humans (1). This natural form, generic brand called Naturthroid, was the primary medication prescribed by Dr. Breanna.

We know that our diet and lifestyle can affect our health, and we have observed this throughout history. The shift from food staples to processed food procedures during the industrial and Neolithic periods have altered seven major nutritional areas in the American diet including, glycemic load, fatty acid composition, macronutrient composition, micronutrient density, acid-base balance, sodium-potassium ratio, and fiber content (3). As a Modern day society we collectively suffer from many ailments and diseases that are brought on through years of abuse and mismanagement of our diets and lifestyles. These ailments can be as minor as a cold to sever as diabetes or heart disease. It is common to ignore bad health until it becomes a problem, and then, we want to fix it fast, and effectively. This is where medicine, and intervention occurs. My curiosity and concern lies within the question of, why don't we treat our food as medicine? Why isn't there more emphasis on preventative medicine in our health care systems? Expenditures on out-of-pocket health care increased by 3.8 percent in 2012 to 328.2 billion dollars, primarily due to higher cost sharing and increased enrollment in consumer directed health plans such as natural medicine (2). This reflects a consumer demand in alternative options to the common. Many conditions driving the expenditures on health care could be prevented or maintained with proper diet and healthy active lifestyles. I will leave with this question. If our food didn't contain synthetic

ingredients and grown with synthetic inputs would we need synthetic medication? If we still ate local fresh organic foods regularly would we have the diseases we see today such as chronic heart disease, diabetes, and obesity? Would we really need medicine at all if we lived healthy lives and fueled our bodies with food grown and produced in the most natural way possible? Are you what you eat?

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Research and Sustainable Agriculture

Madison Nixon

Agricultural research is crucial for the advancement of sustainable agriculture. All scopes and ranges of agricultural research help improve the ways in which people worldwide produce food. In general, there is a disconnect between people and the food systems they rely on. This disconnect is in part due to a lack of public knowledge about the science behind agriculture. In addition, there is a gap between researchers and farmers and ranchers.

Science and research can be intimidating to people, myself included. Thanks to my employment and subsequent internship as an undergraduate research assistant in the Menalled Weed Ecology lab at MSU, I feel more comfortable with agricultural science and research. My SFBS 498 Internship allowed me to gain numerous professional skills, make contacts in my

field, and opened up a graduate study opportunity. After a few months working under graduate students on various agro-ecological projects, I realized that improving communication and relationships between researchers, consumers, and farmers and ranchers could improve food systems as a whole.

During my internship I assisted with projects regarding integrating grazers to reduce tillage, plant-soil feedbacks, biodiversity, ecosystem services, integrated pest management, herbicide resistant wild oat, community ecology of carabid beetles, and wheat stem curl mite movement in winter wheat. Agroecological research emphasizes the need to reconnect and strengthen the connection between ecosystem services and food production. Conventional agriculture relies on large quantities of seeds, pesticides, and machinery to produce one major output, yield. Agroecology has a different outlook on food production. Fabian Menalled says it well in that “farming is a socio-ecological systems level enterprise with systems level responses.” I learned that agricultural research is greatly improved by on-farm research. For instance, research sites for one project I worked on are located on various private farms in Big Sandy, MT. Graduate students communicate extensively with

*(Figure 1: Transplanting *Amaranthus retroflexus* in plant-soil feedback greenhouse study)*

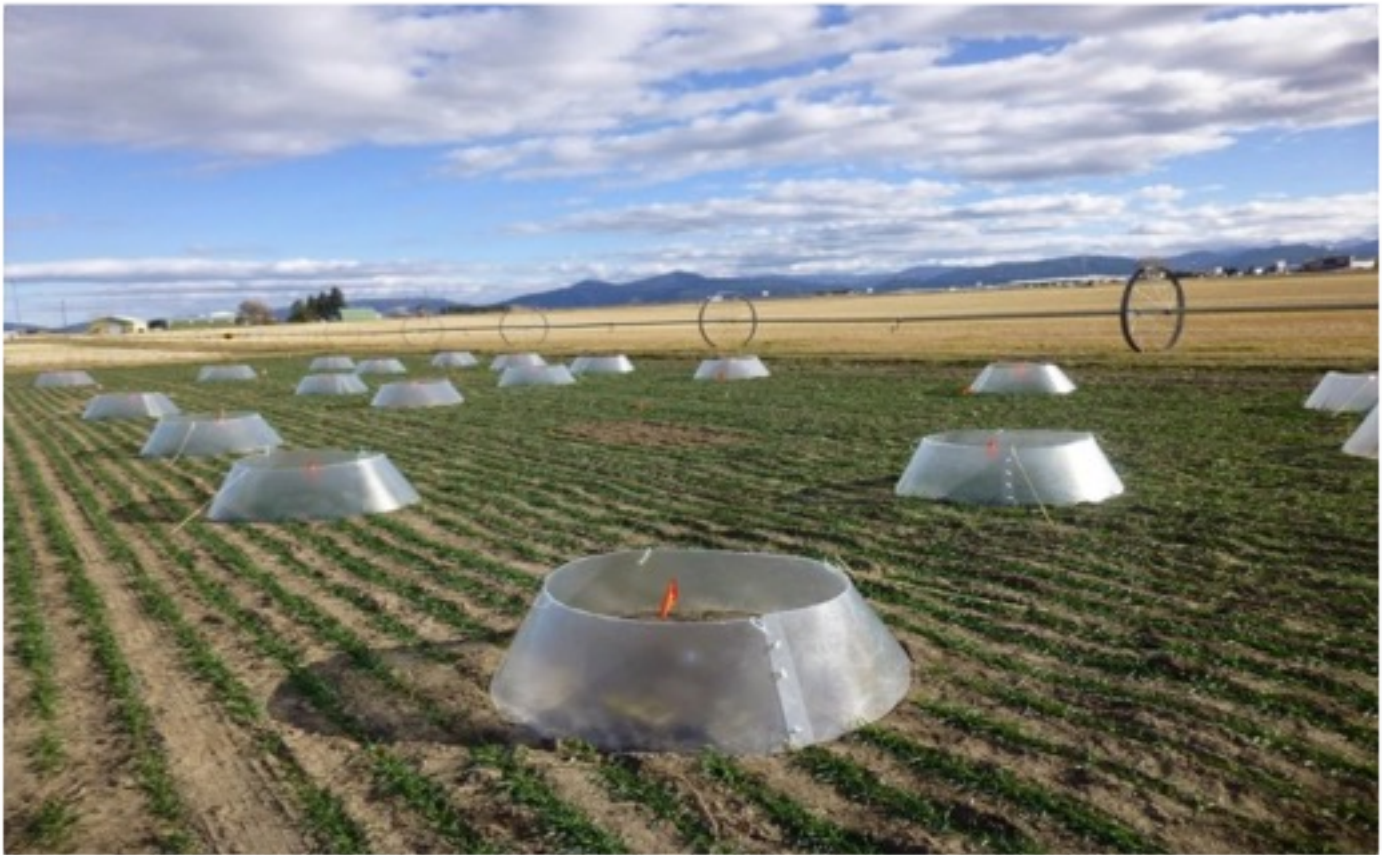
these farmers about the research being conducted as well as how results may affect the management of these individual farms. The efficacy of agricultural research is greatly improved when there is a bottom-up approach from on-farm research along with a top-down approach from public and private sector research. Results from one study showed that when the scope for farmer participation in research is increased, on-farm trial design improves due to important insights and practical information provided by farmers. The study also found that farmer participation in experimental design for on-farm trials requires less resources and time than diagnostic survey research as well as improving communication between scientists and farmers (Ashby, 1986).

Ecology utilizes and promotes systems thinking. Advances in technology have led to a ‘silver bullet’ approach to pest management common in modern agricultural systems. In order to move an agricultural system towards sustainability, researchers and

agricultural producers need to use systems thinking when addressing pest management. Treating a pest solely using ‘one big hammer’ such as spraying a pesticide will likely result in short term effects. Weeds cost farmers in the United States as much as \$20 billion dollars every year. There are over 300 weed biotypes in the world that have developed resistance to at least one of the major herbicide groups. (Yuan, 2007). Sustainability requires favorable long-term effects. System thinking allows researchers and land managers to test and apply ‘many little hammers’, such as a combination of cultural, mechanical, and chemical approaches to pest management. The stability of a system depends on the diversity of that system, which is influenced by the diversity of



management techniques. Research is one of the most effective ways to influence farmers and ranchers to use systems level thinking when making management decisions and on-farm research is the best way to test the efficacy of management techniques.



There are many resources available to Montana farmers and ranchers who would like to implement on-farm research in their operations. Montana State University Extension provides university research and a range of resources to assist agricultural producers. Sustainable Agricultural Research and Education (SARE) provides grants and educational resources to advance innovations in sustainable agriculture. A publication by the Sustainable Agriculture Network, "How to Conduct Research on Your Farm or Ranch" is a concise and useful guide to how to do on-farm crop, livestock, and marketing research at all scales (Anderson, 2004).

(Figure 2: Understanding the interactions of climate, cheatgrass, and a pathogen in dryland winter wheat production. My future graduate research)

In pursuit of just wanting to finish college, I found a program that has changed my future. I want to pursue a career in research and education to help move food systems toward sustainability, while strengthening relationships between agricultural producers, consumers, and researchers. The SFBS program has provided me with extensive education, but just as importantly with a positive attitude

towards my future and the future of agriculture and food systems.

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Sowing Seeds for the Farm to Table Movement: Days on an Organic Farm

Shane Cartularo

Producing fresh local vegetables is a demanding task for an organic farmer. The planning and dissection of what to grow, when to grow it, where to grow it and most importantly where it's going to end up introduces crucial problems that need careful planning. Whether it be produced for restaurants, hospitals, markets, grocery stores etc. the product and buyer has to be in place in order to be successful. Carefully planning a crop field takes diligence and knowledge that will furthermore affect the crop and its performance.

As I walked onto the field on my first day for my SFBS 498 Internship, Farmer Dave Quickel and myself stood facing the barren field as our boots sunk into the soft mud. He explained how the field was laid out the previous season as well as future plans for the upcoming season. In the distance I hear the sound of the mechanical seeder in the greenhouse as Neil works hard to get the seeds started in seed trays. This memory is embedded in my memories, for the field was transformed with every second of hard manual labor in hopes of producing quality products. The map of the 33-acre plot with crops in their corresponding locations was displayed in front of me, the due dates of when each crop should be in the ground and when they should be harvested. The field had been transformed as everything was in their corresponding spots and thriving. Praying for a good season and hope storms divert our path, it was time to find buyers. We had a handful of buyers from last season who were more than happy to buy again as long as the product was high quality and consistent.

As the health conscious and environmentally aware consumer base increases, fresh, local, organically produced products have seen an increase in a 15 percent average over the past eight years bringing a total of \$5.4 billion in 2006 (Dettmann, 2006). Dettmann explains the concept of organic produce as a 'gateway' product as consumers start off buying small organic quantities and soon increasing their organic purchases as if it were an addicting substance. Working first hand with customers that were buying our product, I saw that small purchases were made as a trial run for our product and as customers showed great interest in the product procured, the order lists became larger for us. For example; Chef Sevie Cartularo, executive

chef at Buono Appetito, was interested in our lettuce in hope to slowly switch over to organically produced vegetables to increase the flavor of his dishes. As customers devoured the salads, the interest of where the beautiful vibrant leaves came was apparent. The restaurant increased their orders for lettuce and soon started seeking out what else we had on the farm. I gave the owner of the restaurant a tour of the fields and greenhouses, pulling out carrots and onions, and popping off squash and tomatoes from their respected hosts to give a simple taste test. As I looked at the expression on the face of the owner as the carrots crunched and the tomatoes juiced in their mouths, eyes widened and basically speechless, I know the sale was made. The restaurant started buying more and more produce and their menu expanded with weekly specials. Customers seemed to greatly appreciate the farm to table movement and the customer base increased. While talking to the passionate chefs and owners, they explained that not only are customers coming back and profit is being made, but the quality has increased exponentially and the food increased in full fresh flavor.

Forty-three percent of consumers choosing organic food do so because of "better taste" (the organic center). Research made by The Organic Center explains that the organoleptic quality or organic fruits and vegetables may be higher due to higher levels of antioxidants the lower yields. Yield levels, and the availability of nitrogen to crops can alter the quality and nutritional content (The Organic Center). Customers were surprised with our organic tomatoes, realizing the increased flavor, juiciness, texture and vibrant color. Ethylene is a small hydrocarbon gas that is produced naturally as ripening occurs (WSU Tree Fruit Research and Extension Center). Tomatoes that are fresh picked off the vine tend to have those sweeter, juicer, textural properties as explained before are due to the fact that the fruit is naturally ripening and as they ripen, they take natural sugars from the plant. In a non-organic conventional system, most tomatoes are produced in large quantities and picked before they are ripe, and before those natural sugars are able get to the fruit. Some operations then take the unripe fruit and introduce them to ethylene gasses to ripen them and make them look red and inviting. The gas can be introduced by three different ways; gas from a cylinder, catalytic generators or by Ethephon, which is, a plant growth regulator applied to plant foliage by ground or aerial equipment. The simple fact is, that the fruit is not getting the natural nutrients and sugars needed in order to taste true. Furthermore, this is the

reason why a non-organic produced tomato may lack flavor, sweetness, and texture.

The time spent on the farm was not only a great learning experience but a rewarding one as well. As each day passed, my expansion of organic farming practices and marketing knowledge increased and my passion for food has become an obsession.

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Exploring Food Systems in Morocco

Alexander Koukov

I spent five weeks in a remote region of the High Atlas Mountains of Morocco in 2014 to carry out a food system analysis with a group of twelve students. For the first four weeks of the trip, we were repeatedly heard about the ancient process used by the locals to thresh wheat. As American students with agricultural educations, we did not know about methods for threshing wheat that aren't mechanized. On our last full day in the small village of Agudhim, on one of our last town walks, we came across a group of men setting up to perform the last thing that was left on our list to see, and not only did we get to watch, but we were encouraged to participate!

Our research in Zawiah Ahansal lead me to understand three primary food system and cultural concepts. The first is that the food system is at a critical point in development, and is extremely fragile. The second is that Western societies like ours have a great deal of practice that could be learned from remote societies like this. The final concept is that language barriers make it very difficult to connect with people on a personal level.

Food produced and processed outside of Zawiah Ahansal, and packaged junk foods are now regularly imported into Zawiah via the weekly market, or suq.

These foods are inexpensive, easily accessible and are being consumed at higher rates than ever before. These foods are calorically dense, contain ingredients that have never before been consumed by the native people and the negative effects of these foods have begun to surface relatively recently. Chronic disease and litter are the two main negative outcome that are becoming present. The culture does not inherently know about the proper methods of litter disposal, and although there are strong efforts towards mending this issue, it is very slow moving towards a cleaner environment as more and more trash is disposed of in any and all locations. Chronic disease is slowly becoming an issue, but it is clear that it has the potential to explode in the coming years. The majority of the sweets and processed foods that are sold in the region are sold to young children. Adults have not yet fully adopted these habits yet, but chronic diseases such as type-two diabetes and heart disease could, potentially plague the generation that is now young and healthy.

Our Western society has made many technological advancements that have made us live longer, healthier and stronger. However, do these advancements have the ability to last? Are they resilient? The practices that are used to produce sustenance for this Moroccan culture are efficient, effective, and sustainable. I believe that there's a great deal of information to learn from these sorts of systems all around to world, and these could provide our large system with better sustainability and more ethical practices. The food they produce has very low food miles, their waste levels are extremely low, and

the food that is grown there is consumed by whom it was grown by.

The most applicable lesson learned outside of the food systems realm regarded language barriers and communication. I learned that it is extremely difficult to have meaningful interactions with people if there are no shared languages between the two. My limited grasp on the French language (the third language of the area) was incredibly useful to me, as it allowed me to have conversations with community members without the need for a translator. Meaningful verbal interaction is no easier to have with a translator because the interactions do not feel at all authentic. This being said, after spending enough time with a person, even if you do not share a language, it is possible to evoke emotion out of any human and interact in a very meaningful, but less specific way. The majority of our group were able to exchange laughter and smiles with the members of the household that we were staying in by the end of our stay, but it did take multiple weeks for these interactions to blossom.

Five weeks in Zawiah Ahansal opened my eyes to the variability that the world has in terms of food systems and culture. It was an invaluable experience and I hope that my future holds more opportunities for me to do similar research in all parts of the world.

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Conservation Planning on a Montana Cattle Ranch

Caitlin Spencer

Water is a crucial component to any agricultural operation. Managing this resource then, is equally important. In the west, and Montana specifically, an increasing amount of ranchers are looking to outside entities in order to best manage this valuable resource. For my SFBS 498 Internship, I sought to better understand water conservation and



management first hand on a Montana ranch. Rosa Ranch is an example of one such ranch. Located in Willow Creek, Montana, Rosa Ranch is a cow-calf operation that raises Natural Red Angus Beef. In 2012, Rosa Ranch began a 10-year conservation journey with the National Resource Conservation Service in order to best manage their water and land resources. The National Resource Conservation Service, NRCS, is an entity under the United States Department of Agriculture that aims to aid agriculturalists with the knowledge and processes to ensure the highest level of resource management. The NRCS uses management planning to assess and identify the implementation of practices and activities needed to solve identified natural resource concerns (National Resource Conservation Service). Conservation plans are then developed and implemented to protect, conserve, and/or enhance natural resources with the client's social and economic interests and abilities in mind.

There are two water-related factors associated with western ranching that conservation programs generally focus on. The first is the provision of drinking water for livestock and the second is

irrigation of hay meadows for winter-feed. Small streams have long been documented as being significantly effected by the congregation of livestock, which has a negative effect on the riparian ecosystem (Freilich et al, 2003). In addition to livestock water, a second factor is the irrigation for hay meadows. Traditionally, much irrigation for this purpose was done through flood-irrigation. This method has a negative effect on the hay meadow as often times part of the field is significantly overwatered using this method, while other parts are left untouched. Therefore, water use in this method can be very inefficient (Freilich et al, 2003). By improving efficiencies in both of these areas time, money and labor can all be used more effectively (Gordon 2008).

At Rosa Ranch, the conservation strategy was conducted through an Integrated Water Management Plan. This strategy gathered data from pivots, soil moisture sensors and flow meters to measure water use on a specific twenty-acre hay meadow. At the end of the four-month irrigation season, this data was compiled and analyzed in order to identify periods of overwatering and under watering. Additionally, the plan included suggestions for more efficient watering techniques in future irrigation seasons. With this as a starting point, Rosa Ranch will continue to incorporate more methods of the conservation plan into action in future years. Some future improvements include fencing of certain ditches with small runs for watering purposes to decrease the negative impact of livestock congregation. Additionally, flood irrigation at Rosa Ranch is being replaced with wheeline, handline and pivot systems that are much more efficient in their use of water (Rosa Ranch Integrated Water Management Plan 2014). With these conservation goals in place, Rosa Ranch is committed to improving upon their operation over the next ten years in order to be the best managers as possible.

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U-Pick, I Pick, We all Pick

Dillon Bauernfeind

We have all been to grocery stores and have picked food from the shelves to place in our shopping cart and then proceed to stock our shelves at home, but how much do we know about that piece of food that is headed for our shelves and later our stomachs? Do we know where it came from? Do we know how it was treated? These are the questions that intrigue me as I try to figure out ways to reconnect people with their food. In a sense I want to reawaken that primal instinct of plucking fresh fruit from the trees or uprooting a carrots and potatoes from the soil. I want to establish a food system where the consumer knows exactly what they are ingesting and not knowing that it is just a red or green pepper they are eating, but rather a red or green pepper from Three Hearts Farm that was grown 15.2 miles away in a single membrane high tunnel by Dean Williamson using organic methods. This is the level of information that must be achieved for every piece of food consumed. This is why I believe targeting the primal instincts that dwell inside of all humans is the key to reestablishing a food system that doesn't lurk in the shadows. This is why I believe that U-Pick farms are the most useful tools to prompt a food system revolution.

The disconnect between people and their food is a growing gap that seems to go on forever. It has been created by chain grocery stores that stock their shelves with foods that have no information of how or where they were created; almost as if the food was made out of thin air. As we continue to by these products the more the distance increases of the food knowledge gap.

Integrating U-Pick farms into the food system is an expert way of bringing people to where the food is produced. The U-Pick operation allows visitors to step on to the farm, get their hands dirty and harvest food to eat, all the while absorbing the atmosphere of where their food has been living for the last few months. Reestablishing the connection of physically seeing where the food has been growing introduces

an even deeper, personal connection to the food that is desired. This connection is one that leads to many different lifestyle changes that have the potential to take place. I observed the connection take its rightful place back in to many walks of life last summer as part of my SFBS 498 Internship. It was thrilling to watch the children, with their red-stained faces, and their parents, with sore backs, work together to fill a plastic bucket of our strawberries. As I watched the families feverishly strip the plants of the ripe red treats, I begin to remember my first trip to a U-Pick farm as a child. On a frosty morning in fall, I was brought on a field trip to a place called Greenbluff. Having been told almost nothing about the field trip, I was eager to find out the days activities. I jumped off of the bus to meet the frost nipping at my nose. With cold appendages, I boarded the hay ride with the other kids in my class all while wondering where we were headed. As we rode through the orchard I plucked a golden delicious apple from one of the over-hanging limbs to nourish my early morning hunger. Crisp and refreshing, the golden delicious variety of apple was my favorite. We continued on until we approached a field covered in large, dead, brown leaves with vines stretching into the dirt road we were on. After quick picking instructions from the farmer my class and I flooded the fields to pick out the most perfect pumpkin we could find. There is nothing like finding and harvesting your very own pumpkin. A sense of pride washed over me as I hauled my oblong orange beast back to the hay trailer. At this very moment, I knew I wanted to pick all of my pumpkins and fruit from Greenbluff. As I grew older I made more trips to Greenbluff for locally grown produce that was far tastier than any other stores produce.

Working at Rocky Creek Farm reintroduced me to these values and the tradition of harvesting my own food while letting me interact with people to inform them of the food they are picking and about to consume.

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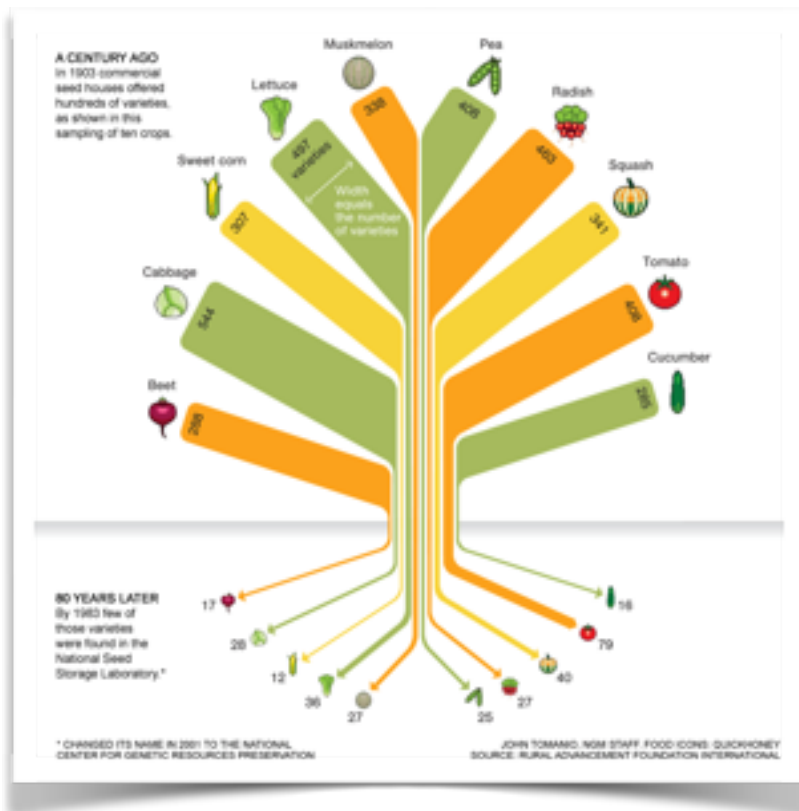
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Protecting Biodiversity

Talinna Appling

Across the country, an agriculture revolution is brewing as we become more aware of the positive impact local, sustainably grown foods have on our health and the environment. However, there is a vitally important aspect of this movement that deserves more attention, the loss of genetic diversity within our crops. According to The Food and Agriculture Organization of the United Nations, an estimated 75% of our crop diversity has been lost between the years 1900-2000. This is a staggering number that doesn't even take into account the last 15 years. The figure below gives a good illustration of lost vegetable diversity that has occurred in the U.S. There are many contributing factors that have led to this significant decrease in crop biodiversity: industrialized agriculture, monocultures, a decline in small farms and gardens, modern breeding methods, and an increasingly globalized diet are but a few (Khoury et al. 2014; Pautasso et al. 2013). The realization that local, diversified food systems are uniquely poised to help preserve and increase crop diversity prompted me to seek out knowledge of seed-saving and led me to Seed Savers Exchange for my internship. This article will discuss some key reasons to save seed as well as some beginning seed-saving tips.

Heirloom vs. Open-Pollinated vs. Hybrid. Before you dive head-first into seed saving, it is important to understand the difference between heirloom, open-pollinated, and hybrid plants. Seeds can be saved from open-pollinated or heirloom varieties and will come true to type as long as proper isolation methods have been followed. Open-pollinated simply means that the plants are pollinated by wind or insects and desired traits have been selected over time. All heirloom varieties are open pollinated but not all open pollinated varieties are necessarily heirlooms. Hybrid plants have been developed by deliberately crossing parents, often inbred lines, to obtain desired traits and increased vigor in the offspring. Although you can save seed from hybrids, the seed will not come true-to-type, meaning the plants will be highly



variable is size, flavor, vigor, yield, etc., or the seed will be sterile and simply not grow.

REASONS TO SAVE SEED

Preserve genetic diversity. The ability to breed or select new plants that can withstand changing climates and pest and disease pressures is dependent on having a broad base of genetic diversity within species. Open-pollinated varieties and wild relatives are often used in breeding programs as a source of new genetic material. In some cases, wild relatives of species are extinct and our source of variation is solely dependent on the preservation of existing varieties. One species where this is the case is cilantro, which is no longer found in the wild (Bashtanova & Flowers 2011). Collections made throughout the world by plant scientist Nikolai Vavilov early in the 20th century are now the only source of new genes for this herb (Bashtanova & Flowers 2011).

Adapt varieties to specific locations. The diversity within crop varieties was developed by our ancestors throughout the millennia by continuously selecting plants with desirable traits that performed the best in their environment. A revitalization of this practice

would allow farmers to select or even breed plants that are better adapted to regional conditions (drought or wind, etc.), agricultural practices (tillage, irrigation, etc.), and organic production systems (resistance to pests, nutrient use efficiency, or ability to out-compete weeds).

Provide food and shelter for pollinators. A diversity of flowering plants helps to promote a diversity of pollinators and beneficial insects by providing increased forage and shelter opportunities (Fruend et al. 2010). Allowing plants like radish, basil, onion, or parsnip to flower will attract more pollinators to your garden and enhance the overall resiliency of your farm.

BEGINNING SEED-SAVING TIPS

Start small. Pick one or two easy varieties to begin with such as lettuce, beans, or tomatoes. As you gain experience you can add varieties to your collection.

Be aware of isolation requirements. Each species is different in their isolation distances. Different methods for isolation include separation in space or flowering time, caging and bagging, and hand-pollination.

Collect seeds from a large population. Save seeds from as many plants as possible within a variety. Doing so will help to maintain the diversity and resiliency of your plants in future generations.

Keep good records. The more information you record, the better. Taking the time to document information about your seeds such as the original seed source, year of harvest, population size, photographs, and plant descriptions will help you develop a database of information for future reference.

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Returning to the Land

Bradley Schuler

Walking down the main street of Bridger Montana, for a quick moment in time I am the center of attention. Trucks driving down the road would slow down and men with cowboy hats would stare, perplexed, at me. Seeing a 22-year old in Bridger was rare. There were very few of them, male or female. Especially with long hair, sandals, rolled up hiking pants and the look of not enough showers and too much sun. The story of Bridger is being played out all over the state: rural communities with declining populations. The kids aren't coming back to the farm, farmers are getting older and older. The average age of the Bridger population was...well it was old, that's about all I know. Yet, there is a recent change that has caught the attention of many people; sustainable farming is bringing young people back into agriculture.

That's how I ended up in Bridger, because of an internship on a ranch three miles outside of town. The ranch produced organic beef, pork, wheat, alfalfa, and vegetables. Aside from raising a batch of turkeys, the real "ranching" was left to the owner and I spent most of the time in the vegetable garden. I was thrown into a lifestyle I often dreamed of, nothing but fields surrounding my little wall tent, mountains in the distance, no running water, and the joys of living off the grid and in rural Montana.



Organic farming has offered young people like me the opportunity to experience things we didn't grow up having, like a physical connection with the land. And, when conventional systems started to seem less and less attractive, the organic movement has reshaped farming as a whole into something more palatable. The *Journal of Agriculture and Environmental Ethics* state, "overall, conventional farmers report more stress in their lives although they also view themselves in a caretaker role for the land more than do the organic farmers. In contrast, organic farmers report more satisfaction with their lives, a greater concern for living ethically, and a stronger perception of community." This is a key point because it demonstrates that, although both sides share the same goal of making a good wage, organic farming may be more attractive for someone young because of a real or fake perception of greater happiness.

Within the lives of farmers, the rural communities play a major role in their happiness. An Australian study claimed, "engagement between farmers and town communities are important in maintaining rural populations and services along with both a strong local economy and environment." Personally, I got to experience that at farmers markets, specifically the Red Lodge Farmers Market. It was an event that, I kid you not, some members of the community had been

waiting months for. Everyone came out to buy some vegetables, meat, tacos, toys, baked good, but more importantly, talk with their neighbors and friends. Due to the isolated nature of living in a rural area, farmers markets offer a unique opportunity for the town folks of Red Lodge to see, talk and befriend their farmers. It is important for farmers of all types to feel that their work is important, because it really is; therefore farmers markets are a great way for producers to hear they are valued. There were also countless producers, mostly ranchers, who were not a part of the market, yet they would still drive into town to chat about their own gardens and compare their pictures with what we were offering. Farmers markets are a key to this new agriculture movement and they welcome any producer, conventional or organic.

Part of this movement is also based around a disconnect lots of the youth feels with the land, and a movement back towards it. For example, studies show that “the use of urban open spaces for parks and gardens is closely associated with environmental justice and equity”. The more living plants you see and the more gardens you get your hands in, the more environmental issues you will care about. Now, this doesn’t go for everyone, but for a lot of us it’s almost like reconnecting with the 12 year old in you. Getting your hands dirty and working long days in the sun is something a lot of us spent are whole childhoods doing and farming, to an extent, allows you to go back to those days.

Without the organic movement I would never have had the opportunity to connect with farming, and I know I am not alone. Now that I have seen it, I view both conventional and organic farming as positive, but more importantly, extremely necessary options for young people to take in life. So when I got all those funny looks and blank stares in Bridger, I felt really good about myself. I knew I was working just as long and as hard as those other ranchers, and it was empowering to feel a part of the community by the end of the summer.

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Sustainable Farming Integration Techniques

Erin Eisner

There is a growing awareness of the need to increase food supplies as the population rapidly expands. However, it is also apparent that the majority of current farming practices are detrimental to the environment as natural resources are depleted and pollution increases. In answering to these critical issues, many communities are turning to one another to satisfy their nutritional needs. Sourcing food locally is becoming more and more popular because buyers better know exactly how their food is produced, where it is coming from, and whether or not the production of that food is done in a way which improves the environment instead of causing it more harm.

Cloud Nine Farm is an example of an integrated farm producing wholesome vegetables and animal products to locals of the Gallatin Valley through sustainable farming practices that improve the environment in which they are grown. I had the

opportunity to experience sustainable integration farming techniques first hand at Cloud Nine Farm as part of my SFBS 498 internship. A few of these progressive practices include Earthworks, Keyline plowing, and Holistic Management. Earthworks consists of raising various berms along the farm's contour lines which build up snow in spring and winter and water in the fall and summer. This allows for more water to be harvested from the environment and used to create a greater functioning water cycle.

Keyline plowing is a special plow attached to a tractor that makes several cuts about eight inches into the soil while breaking up hardpans, lifting, and aerating the soil all across the farm. This is done every month to two months when the ground is plowable in order to allocate rainwater, snowmelt, and groundwater evenly across the farm to be more accessible to plants and improve soil quality.

The practice of holistic grazing management involves rotational grazing of livestock one to two times per week during the summer months. This prevents overgrazing, desertification, and soil compaction. It also allows for an even allocation of manure over various plots of land on a farm. By moving the animals so frequently, vegetation is allowed to regenerate and soils are not over fertilized or compacted. These plots can then be used to grow vegetables on the following summer with little to no additional soil amendments.

The farming practices implemented at Cloud Nine Farm illustrate just a handful of ways in which locally sourced foods can benefit the environment while supplying the surrounding community with healthy sustainable foods. If you care about how your food is produced, consider sourcing it locally, and getting to know the farmers in your area and the practices they follow.

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Children and Food Systems

Hannah Manthey

Teaching children about food systems while they are young is so important so that they grow up with an understanding of where their food comes from, and why it is important for these systems to be sustainable. That is why for my SFBS 498 Internship I decided to focus on educating children about healthy eating and food systems through multiple programs and fun activities.

My mentor, Christina McRae Holland is the program coordinator at the Gallatin Valley Extension Office. She helped me to tailor my internship experience to my specific interests. The three main programs that I chose to help with were the afterschool program at Hyalite Elementary, the Junior Master Gardener's summer camp (also at Hyalite), and the 4-H fair. I really enjoyed the afterschool program at Hyalite because I was in charge of preparing and implementing a fun lesson each week. Once, I brought two live chickens to the school. The children took turns holding the chickens, we talked about caring for chickens and the different parts of an egg.

In the summer I assisted Erin Jackson with the Junior Master Gardener's summer camp. This camp was a great way for children to experience the garden in it's height of productivity at a time when they would not normally be at school. Youth gardens are a very important tool for getting children to try new vegetables and learn where these foods come from (Meinen 2012). We used the garden as a tool to teach the kids about plants, insects, the environment and many other things.

This experience really helped me to see how effective these programs are at getting young kids thinking about their food systems. Children in the United States are not getting enough vegetables in their diets (USDA 2005), and active hands-on learning programs are helping to make a difference. I saw firsthand how children who are normally picky eaters were excited to try radishes and kale fresh from the garden. This is just the start. Farm to school initiatives are taking off all across the country (Izumi 2006). Many schools are showing more interest in these programs, but they need help getting the process started.

My internship experience really helped me to narrow down my specific interests and career goals. Because of that experience I feel as if I can better focus my knowledge on my next project. After graduation I hope to get a job in extension or working for a farm to school organization. I want to continue to focus on the important issue of educating children about food systems because I have seen the difference that it makes.

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A Closed-Loop Aquaponics System at Montana Roots

Thomas Bowers

If I told you there was way to grow food using 90% less water than traditional agriculture, used little to no artificial chemicals and who's main input is food

waste, what would you think? At my SFBS internship at Montana Roots I learned about 3 very different areas of life and how they work together to support each other. The three areas are growing plants hydroponically, raising fish, and raising black soldier flies. This method was taught to me by Sam Mascari, who runs the non-profit aquaponic greenhouse in Livingston Montana.

The first system is raising fish, but specifically how aquaponics works. Aquaponics is a way to raise fish and plants together with minimal inputs. The water is pumped through both systems and what each system adds to the water benefits the other. The fish are held in a 500 gallon tank. There are two main species in the in the tank, they are 4 massive koi and about 350 bluegill. There are also a species of bottom feeder that help keep the tank clean. There is a specific amount of fish relative to the amount of water in the system to keep the amount of nitrogen at optimum levels. What the fish add to the water is both ammonia and carbon dioxide. The Ammonia is then converted into nitrogen at a later step in the process. The fish is usually raised to be eaten, but due to strict Montana fish laws the fish at Montana Roots can only be harvested for personal use.

There are two types of growing beds. The first is the media growing bed. It is filled with nonreactive volcanic rock. This is because many other types of rock has a potential to influence the water chemistry. The first step in the process is that the water from the fish tank is pumped into the media bed. Bacteria that naturally form in the presence of ammonia then convert the ammonia first into nitrites and finally into plant usable nitrates. The majority of this reaction happens in the media bed, but it can occur anywhere wet and with all the ingredients necessary. The second beds are floating raft beds. These are Styrofoam rafts that float on top of a pool of about 6 inch deep water. There are air pumps every 3 feet that supply the roots with air. Montana Roots grows mostly leafy green vegetables like lettuce, mint, basil and bok choy. This is because they do the best with excess amounts of nitrogen in the system. There is only once pump for the entire system, so the energy use is minimal. The other thing that has to be powered are the green house fans, but this is an

energy cost that can't be avoided. One of the main benefits of going plants this way is the lack of inputs. Aquaponics uses 90% less water than traditional agriculture. The only other inputs that Montana roots uses is bi-weekly supplements of iron and potassium, some fish food, and neem oil for aphids.

The last component of the system is the black soldier flies. They are tropical wasp mimics. The adults have no mouth and does not feed on waste. They are also not associated with transmitting any diseases. Each female adult can lay around 900 eggs. One square meter of larvae can eat 15kg of waste daily. The flies convert the waste materials (things like food scraps, carrion and manure) into 42% protein, 34% fats and 5% calcium through their own body mass. The flies are also self-harvesting. Upon reaching their last stage of their larvae form they will climb out of the growing chamber using ridges built into it. They then fall into a 5 gallon bucket ready to process. They can be fed directly to the fish, but most of the time they are dried and ground up for immediate feeding or storage.

This method that uses three very different areas of life that can work together and create their own mini-ecosystem. While there are still some inputs, it small is far ahead of most types of modern agriculture. This is just one example of a closed loop system. By using and experimenting with these types of systems we can gain valuable information that can help society advance to a truly sustainable food system.

While several restaurants over the past several years have been working to purchase as many ingredients as they can from local sources, many others are going a step further and growing their own vegetables or raising their own livestock. This method raises the term "Farm-to-Table" to a much higher level. Incorporating gardening into a food service operation has many benefits and can be very successful in the Gallatin Valley.

When you think of cattle grazing on pasture or rangeland what do you envision? Big herds? Small herds? Are the cattle all clumped together or are they spread far apart? For most people who come from the western part of the country, have only seen cattle on large pastures or out on rangeland, they will

envision lots of cattle spread out over the land with quite a bit of space in between each animal. Now, how do you think the ground and forage looks on that rangeland or in those pastures? If you are outdoorsy, I imagine you have a pretty good idea because you have probably been out on land that has been grazed by cattle in such a way. There is bare ground in between each clump of grass, the grass looks stunted and there are brown stems coming from the plants even in spring. There are signs of erosion on steep hills, in gullies or by creeks. The picture I have just painted in your mind and the one that most people bring to mind when they think of what rangeland and dry-land pastures in the west currently looks like is not a pretty one. It is definitely not the same picture we envision when we think about what the west used to look like before fences and over 100 years of grazing cattle changed it.

Mob grazing: What is it?

Alyson Hicks

Most people contribute this change to over grazing; having too many cattle for too long on the rangeland or dryland pasture. But when we think of the time before cattle introduction, when bison and elk freely roamed the west, do we not envision large herds of these animals? Herds that stretched on for miles and consisted of thousands upon thousands of bison or elk? That is what I think of anyways when I envision how the west looked before cattle took over. So the question we must ask ourselves is what has changed between when land in the west could support such large herds of heavy ruminants to now? After this summer, and after taking a couple classes on the subject, I now believe the degradation of rangeland and pasture land in the west is not due to the number of cattle grazing it, but instead is due to the way these lands are being grazed.

What lead me to this conclusion is not an outstanding amount of scientific data, because it is hard to collect scientific data on such a large, multileveled, complicated scale, but because of first hand experience.

Last summer I interned for my SFBS 498 internship on a large cattle ranch in eastern Montana where they utilize mob grazing to both improve their grassland and to increase the stocking capacity of their ranch. Mob grazing is a super intensive grazing technique



that considers not only how many animals are on a piece of land but also for how long those animals are grazing that piece of land and how much rest that land receives before being grazed again. This leads us back to that image of huge herds of bison and elk spread out across the west before fences and cattle. These herds would bunch up into tightly packed groups because of predation threat and then would slowly graze the land, the whole time bunched tightly together and defecating on what they had just grazed [1]. Because of the remaining fecal matter spread fairly consistently over the ground, that land would not be grazed again by the same species of animal for at least 30 days. These are the grazing conditions that most native grass species in western America evolved in, and thus excel with.

The purpose of mob grazing is to recreate these conditions as best we can in a human dominated environment. Cattle and bison have similar grazing patterns and technique, but because there is not the amount of predation do to the decrease of large predator populations in the west the large ungulates no longer need to stay bunched together for safety [1]. Mob grazing recreates the effect predators would have on the large herds of wild ungulates by containing the cattle herds in tight bunches while they

graze. With mob grazing, stocking densities can range from 20,000-pounds per acre to 200,000-pounds per acre [2]. In most management settings this would be extremely detrimental to the land. However, there is another component to mob grazing that I mentioned earlier. This component is time. The amount of time that cattle graze a specific pasture or area of forage determines the outcome of the graze. In some mob grazing systems the bunch of cattle that are being mob grazed may be moved up to four times a day [2]. The ranch I interned on this summer moved two of their mob herds twice a day and their third mob herd once a day. The high stocking rates as well as the short grazing duration simulates the movement the herds of bison and elk would have made while grazing before the time of fences.

This intense impact not only does not allow the animals to re-graze a specific grass plant over and over again with only a few days in between but it also

only gives the animals enough time to eat each plant down 40 to 50 percent. This minimal consumption of each plant is what would have kept the grasslands of old from being overgrazed and this type of plant use is what the native grassland species evolved under [3]. The third component to mob grazing is rest. Rest is the amount of time between when a pasture gets grazed to when it gets grazed again. The time of rest needed for plants to regrow is completely species and situation dependent. Grasses on rangeland will need a lot more time to regrow before they can be grazed again than dry-land pasture grasses. Dry-land pasture grasses will need more rest than grasses under irrigation.

Each of these three main components of mob grazing are truly just the building blocks to a good mob grazing system. For mob grazing to be successfully utilized many aspects need to be considered. How many animals do you need to mob graze? What species make up your pasture or rangeland that you will be mob grazing? Will you need to graze that land more than once a year? What is the production level of your pastures? Once you figure out the answers to these questions and have a starting point to a mob grazing system the remaining aspects all depend on observation and changing the system to fit the

current needs. Ideally, a good mob graze will utilize 40 to 50 percent of every plant in the pasture that is being grazed. The remaining portion of each plant will be flattened and even slightly tilled into the ground, creating a carpet of grass that completely covers the ground. This traps moisture in the soil, which keeps the plants greener for longer. The slight tilling breaks the hard surface that can develop on the soil, which allows precipitation to enter more quickly and also helps the plant seeds penetrate into the soil. All of this combined will lead to pastures being greener for longer and reduced open ground in between each bunch of grass.

Here are photos I took last summer on the ranch I interned on. The first photo is a very good example of what a great mob graze should look like after the cattle have been removed from that section of pasture (Figure 1). The second photo is of grassland that has been under mob grazing for 5 years (Figure 2). The third photo is from the same ranch but from a section that they have not yet put into mob grazing (Figure 3).

If mob grazing becomes utilized more often in cattle production systems, I believe we will once again see great expanses of green, thick grasslands like the ones that would have been seen over 100 years ago. We will probably never go back to a time without fences or herds of thousands upon thousands of animals grazing together. But that does not mean we will never see healthy, productive grasslands again. cost for communities can be converted to a net benefit.

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How a Montana Rancher “Keeps it Local”

Trillium Memmer-Rahn

Cattle ranching: an idyllic impression of the Montana agriculturist. Many generations ago, cattle ranchers began movement in the west and found their niche in the new American world. Through much trial and error, Montana stock growers learned how to successfully raise their breeds. Today, the vast meat industry contributes significantly to the lives of producers and consumers and our food system stability on global and local scales. In fact, global beef production has increased 24%, that is 16 billion pounds, in the past 10 years, and predicting the next decade, we can expect to add another one billion consumers globally (Peck, 2009). Beef, like many other foods, is a commodity that we rarely keep local connection to despite the huge role cattle ranching and the meat industry play in Montana’s culture and economy (Goodwin & Holt, 1999).

In the face of the warnings we have received about health risks associated with red meat consumption, beef is a huge red meat staple to our food system (Piggott & Marsh, 2004). But as consumers begin to demand a healthier and more sustainable source of protein, there is a new trend infiltrating our local meat market—Naturally raised, grass-fed (and finished) beef.

Halfway through my undergrad career, I received an opportunity to embark on an internship with Crazy Mountain Grass-fed Beef (formerly known as Eagle Ridge Ranch Beef) based in Wilsall, Montana. I grew up in that area and carry a huge appreciation for Montana ranchers of all kinds, so it was intriguing to be brought on to a new project the ranch had begun. With the lighter steers left behind as the shipping trucks rolled out towards the feedlots to finish and process, what better a thing to do than finish the remaining youngsters on native grasses right at home?

Eagle Ridge Ranch operates primarily according to conventional agricultural standards. That is, Black Angus calves are born in the spring and shipped to the feed lots in the fall. This allows an opportunity for the newer local grass-fed beef business to “piggy-back” on the conventional, more lucrative business.

For a rancher interested in raising grass-fed/finished beef, this is a very sustainable way to manage the businesses side-by-side. The grass-fed calves are not treated with any hormones or antibiotics. However, if one of these animals were to become sick and require certain kinds of medicine, there is no hesitation to treat the sick calf and return it back to the conventional herd. This results in minimal profit loss for the ranch as a whole. After roughly 26 months, when the grass-fed cows are grown, they are processed and packed no further away than Columbus, Montana. That means that the food miles associated with grass-fed beef from Crazy Mountain Grass-fed Beef is barely 200 miles!

I quickly learned how to deliver the increasingly desired completely natural and grass finished beef to the local market very directly. With a pick up loaded with a small folding table, an “easy- up” tent that was not that easy to put up, a big cooler packed full of frozen meat and dry ice, a big sign, and some other promotional props, I headed to the local farmers markets twice a week. Week after week I learned that competition is stiff, and selling unfrozen beef is actually not easy whatsoever. Like many small businesses, this one was not self-sufficient at first. However, selling the basic idea of healthy beef is totally doable, and that became my favorite part. I learned that customers do actually crave a face-to-face interaction with the people who deliver their food to them, even if they are not actually buying anything at the time. If you are interested in purchasing healthy beef or would like more information, please visit crazymountaingrassfedbeef.com

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My Summer on the Farm

Cassady Daley

Arriving at Raven Ridge Farms in Kalispell, MT not sure of what exactly I was getting myself into. First of all, no one around the area even knew that it existed. Second, I didn't really know that much about farming. Despite all the uncertainty, I was ready for whatever was coming my direction.

As part of my SFBS 498 internship, I worked at Raven Ridge Farms for a woman named Val. Her small farm was two miles east of town. It was just us and her 6-month old daughter in the field to begin with. When I arrived, the farm was in desperate need of another set of hands and I acclimated quickly to the tasks at hand. Much of my time at the beginning of the season was spent weeding. Carrots, beets, onions- you name it. Another early task was that of planting. I planted all of the squashes and melons, learned the process of seeding, and direct seeding for greens. The farm was run similar to other small-scale farms that I had seen and I immediately felt at home and loved the place.

Each week on Monday between 4-7 pm CSA members would come to the farm to pick up their shares. This was a very interesting process because I had never seen anyone run a CSA this way. We would harvest and clean all day before they got there and then create a board with the weeks pickings. These would all be laid out in a U-shape in the distribution shed and the members picked their own produce at the quantities listed on the board. There was a huge system of trust because we would still be working much of the time that they were there so we weren't directing them on what to do or how to do it.

The other outlet that we had for marketing was at the local farmers market and small restaurants in the area. It was interesting to be at the market because it was very evident which farmers were more successful in selling their produce. Research has been done regarding the different levels of agriculture (from small to large) and which markets they target. The larger scaled local farms are more focused on intermediate sales at the local level while smaller and medium sized farms are focused on the “direct-to-consumer” channels (Low, Vogel 2011). When being on the producer level in a small scale system, it is definitely a clear pattern. The same research also noted that local systems were more centralized in proximity to

urban centers and in the Northeast and West Coast of the United States (Low, Vogel 2011).



Living in Montana, there is a huge issue with figuring out what exactly sustainable agriculture is. Is sustainable agriculture the existence of a local system or being financially stable as a farmer? Or is it a community involvement, that in reality lasts only a short duration of the year because of seasonality. Though there are these issues, my experience on the farm this summer made me believe that small-scale agriculture in Montana is sustainable and an overall powerful thing. It is vital for Montana residents to understand the seasonality that is our food system. Many studies have delved into the issue of transparency for consumers. When a grocery store is fully stocked with produce, it's hard to understand that this isn't the most sustainable avenue for consumption of food (Peters 1997). There needs to be education to consumers about where food comes from and the human and environmental impact different growing techniques have.

Farming last summer and working at markets made me even more aware of what is really happening at the base level of the food system. As consumers, we see food and don't always consider what the actual cost of growing it is. As the globalized food system becomes more of the norm, less connection to our food is going to be an even bigger concern (Peters 1997). It is on our generation, the people studying sustainability in different realms, to be aware and share the gift of knowledge.

Small-scale farming has many positives but it's not an easy endeavor. In the United States we are lucky to have a backing for this type of system. As the youth around the world, especially in rural regions of developing countries enter the workforce, the largest employment opportunity is in small-scale agriculture (White 2012). Though there is the most opportunity here, many younger people are not interested in

agriculture and want to enter the urban setting. It is partially the responsibility of the developed nations to support and encourage small scale agriculture in these places because as we have noted (and have begun making the shift) it is the future of our food system.

It was an incredible experience that inspired me to be a farmer. In my experience I was able to figure out how my values could be translated into the food system. To me, having the opportunity to work as a farm intern was one of the strongest points of the SFBS program so far. I found my passion in the dirt and hard work and how gratifying it was to sell food to people who genuinely cared about where their food was coming from and how it was produced.

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Alumni Updates

Olin Erickson is working as a sanitarian with the Lake County Environmental Health Department in Montana.

Tim Reusch previously worked as a research coordinator and organic program manager for Edible Garden in Belvidere, New Jersey. This summer Tim got married in Scotland and moved to Seattle where he is working as the western technical manager for Dramm.

Michael True is working as a Peace Corps volunteer in Senagal, West Africa.

Cassady Daley is farming near Kalispell Montana.

Tarra Culbertson works for Alpha Dominche, a manufacturer of commercial brewing machines for tea and coffee, located in Salt Lake City, UT. See: <http://alphadominche.com/>

Claire Slosson lives in Paso Robles, CA and is working on a 50 acre biodynamic farm. She manages the farm store, the nursery and the office.

Dylan Strike is very successfully operating Running Strike Farm in Bozeman MT, selling at local markets and through a CSA. See: <http://www.runningstrikefarms.com/>.

Candace Moyer is in the first year of her MS degree program in Sustainable Food Systems at MSU, developing curricula for new farmers.

Kara Landolfi is in the second year of her MS degree program in Sustainable Food Systems at MSU and has been managing the marketing of Towne's Harvest garden for the past 2 seasons.

Alyson Hicks-Lynch is moving to La Grande, OR to work on an MS degree in Rangeland Science at Oregon State University.

Liz (Wise) Carr has opened a restaurant in Hobson MT--Tall Boys Tavern. See: <http://tallboystavern.com/>

John Thiebes has returned to Montana and is working on the family farm in Carter. He has a particular interest in meat birds.

Jacqui Lebel is living in Truckee, CA and working toward her career in medicine.

Jill McIntyre is an AmeriCorps VISTA, working with the Blackstone LaunchPad at MSU. See: <http://www.montana.edu/launchpad/>

Ben Shepard is operating Mountain Mycoworks: Ambassadors to the fifth kingdom in Bozeman MT. See <http://www.mountainmycoworks.com/>

Caitlin Spencer has been working at Rosa Ranch in Willow Creek MT, and has been nominated for a Rhodes Scholarship to continue her education at the University of Oxford.

Have an update? Send it to Alison Harmon harmon@montana.edu. We would love to hear from you