Entrepreneurial Sustainable Agriculture -ESA-Curriculum-

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-ESA Curriculum-

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Entrepreneurial Sustainable Agriculture Curriculum (ESAC) Manual

This educational manual introduces and helps producers understand and practice sustainable agriculture production methods from a business approach. To teach and/or facilitate an integrated approach to sustainable agriculture, this ESAC uses an interdisciplinary approach from different disciplines, including entrepreneurship, management, business, economy, sociology, agro-ecology, agro-forestry, animal science, and rural community development. However, it primarily supports agro-ecology as the discipline leading to sustainable agriculture systems to enhance farmers' profitability, community social impact and sustainability of natural resources.

Based on a sample of 128 small and medium producers in Missouri and USDA secondary data of other small and medium producers in the United States of America (USDA census of agriculture 2012), this manual contributes to the argument that most small and medium producers around the world are unable to profit from their farming activities and still need to find an off-farm income to sustain their household operations (FAO 2011). This Entrepreneurial Sustainable Agriculture (ESA) manual also seeks to inform all types of farmers and ranchers, including large producers who might have profitable systems, as well as fast and easy access to new research discoveries and direct support from Extension programs and USDA programs in the United States.

Entrepreneurial Sustainable Agriculture (ESA) education offered in this instructional manual is a research-based approach, it focus on enhancing the understanding of sustainable agriculture as a response to the lack of skills and knowledge observed among data collected from 128 Latino producers in Missouri.

This manual will help producers to increase their knowledge and understanding of agro-ecological production practices and sustainable livestock grazing methods. If producers adopt them as a way of farming, eventually it will positively impact their lives. By practicing these production systems, producers will not only be able to regenerate natural resources, currently in early stages of becoming scarce, but they will be able to manage and sustain their soils, water and level of emissions into the air surrounding their farm and ranches.

This manual assists producers in acquiring knowledge and understanding of business and production strategies to increase farm and ranch profitability. At the end of the manual, producers with weak connections to farming and ranching resources will also learn about different strategies to improve their integration into local communities by using a farmer and community capital framework learning approach. This leadership approach to communities allows producers to increase their understanding about how to connect with community resources for their farms and how to connect to other community capitals. By sustaining these types of mentoring and teaching interactions, producers eventually start feeling part of community, experiencing a sense of belonging.

This ESA educational manual is an innovative approach to enter the agri-food business and continue evolving agri-food businesses with a sense of community ecology. Instruction is based on four pillars that frame the Entrepreneurial Sustainable Agriculture educational model. First, ESA uses an educational model approach as follows: one educational session focused on enhancing producers' understanding of sustainable agriculture and their business approach to their farms and ranches: producers will be able to understand the entrepreneurial side of their operations. A second session will help them to

increase skills and knowledge about sustainable farming and ranching production methods by teaching them agro-ecological principles and holistic livestock grazing techniques which enhance the *sustainability of natural resources on their farms and ranches.* A third session focuses on developing producers' business capacity by focusing on developing their financial and marketing capacities; it allows them to *increase their farms' and ranches' profitability.* Finally, a fourth educational session in this ESA manual model assists producers in understanding the socio-economic side of their operations, teaching them a community capitals approach to comprehending how their farms and ranches can connect with the social and economic life in their local communities; this contributes to sustaining the *community's social and economic development* as a whole.

Further, this ESA educational approach includes a series of 4 on-farm and ranch demonstration activities, which are also referred to as 'hands on' working activities that give producers a real-world day-by-day experience in an agro-ecological, organic or sustainable operation. By exposing producers to these farming and ranching experiences, they will be able to strengthen their social and business networks, create ties with experienced farmers and ranchers, acquire new production skills, enhance their understanding about sustainable production methods and have a lot of fun while learning how they will be able to bring those experienced ways of producing into their own farms and ranches.

How was this ESA manual created?

An assessment of Latino farmers and ranchers about how they perceive and practice sustainable agriculture was used to build this curriculum. The educational sessions in this curriculum manual are based on findings from qualitative and

quantitative research data collected in summer and fall of 2016 and 2018. As an initial stage to explore learning needs, skills and knowledge of Latino producers, we used focus group interviews. Then, in a second stage, we used a survey interview instrument, which was designed with data collected from focus groups during stage one. Latino farmers and ranchers' skills, knowledge, attitudes and perceptions about sustainable production methods were analyzed among 100 Latino producers in Missouri during year two of the program. The findings were used to validate and focus on specific learning needs to increase skills and knowledge of Latino producers in Missouri. In year three, we replicated the survey to producers interviewed in year one; we also were able to reach additional producers to increase the validity of our data.

This three-year research program was funded by the North Central Region Sustainable Agriculture (NCRSARE) to provide on-farm education and document Latino farmers and ranchers' production methods and perceptions about sustainable agriculture. Instructors of sustainable production methods, among new and beginning farmers and ranchers, face a bigger challenge than teaching sustainable production methods to college students and other audiences. This manual is designed to meet many small and medium farmers' needs in skill and knowledge about entering and following sustainable production methods in agriculture. It also helps those farmers and ranchers who are already practicing conventional production methods and are willing to transition and follow a path to produce results using sustainable agro-ecological production methods. Other producers who mix farming and ranching activities will also benefit from this manual.

The outline of topics covered by this initial draft curriculum has some changes with respect to the original draft proposed in year one of the program. It is created after completing two cross-sectional interview surveys and reaching a total of 128 Latino producers in Missouri.

How to instruct farmers and ranchers with this curriculum-manual?

In order to educate farmers and ranchers using this manual, it is recommended to explore and to know more about the demographic and production profile of the participants taking the instruction sessions. The curriculum is designed for use inside classrooms and for on-farm and ranch demonstrations.

Based on past experiences in teaching a previous curriculum, it was observed that, for maximum information absorption and comprehension, the educational level of the audience must be considered beforehand, and it must influence the design of the instruction of the curriculum. For instance, if an initial assessment of the socio-economic profile of the targeted audience shows a low level of formal education, pour or low skills in the topics to be presented, then the teaching approach needs to be adjusted to make sense to the audience, meet each producer where they are at in the process. Many small and medium producers coming from minority groups in the United States are most likely expected to fit within these socio-economic and production indicators.

Based on the demographic profile of our intended audience, this curriculum manual is designed to be shared/presented as outlined below:

- 4 in-classroom sessions
    - Each session should include a leadership section to help producers connect with farming and ranching resources

regarding the specific topic covered in the session. For example, in session one, a representative from a local agency might be able to help lead participants through the process of starting and registering farms and ranches with local business resources. Session two will need an Extension service professional to help producers connect with technical and advising production services. The business leadership section, session three, can be facilitated by Extension small business specialists and/or Extension economic development programs. Session four links the previous three sessions and requires showing producers how to integrate all the capacities covered in the previous sessions.

- 4 on-farm demonstrations
    - Local farms and ranches practicing sustainable agriculture or organic farming methods are required to be hosts for on-site teaching farm visits.

Entrepreneurial Sustainable Agriculture Curriculum Content

1. Session One: Understanding Sustainable Agriculture Entrepreneurship Philosophy

2. Session 2: Production and Sustainability of Natural Resources

1. Session One: Understanding Sustainable Agriculture Entrepreneurship Philosophy

Picture source: Barbados entrepreneurship foundation

1.1. Farming and Ranching Entrepreneurship

There are many ways to start farming and ranching, some of them easier than others. Some new and beginning farmers find themselves involved in farming activities because they bought real state property with acreage on it. For many others, farming and ranching has been a dream they have pursued since they, or their ancestors, immigrated to this country and the opportunity to farm or ranch arose. From a sample of 128 Latino farmers and ranchers collected in two surveying stages, one in 2016 and other in 2018, 45% argued that farming and ranching is a cultural heritage; "it runs in my blood," some of them mentioned. Self-employment was second with 23%.

One of the larger challenges that most small and medium sized farms currently have is understanding the production and socio-economic sustainability of their

operations. In most cases, farming and ranching activities are seen as the piggy bank of the household and a way to reduce food expenses. Producers who own ranches consider their livestock as a savings account--when there is a need in the household, the livestock is sold in local auctions. Small producers are gardeners who don't own large acreage, but have a good-sized back yard, in rural or semi-urban areas, where they grow seasonal crops. Some of these gardeners have grown local networks of people in their communities who regularly come to their gardens to buy fresh produce products. Other gardeners produce for self-consumption, reducing their grocery bill. This way of farming and ranching is becoming customary among many small and medium producers who are unable to make a full-time living out of their farming activities.

Becoming an entrepreneur in the agriculture industry entails large challenges. There are a lot of small and medium producers who have entered farming with big enthusiasm, some of them starting with a back-yard garden, others buying a few acres for livestock activities. After working for a short period of time in farming or ranching, some of them find out that this work is not for them. Those who stay in farming soon find out that it is not easy to grow their business; they usually remain the same exact size of operation they started out as if they are unable to find the right education and resources with which to grow.

Some of the main challenges reported by small and medium producers are:

- Increasing farm and ranch profitability. Most small and medium producers have an off-farm primary source of income. Being unable to sustain a consistent full-time income from the farm limits their farming success.

- Developing habits and skills to manage financial and production records.
- Accessing financial resources with flexible payments.
- Accessing farm equipment.
- Growing their marketing capacities.
- Increasing their access to community resources.
- Accessing learning resources customized for small to medium producers which enhance their skills and knowledge about sustainable production methods. Learning resources access is a direct link to their ability to communicate in the English language.

Farming and ranching entrepreneurship challenges are addressed further later in this manual.

1.2. Entrepreneurship Farming Resilience

Why are small and medium producers persisting in farming and ranching activities?

Most small and medium producers are in some way finding their path for doing agricultural business or are still developing their entrepreneurial mind-set. Based on a sample of 128 Latino producers in Missouri, most producers have started their production activities mainly because farming and ranching was a way of living for them; when they immigrated to the United States, they brought this vocational heritage with them. A few of them argued that their main intention was to increase household income or find an alternative part-time job activity. All of them responded face-to-face surveys that a proportion of their household income is provided by their farming and ranching activities.

In an analysis to understand their entrepreneurial resilience for doing farming and ranching activities some of main challenges these producers have is the lack of ability to find and interact with markets, and lack of self-confidence to

lead other to involve with their farming and ranching initiatives to enhance their entrepreneurial success.

- *Entrepreneurial Resilience*. Persisting in farming and ranching activities is an attribute that small and medium producers can use in their favor to naturally become involved with sustainable production methods.

- *Purpose of farming and ranching*. The love and passion for doing farming and ranching activities among small producers is also an attribute that might facilitate their involvement and practice of sustainable agriculture.

- *Farm future certainty*. Once producers acquire the property rights of their land it gives them security about farming and ranching. When asking them about how they feel about their certainty and future of their farm, most of them responded to have a great expectation in their future as farmers.

There are more attributes observed among small and medium producers that provide certainty about their commitment with their farming activities (see NCRSARE report project LNC15-368).

1.2.1. Farming and Ranching production idea

Most producers who have started farming and ranching activities in the US had a connection to farming and ranching in the communities where they come from. However; having an innovative idea of doing farming and ranching business hasn't been a common perception for many small and medium farmers. By trying to understand what has motivated small and medium sized Latino producers to pursue

farming and ranching as a way of life, the most common response underscored "cultural heritage" as the most influential factor for farming and ranching.

The goal of producing a specific product is already in the mind of each producer; however; if the main goal is to achieve a profit, it is important to reconsider the agribusiness model using business concepts relate to farm productivity, product prices, markets, supply and demand analysis, production systems, crops seasoning facts, farm and ranch capacities, natural resources availability, as well as community capacities to support farming and ranching in general.

This manual is focuses on guiding new and experienced farmers in pursuing sustainable methods of production. Session one will assist producers in starting to understand how the agriculture industry currently works.

1.3. How does entrepreneurial sustainable agriculture relates to conventional agriculture?

The first green revolution in agriculture started in the late 1950s, early 1960s, revolutionizing technologies to enhance productivity and increase agricultural production worldwide. It coined the industrial agriculture business model, this approach soon become the conventional form of production by the 21st century, later evolving into the industrial, or modern, agribusiness model used today. During this evolution mass production of commodity crops rapidly advanced, empowering other agricultural sectors, such as the livestock and biofuel. Agriculture has been evolving by using different technologies that aimed at increasing food productivity and sustaining food production, feeding a growing world population. However, in the process of discovering different ways to

maximize food production and minimize production cost, the path has sometimes failed to include consumers and a large proportion of producers in the conversations critical for food production. Rather, it has been highly influenced by the economic interests of private investment corporations, seeking to control farming and ranching industry, consequently influencing the supply side of food.

Large agribusiness corporations disregarded the environmental and social impact of their products, focusing instead on economic principles driven by maximizing profits and minimizing production cost. With new technologies, improved seeds, chemical formulas to control pests and weeds, these large agribusinesses have been able to influence, and some cases economically 'demand' or require producers to adopt farming and ranching practices of their products, their methods and their rules.

According to field notes collected from Latino farmers interviewed in Missouri, who use herbicides like Roundup Ready and Savin to control weeds and pests, these new technologies have become convenient to use because they significantly reduce labor. Farmers and ranchers of all sizes around the world has been influenced by these technologies. For example, significant emphasis to follow conventional production methods were found among a sample of 100 Latino producers, who entered the agriculture industry during their first 10 years in production in the United States (Gonzalez E. 2018). This influence also has helped these large agribusinesses to gain market control of farming and ranching inputs used in modern and industrial agriculture, such as the seed, fertilizer and pesticide markets.

The conventional model, also known as the industrial and modern agricultural model, uses any kind of technology available in the market to maximize production and minimize cost. It is highly effective in large farms because it also offers large scope and scales economies in the production process. The justifying purpose of

conventional farming is to guarantee food security in the future. However; it is jeopardizing sustainability of natural resources, because its purpose to achieve food security is based on using controversial inputs in the production process. Agricultural inputs like synthetic fertilizers, high spectrum pesticides, genetically modified seeds, implants and hormones have not yet been accepted by a large group of investigators in the science research community and other members of society in general. Conventional agricultural practices have been widely documented to influence soil dependence and degradation of natural resources not only at the farm level, but also in the communities surrounding them (Tilman D. 1999; Huntley, EE. Et al 2013; soil Ass. 2018). Alternative production systems, such as agroecology and organic agriculture among small scale producers have proved to be more effective to protect the environment, increase farmers income and reduce external input cost (Jouzi Z., et al. 2017).

1.4. The new green revolution and the re-evolution into sustainable agriculture

To understand the sustainable agriculture production systems, the manual starts by explaining the evolution of agriculture since the period of the green revolution. Sustainable agriculture has always been here, but we didn't develop it as a production system supported by research and education. Instead, research and education focused on promoting production methods supported by technologies that aimed to increase productivity based on synthetic chemical substances. Eventually over the years, the induction of these technologies has been debated because of their effects on disturbing the natural balance of soils, water and air. Predominantly, disturbing effects have resulted from the mass use of all kind of substances, created in laboratory settings to increase agriculture productivity. In

current times, we are looking back to bring sustainable agriculture back as a new agroecology production system, which aims to compete and complement modern agriculture's supply chain food. However; this emerging production system not only supposes to sustain producer profitability, it also teaches sustainability of farms' and ranches' natural resources and the local rural communities where families and producers live. Our current real green revolution in agriculture is gaining legitimacy as sustainable agriculture or agroecology (Parrott and Marsden, 2002).

Similar issues exist in the conventional animal production side of this conventional production model. Industrial agriculture is a large promotor and supplier of the Concentrated Animal Feed Operation (CAFO) business model, which is characterized by using large amounts of materials and supplies from conventional farming, including food additives and antibiotics. CAFO systems create large amounts of waste, degrade natural resources, and oftentimes forfeit animal welfare in the production process. CAFOS have been documented as unsustainable, unable to protect on natural resources and healthy lives in rural communities. This large controversy about the sustainability of modern agriculture and its conventional production methods has developed awareness among different sectors in society, including educational institutions and environmentalist groups, who are focusing on strengthening alternative production systems such as organic agriculture, sustainable agriculture and agro-ecological agriculture.

1.5. Sustainable Agriculture Philosophy

A growing perception within our society that agri-food production discoveries aimed at empowering all producers' sustainability has headed to revise some unexpected results, not only in the profitability of most producers, but also in

the capacity to sustain earth's natural resources and the rural life of those communities surrounding the industrial agriculture fields. The conventional, or industrial agriculture business model, has been largely debated because it has not been efficient in supporting sustainable communities able to protect their natural resources.

This new agricultural re-evolution, based on agro-ecology principles, supports the sustainable agriculture model claims that earth's natural resources and social and rural life have not been equally analyzed and supported by science when inducing the adoption of new agricultural technologies. On one side, the massive use of new technologies on earth's natural resources has significantly degraded quality and quantity of earth's natural resources (Marinari et. all. 2006). On the other side; the economic and production power of industrial agriculture has been replacing small and medium producers because they are unable to sustain their household income only from farm and ranch business activities. This forces them to sell their farm or change the use of their land to other sectors such as the housing, hospitality and the manufacturing industry. This crisis of depopulation among small and medium rural communities has been happening in countries with a large agriculture industry, where small and medium farmers and ranchers have silently and slowly been replaced by large farms that specialized in producing monocrops to supply specific industries. As a matter of fact, we have been observing that in the United States, a country that promoted industrial agriculture, 57% (more than a million producers) of farmers and ranchers have been reporting gross sales of $9,999 or less per year (US Census of Agriculture 2012). Sustainable agriculture is pushing to reverse those trends, all those farmers are very likely to move out their farms and ranches in the short future.

The agricultural revolution in the 21st century is rapidly moving. It aims to be equally involved in the process of fair participation of all production sectors needed to sustain food production systems. This trend should encourage and sustain farm and ranch numbers, diversity, sizes, as well as the conservation of natural resources, and quality of life in rural and urban communities.

The transformation and transition of industrial agriculture into sustainable agricultural production systems is demanding bigger efforts of the different production agents currently involved with conventional production systems. To achieve a significant growth of sustainable agriculture, all sectors need to engage, but mainly educational institutions, whose research and extension services should focus on transitioning from teaching and promoting conventional ways of producing food into instructing and promoting sustainable production systems to students and producers. *Developing capacity in sustainable production systems among farmers and ranchers will have a direct impact on community social development, community economic development, sustainability of natural resources and farm and ranch profitability, and on each and every animal and human's life surrounding the sustainable system.*

1.6. Food Production Systems

Pillar one of this educational curriculum improves the understanding and knowledge about what kinds of production systems the producers are identified with. By introducing new and beginning producers to the understanding of sustainable agriculture, participants in session one training will be able to learn about three main production systems: sustainable agriculture, organic agriculture and conventional agriculture, also known as industrial, or modern agriculture.

Most producers are still confused with the term sustainable agriculture. In many cases the farmer might conduct sustainable production practices in his operation without having a strong theoretical background about it. Most farmers and ranchers are aware of the existence of organic agriculture, and sometimes, because they don't use conventional inputs in their operations, they call themselves organic producers, without knowing about the certification process and other requirements of the organic production system.

1.6.1. This manual defines **Sustainable Agriculture** as the production system that uses agro-ecological production practices to enhance soil fertility and systematically create a self-connected biological environment that sustain and enriches soil, water and ecological resources in farms and ranches, as well as farm and ranch profitability and local community development. By following these principles, a sustainable agriculture system will systematically eliminate unneeded inputs, eliminating production cost, adding premium value to products causing a snowball effect on increasing farm and ranch profitability. In response, sustainable agriculture regenerates soil, air and water quality environments and consequently impacts local food markets with fresh and clean products in the surrounding communities.

1.6.1.1. **Agroecology** is the scientific discipline that supports sustainable production methods. Its research and development principles are a mixture of the agronomy and ecology fields (Gliessman S.R. 1990). It is the science that studies how ecosystems work, focusing on mechanical, functional, biological, biophysical, ecological, social, cultural, economic and political relationships that allow sustainability without using

products that might cause toxicity in the soil, water, air and human environments.

1.6.2. This manual defines the **conventional or industrial agriculture** system, which is the most used production model around the world currently, as a food production system model that uses large amounts of synthetic fertilizers, pesticides, controlled seeds (mainly genetically modified seeds), high mechanization levels, and large amounts of water. By using those inputs, this system has been able to significantly increase production yields in crops and accelerate weight gain in much shorter period of time in the livestock sector.

This conventional system is highly criticized because the use of massive amounts of inputs supplies such as water (with lack of management in its use in many cases) and pesticides that have affected the balance of natural resources and the capacity of farmers to deal with farming repercussions. This production environment has influenced producers' dependence on synthetic substances to continue in production. Other negative externalities about conventional farming is a lack of enforcement in the use of controlled substances that aim to improve productivity, but become highly toxic to animal and human life if not applied appropriately in the farms. Further, this conventional system has been affecting the sustainability of rural communities, because many small and medium producers are unable to access those high levels of technologies and mass mechanization. Thus, many farmers and ranchers quit production, and because they are unable to find jobs in their local communities, they end up migrating to metropolitan areas.

From direct observation analysis, this manual also supports many conventional farmers who have been opting for transitioning into sustainable and organic practices on their own, mainly by establishing cover crops and non-tilling practices. Many of these farmers still use conventional practices such as managing cover crops with pesticides to convert their operations to commodity or crops with profitable purposes.

1.6.2.1. **Conventional farming**

It also known as **industrial agriculture**, refers to farming systems which include the use of synthetic chemical fertilizers, pesticides, herbicides and other continual inputs, genetically modified organisms, Concentrated Animal Feeding Operations, heavy irrigation, intensive tillage, or concentrated monoculture production. It is also known as a production system with intensive resource and energy use, but also highly productive (Apropedia 2018).

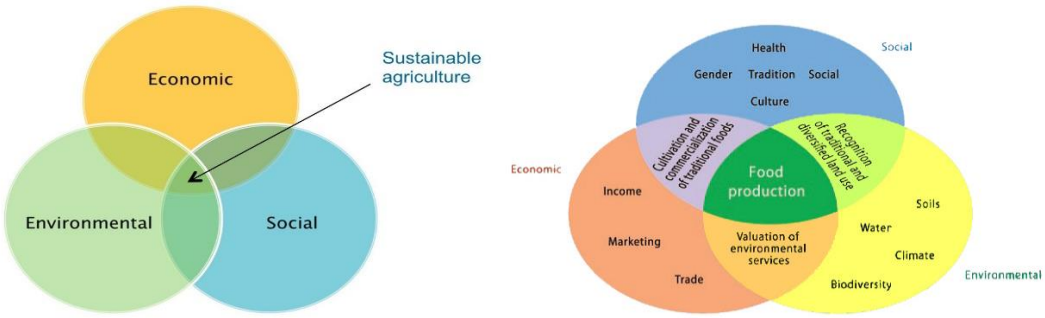
According to the USDA, conventional farming is not certified organic and is defined as the use of seeds that have been genetically altered using a variety of traditional breeding methods, excluding biotechnology, often times to develop plants with faster growth, higher yields, pest and disease resistance, larger seeds or sweeter fruit. Conventional crops may be grown simply as commodities and enter the commodity stream where they are mixed with other crops, including genetically engineered crops, or they may be grown to meet a requirement set forth by an end market, such as a specific chemical or nutritional requirement.

1.6.3. The **organic agriculture** production system is quite similar to the sustainable agriculture system. Contrary to sustainable agriculture, organic agriculture is regulated by state certification to produce food. In its production process, the certification allows the farmer to use fertilizers and other substances to improve system productivity and pest control management. A selected definition of organic agriculture:
"Organic Agriculture is a production system that sustains the health of ***soils, ecosystems*** *and* ***people****. It* ***relies on ecological processes, biodiversity and cycles adapted to local conditions****, rather than the use of inputs with adverse effects. Organic Agriculture combines* ***tradition, innovation*** *and* ***science*** *to benefit the shared environment and promote* ***fair relationships*** *and a good* ***quality of life*** *for all involved."*

'Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system (FAO 1999).'

By developing capacity to perform sustainable production methods among farmers and ranchers, the producer will be able to directly impact their farm or ranch's ***sustainability. First it will create stewardship of natural resources, increase profitability, and make a local positive impact on social and economic development in the communities where they live.***

This educational manual influences these three areas of sustainable rural development to influence sustainable agricultural systems. Most sources refer to Sustainable Agriculture as the production system based on using environmentally friendly practices, to not only create an economic impact on the producers, community and regions, but also a social impact on the local communities surrounding these farms. Sustainable agriculture integrates the stewardship of natural resources with the economic and social life of where it is practiced. Below there are two diagrams to help producers visualize the concept of sustainable agriculture (diagrams- cited on a viable food future).



1.7. What are the socioeconomic and cultural influences that might keep producers from trying new practices?

There are many factors that influence the agribusiness success of small and medium producers, based on a sample of 128 Latino producers in Missouri, these factors are related to the availability of **natural resources** on their farm and ranches, such as soil quality, water and land topography, In the case of livestock producers, the kind of grazing system already stablished in their operations, is also a factor. Other factors are related to the **cultural influence** of production systems.

Example, a sustainable agriculture production method is the no-till system. However; for many crops producers tilling the land is the best way to oxygenate the soil and to control for unwanted weeds, changing a cultural habit requires exposing a population of farmers that are willing to attend on-farm demonstrations to new methods. By seeing results of other farm, producers are able to document by themselves, how no-tilling practices help with soil aerobic life and weed control, creating farm profitability.

Additional cultural influences are embedded in the production behavior of many livestock producers, where grass management and the number of animals pastured per acre-time don't align with sustainable agriculture principles. However; that is an accepted way to farm for many new and beginning farmers. Most farmers who move to the United States from Latin American countries share a common belief about owning livestock, "the more animals somebody owns, the most successful they are.' This cultural belief is still held by many small and medium producers, directly affecting the soil fertility and grass availability in their ranches, forcing producers to keep buying more pasture to energize their livestock.

Embedded cultural beliefs held over time impact the economic success of farms and ranches. Among the sample of producers analyzed, most producers are unable to create a stable return on their investment, and see the farm as a hobby and livestock producers as a saving account. Most producers who are receiving this ESA training are also producers who need to increase their understanding of the **economy of the farm and ranch;** as a producer, they need to see their farm and ranch as a production unit where the crops and livestock that they are seeking to produce is maximized to a level of production able to generate profits, once all production and transaction cost are covered.

An additional big influence that might keep small and medium farmers from fully success in the current re-evolution of producing food with friendly environmental practices is the sociological side of the farm. Social community involvement, the feeling of belonging in the community, is strongly related to levels of trust and solidarity with other producers. Formal and informal institutions in the communities where they live. Developing the bonds that allow us all to work together might be a factor that will influence farmers and ranchers' agribusiness success.

1.8. To what extent are producers aware that they are using conventional production methods?

Based on most producers' responses about their farming and ranching production methods to grow food, we found enough evidence that these small and medium producers are significantly biased to use conventional production methods in their farms and ranches, they are unaware of the long term negative effects of conventional farming (Gonzalez E. 2018). According to the Food and Agriculture Organization (FAO) conventional farming and ranching is a production system widely used by most small producers around the world (FAO 2011).

This manual seeks to develop awareness about the current production methods small and medium producers do in their operations. It also aims to enhance their skills and knowledge about alternative production methods which allows them to start regenerating their farms' and ranches' natural resources, while increasing farm profitability. Most producers involved in the study preceding this manual were questioned about to what extent they know about the potential secondary effects of using synthetic pesticides in their health and soils and most answered that they did not know about it (NCR SARE report-LNC15-368).

1.9. References, exercises and readings materials

2. Apropedia. Conventional farming. Retrieved in 2018, from http://www.appropedia.org/Conventional_farming

3. Chemical and biological indicators of soil quality in organic and conventional farming systems in Central Italy. Retrieved from https://www.sciencedirect.com/science/article/pii/S1470160X05000981

4. Eco-philosophy retrieved from. http://ecofarmingdaily.com/industrial-agriculture-versus-biological-agriculture-ethical-debate/

5. FAO (2011). The state of the world's land and water resources for food and agriculture-Managing systems at risk. Retrieved from http://www.fao.org/docrep/015/i1688e/i1688e00.pdf

6. Fenstra G. What is sustainable agriculture? UC Sustainable Agriculture Research and Education Program, University of California. Retrieved in 2018 from http://asi.ucdavis.edu/programs/sarep/about/what-is-sustainable-agriculture

7. Gonzalez E. (2018). NCRSARE project report. https://projects.sare.org/sare_project/LNC15-368/edit/?rid=504516&page=report-overview

8. Huntley, EE.; Collins, EE.; Swisher, M.E. Effects of Organic and Conventional Farm Practices on Soil Quality. *University of Florida* [Online]; http://www.nal.usda.gov/afsic/nsfc/39.htm

9. IFOAM (2018) Definition of organic agriculture. retrieved from https://www.ifoam.bio/en/organic-landmarks/definition-organic-agriculture

10. Kristiansen and Reganold (2006) Organic Agriculture. A global perspective. Retrieved from http://orgprints.org/14043/1/14043.pdf

11. Naerstad A. (2011). A viable food future. The Development Fund Utviklingsfondet. Retrieved from: https://www.utviklingsfondet.no/files/uf/documents/A_Viable_Food_Future_updated_web.pdf

12. Parrot N. and Marsden T. (2002). The real green revolution. Organic and agroecological farming in the South. Greenpeace Environmental Trust. Retrieved from. https://www.greenpeace.org/archive-international/Global/international/planet-2/report/2002/1/the-real-green-revolution.pdf

13. Rosset P. and Altieri M. (2018) Agroecologia Ciencia Y Politica. Sociedad Cientifica Latinoamericana de Agroecología. SOCLA. Retrieved from https://drive.google.com/file/d/1-PqwssKuAU7LZchYetK9wd4Ck-fR5jYl/view

14. Soil Association (2018). The impact of glyphosate on soil health. The evidence to date. Retrieved from https://www.soilassociation.org/media/7202/glyphosate-and-soil-health-full-report.pdf

15. Tilman D. (1999) *Global environmental impacts of agricultural expansion: The need for sustainable and efficient practices.* Proceedings of the National Academy of Sciences of the United States. Retrieved from http://www.pnas.org/content/96/11/5995

16. USDA (2015) USDA Coexistence fact sheets conventional farming. Retrieved from https://www.usda.gov/sites/default/files/documents/coexistence-conventional-farming-factsheet.pdf

17. US Census of Agriculture (2012). Census of Agriculture Historical Archive. Retrieved from http://agcensus.mannlib.cornell.edu/AgCensus/homepage.do

18. Jouzi Z. et. all. (2017). Organic Farming and Small-Scale Farmers: Main Opportunities and Challenges. *Ecology Economics Journal*. 132. 144-154.

2. Session 2. Production and Sustainability of Natural Resources

Picture source: author owner

2.1. Soil. Sustainable management soil practices

Why is soil one of the most important natural resources in agriculture?

Soil and water are the two more important assets in the farm because one cannot sustain life without the other. However, even if a farmer has both, it doesn't guarantee he will be able to be a sustainable farmer. Assuming that there is water available or the farm is located on rainy region, soil and its management will be the main asset to generate food for humans, animal life, and the environment. Managing the quality of the soil on farms and ranches should be the main goal of the producer because inside the soil is the life that sustains life above the soil. As we continue working with our soil, we will be able to establish independent production systems that will only need good soil cultural management practices to sustain its dynamic life cycle while it is providing food for humans and animals, and oxygen through trees to the environment, those trees chemically reconnect in a natural way with soils by sequestering carbon back into soil from the environment.

2.1.1. Knowing the farm and ranch soil

Producers who follow conventional farming methods are or should be always concerned about having a soil balance of nutriments available for the seeded crops. This is because those soils have been continually exposed to synthetic fertilizers, and the soil system has developed dependence on those formulas composed mainly of by nitrogen, phosphorus and potassium, the main macronutrients most required by crops. The intrusion of synthetic substances into soil eventually replaces the natural generators of those nutrients. In a sustainable production system those nutriments will be regenerated by themselves by following soil-crops diversity and management practices once a system is created and established. Soil testing might not be needed as frequently and eventually become unnecessary in a sustainable production system.

Among our sample of 128 producers it was observed that a very small proportion of them are familiar with soil testing. They have been worried to know what is in their soils. Lack of information and knowledge about soil management is a common factor among many small and medium producers. Most of them have never had their soil tested and or an assessment of their farm and ranch to know the potential for production activities.

2.1.1.1. Soil sampling, testing and interpretation of results

A soil analysis will help producers know the soil profile currently existing in their operation. The soil analysis will help producers plan for crops. The soil

analysis will provide the level of pH currently existing in the soil, as well as the level of micro and macro nutrients needed to produce specific crops.

What is the pH of the soil?

This term has been hard to understand among many producers, mainly because most producers don't have technical training about soil management. The level of pH in the soil is the more important factor to consider when establishing crops systems. This term basically refers to three conditions of the soil: the levels of alkalinity, neutrality and acidity existing in the soil at a specific time for specific crops. The soil pH levels range from 0 to 14.
Alkaline soils are those with a pH over the 7 level.
Neutral soils are those with a level 7.
Acidic Soils are those below the 7 level.

a. Soil sampling techniques
b. Soil testing locations
c. Understanding testing results

2.1.2. Soil building

Most small producers are facing issues with soil fertility. It is normal to hear them talk about their practices to increase fertility, and about how they tried to increase soil fertility by visiting their local farm and ranch stores to buy synthetic formula fertilizers, but then finding that their soil productivity still didn't improve as was expected. They started to find out about how important it is to know their soil. Some of these stores become extension service providers and help producers figure out how to improve their soil with other options available in the stores.

However, it is only when producers perform a soil test analysis, that they find that soil fertility problems. In many cases it is not due to a lack of macronutrients in the soil, but to an unbalanced pH in the soil. It can look like a costly practice, but it could be a low cost solution by adding the right inputs to balance the soil environment.

All sizes of producers have been self-impacted with the unsustainable practices they have been doing on their farm and ranch soils. The challenge is to change those habits and ways of doing farming. Bringing back soil to sustainable fertility might take a long time, but it will depend on the level of degradation each soil has at the time the farmer decides to follow agro-ecological practices. It will depend on the soils own capacity to regenerate itself and on the kind of regenerative practices producers make to accelerate its recovery and fertility.

Some common regenerative practices are as follow:

2.1.2.1. Soil building practices when producing commodity and specialty crops.

a. Composting. Producers will learn different methods of composting and its literacy. It is one easy way to start making soil. However; many small gardeners get frustrated with the amount of soil collected after composting their food waste over a year.

b. Cover crops. Cover crops are also known as winter crops. Their use has widely increased as an alternative to control erosion and degradation of soil fertility between seasonal profit crops. Cover crops also help to reduce the

disturbance of life inside the soil by reducing tilling, which also help oxygenate and control weeds on tillable land.

c. Crop rotation. It helps to mineralize the soil. Producers learn about how crop diversity improves soil quality.

d. Water use and management. Most producers disregard the use of water. Water use and quality will determine your crops quality. Producers learn about how water sustains the farm and food quality.

e. Erosion management. It can be caused from many factors, air erosion and water erosion are focused on as the main factors.

f. Mulching. This practice is connected to erosion, weed and humidity controls.

g. Non-tilling. It is a modern method in sustainable agriculture. Producers will learn about how to implemented, mechanize and weed control involved with it.

2.1.2.2. Soil building practices when producing Livestock.

a. Increasing crop diversity. It will help to balance soil nutriments.

b. Livestock paddock design management. Producers will be able to calculate the size of paddock based, on grass density and crop diversity.

c. Grass management. Different kind of livestock using the grazing system cause different effects on the soil. Producers learn about how to approach grazing system based on ruminants and monogastric animals

.

d. Water management. Livestock's water needs, use and management are taught.

e. Terrace design. It is recommended for grazing system with high level of slopes to protect the loss of soil from the highest places in the ranches.

2.1.3. Soil management

When a producer gets a good understanding about the soil in their farm or ranch, the will be able to start orienting their efforts to increase soil sustainability and fertility. They will be able to opt for creating a biological system that eventually will connect the biological life of soil and crops. The biological management of the farm ecosystem will eventually create its own biological pest control environment where unwanted weeds, insects, pathogens and other soil organisms work in favor of the fertility of the soils.

What do producers need to care about while managing the fertility of their soils?

a. Crops need nutrients. Crops nutrient needs are different. Some crops demand more of one nutrient than another. For example, many producers who immigrated from the Central north region of Mexico used to grow crops by combining crops, a good combination was to mix corn, bean and pumpkin

crops at the same time. The reason of seeding them at the same time is to obey to an agroecological principle described as follow:

The principle is based on the fact that corn is a gramineous plan, bean is a leguminous plan and pumpkin is cucurbitaceous plant, these three crops support each other in the production process. While the bean plant is feeding on nitrogen in the soil, the corn plant is using it to promote growth, and at the same time the pumpkin plant is expand and covering all over the soil to control for weed. The effectiveness of these principles will vary depending on the producer's management skills.

If there is not a combination of crops, the availability of soil nutrients in the soil will be a factor to care about it. Soil testing will be required with more frequency.

This principle applies to grazing systems: a good grass management plan is a determinant to sustain soils (for more information about this read session 2.3.1. below).

b. Water use and management.

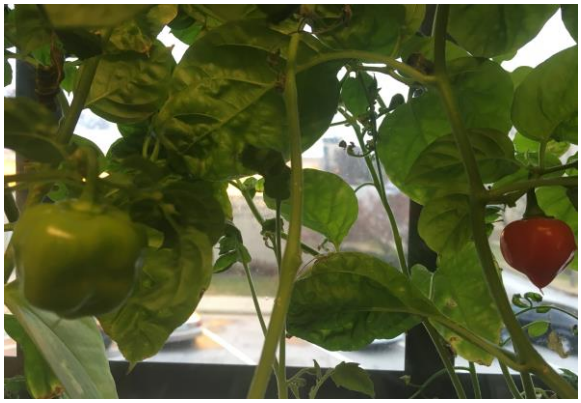
For the purpose of sustainable agriculture and for what the farmer and rancher is learning in this manual, water is the main resource in the operation. Scarcity of water will negatively influence the sustainability of all other natural resources. Each sustainable production system demands different amounts of water, but it will never will compare with the conventional production system's demand for water. Water management and use is widely covered during farm demonstration. This manual refers producers to the Natural Resources and Conservation Service (NRCS)

programs and Soil and Water Conservation Districts at any state USDA Office to help the producer to access the available resources to optimize the use and management of water. These government agencies offer cost-share programs to develop the farm and ranch infrastructure, which will facilitate the sustainability of the farm. For more information visit the link: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs143_013724

2.2. Agroecology and Sustainable Agriculture

Most producers are not seeking to learn new ways of naming their production activities. Some of them are already doing agroecological practices without knowing how science has named them. The science supporting sustainable production methods in agriculture is agroecology. Agroecology has been growing as a discipline that studies and researches how the interactions of the flora, fauna and earth natural resources such as soil, water and air sustain life. Ecological principles are applied to agriculture to form agroecology as a discipline that helps to sustain natural resources while producing healthy food.

Suggested practices and principles:



Picture: food everywhere own source

2.2.1. **Agroecology principles**.

Picture source: author owner

a. Crop production practices. See reference guide https://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1006&context=extension_pubs

b. Weed control and tilling systems. This is reference guide publication with mixed methods. https://www.extension.purdue.edu/extmedia/ws/ws-16-w.pdf

2.2.1.1. Agroecological Pest Management (APM)

APM is an emerging discipline with a holistic vision to manage natural resources in the farms and ranches. APM main goal is to be able to control pests based on biological principles, where cultural farming activities support the sustainability of each other, and eventually the same agroecological system control soil and plants enemies.

APM is a production system that increases the sustainability of production food systems with ecologically based management strategies

(Reddy P. 2017). It is easy to connect with other sustainable soil management methods discussed in this manual like cover crops, crop diversity, and agroforestry that aim to create organic matter.

2.2.1.2. Integrated pest management (IPM)

IPM is defined as a science-based and decision-making process that identifies and reduces risks from pest and pest management related strategies. According to a recent article from the Organic and IPM working group, it also aim to prevent unacceptable levels of pest damage by the most economical means, while minimizing risk to people and the environment.

Producers are introduced to integrated pest control management techniques. Different pest control management guides are referred to crops producers. Pest control management in grazing systems is also covered in the training.

Resource guide to increase understanding of pest control management are suggested as follow:

a. *Resource Guide to Organic Insect and Disease Management.* *http://web.pppmb.cals.cornell.edu/resourceguide/pdf/resource-guide-for-organic-insect-and-disease-management.pdf*

b. Natural Enemies Handbook: The illustrated guide to biological pest control. Mary Louise M. F and Steve H. D. University of California. More information about this guide can be consulted in the link below:

https://books.google.com/books?hl=en&lr=&id=FBJvpMqcV9UC&oi=fnd&pg=PA2&dq=biological+pest+control+guide&ots=7XceehhNWC&sig=GjxL8s1Q_s5bUoAa3yD6FHprppg#v=onepage&q=biological%20pest%20control%20guide&f=false

c. Bahena F. (2008). Enemigos naturales de las plagas agrícolas. INIFAP. SAGARPA. file:///C:/Users/gonzalezeu/Desktop/Box%20Sync/NCRSARE/CURRICULUM%20DEVELOPMENT/ENEMIGOS%20NATURALES%20DE%20LAS%20PLAGAS%20AGRICOLAS%20DEL%20MAIZ%20Y%20OTROS%20CULTIVOS.pdf

2.2.2. Pollinators and sustainability

Why is pollination important to create sustainable agricultural systems?

Referred guide at https://www.fs.fed.us/wildflowers/pollinators/friendlypractices.shtml

2.2.2.1. Insect and animal pollination management

2.2.2.2. Native Plants

Using native plants is the oldest technique to regenerate soils and sustain production systems. However; it is barely known among the farming and ranching community. As an example, most of the Latino producers interviewed in Missouri to validate a teaching program reported not to know anything about native plants. They think about native plants as a weed problems in many cases. There is a large need to grow small and medium producers' awareness about the potential of native plants, and how native plants connect with the pollinator community to revive ecosystems. This manual will help farmers to understand the economic, ecological and genetic value of native plants to sustain ecosystems and agricultural and livestock systems.

2.3. Holistic livestock production practices

Picture: Author owner. It represents a free range grazing system. In the front is a pig and in the back chickens

2.3.1. Grazing management practices

Holistic livestock management is a modern way to approach the agroecology of the land. Most small and medium producers own limited acreage, which will limit the number of livestock they will be able to grow in their farms. Holistic management systems to grow livestock use production principles that align with sustainable agriculture goals of increasing producers' profits, protecting the environmental resources and positively impacting the community where they live.

Many small and medium producers and mainly Latino producers, are aware of doing grass rotation on their ranches; however their understanding of grass rotation, time pasturing on the paddocks, and size of paddocks is not consistent with the holistic grass management that creates ranch sustainability.

According to livestock holistic management practices, a system needs to follow strict grass management practices. This manual summarized five principles as:

a) Mobility. Doing an efficient distribution of paddocks among the ranch to force livestock to go to areas where they normally don't like to go.

b) Humidity. Managing water inside paddocks is a very important practice to avoid soil compacting and soil spots that can become points of soil erosion.

c) Fertility. Moving livestock fast among the paddocks, so there is a better distribution of urines and manure all over the ranch and not only on specific places where the livestock choice to stay.

d) Diversity. Letting the grass regenerate from a medium growing stage to a specific high, not only allows the soil to maintain humidity, but also allows the biological regeneration of soils and the reactivation of native grasses and crops that were sitting on the land from the past (native crops). This diversity is what matters in holistic grass management to create life inside the soil and outside, providing an ecological environment for new animals to come to the land, such as birds.

e) Profit. The economics benefit of doing holistic pasturing once the system has been established will not only show in the economy of the farm, but in the whole community surrounding this production system. The ranch or farm economy will be directly impacted when fixed and variables costs are reduced because of adjustment in the expenses on production activities that are not required or needed during the livestock production system. The main expenses categories that are influenced are inputs such as fertilizers and pesticides, because the system facilitates a better spreading of urines and manure, and by managing grass stages, it will influence the soil ecology

which influences the diversity of crops to help balance the soil nutriments. Additional benefits are observed by reducing nutrition supplements. However, the large profit margin will be acquired in the premium prices received per selling selective livestock under grass-fed system and sustainable practices. It is estimated that price premium paid is at least 25% higher than livestock from feedlots or other mixed systems of production. It is noted that holistic livestock producers will need to stay on the ranch longer to move livestock but it is all paid when producers enjoy doing it.

By following holistic management practices, the farmer is not only helping soil fertility, he is also impacting other ranch resources, such as water and air quality. By doing, the soil matter get enriched and acquires the elements to filter clean water. Similarly by doing soil restoration with holistic practices, the farmer is increasing cover green forage which is helping to clean the air by taking more carbon dioxide from the environment and sending it back as oxygen. (Savory A. 1999; Stinner D. et al 1997).

Local communities also directly win when livestock producers do good grazing management practices. Local governments reduce their cost for filtering water, and this snowball effect is reflected on family household bills, because local governments don’t need to use budgets to buy expensive technologies; instead they can use that money to improve community quality of life.

2.4. Agroforestry

Most small and medium farmers involved in this program were unaware about practicing agroforestry principles to sustain their farms and ranches resources. This manual refers to agroforestry as the production system that combines and manages

forest, grazing and livestock production systems into one integrated sustainable production system. It means that by doing an accurate measurement of open spaces among trees that allow solar lights to enter to reactivate the photosynthesis process with native or adopted grasses, it will create the conditions for livestock pasturing.

The management of this integrated system has proved to be profitable by many producers who owned non-tillable land and only are able to manage silvopasture systems. It also increases soil organic matter, water quality and erosion control (Wilson M and Taylor S. 2016, Sharrow S. 1998)

2.5. References, exercises and readings materials

1. Altieri, M. (1996). Agroecology. Boca Raton: CRC Press. Miguel A. Altieri, Agroecology: The Science of Sustainable Agriculture, 2nd ed., Boulder, Colorado, Westview Press, 1995; S. Gliessman, Agroecology: the ecology of sustainable food systems, Boca Raton, Florida, CRC Press, 2007

2. Caldwell B. et al. (2013) *Resource Guide to Organic Insect and Disease Management. Produced by CALS Communications, NYSAES, Geneva, NY. Retrieved from* *http://web.pppmb.cals.cornell.edu/resourceguide/pdf/resource-guide-for-organic-insect-and-disease-management.pdf*

3. *Fortier J.M. (2014). The market gardener. A successful grower's handbook for small-scale organic farming. New Society publishers*

4. Gliessman S.R. (1990) *Agroecology: Researching the Ecological Basis for Sustainable Agriculture. In: Gliessman S.R. (eds) Agroecology. Ecological Studies (Analysis and Synthesis), vol 78. Springer, New York, NY retrieved from*

5. Sharrow S. (1998) *Silvopastoralis: Competition and facilitation Between Trees, Livestock and Improved Grass-Clover Pastures on Temperate Rainfed Lands. Edited in Agroforestry in Sustainable Agricultural Systems. Retrieved from* *file:///C:/Users/User/Box%20Sync/NCRSARE/CURRICULUM%20DEVELOPMENT/agroforestry.pdf*

6. *Stinner D. et all (1997) Biodiversity as an organizing principle in agroecosystem management: Case studies of holistic resource management practitioners in the USA. Agriculture, Ecosystems & Environment. Volume 62, Issues 2–3, April 1997, Pages 199-213.*

7. *Savory Allan. Holistic management. A new framework for decision making. Island Press.*

8. *Reddy P.P. (2017).* Agro-ecological Approaches to Pest Management for Sustainable Agriculture. *Springer Nature Singapore Ltd.* Linbrary of congress.

9. *Wilson H. and Taylor S. (2016) Agroforestry-The next step in sustainable resilience agriculture. Sustainability. Retrieved from: file:///C:/Users/User/Box%20Sync/NCRSARE/CURRICULUM%20DEVELOPMENT/sustainability-08-00574.pdf*

3. Session 3. Farm and Ranch Profitability

Picture source: Barbados entrepreneurship foundation

3.1. Knowing the farm and ranch sustainable production frontier.

Many producers when entering farming and ranching are very enthusiastic and dreaming about all the production they can get out of their operations. However, it is very important to know your farm and ranch potential to produce food.

For instance, among a large number of Latino livestock producers who were visited at their ranches to be interviewed about the potential of their ranches, it was observed that many of them have the custom of keeping their livestock for a long period of time and missing their physiological potential to be marketed. Many of them has been learning in the process and have opted to reduce livestock inventories to meet the potential offered by their operations.

- Livestock production frontier

  A rancher will be able to learn to what extent he or she will be able to raise livestock. Each livestock has different needs and uses a grazing system differently. Ruminants (animals with multi stomachs) such as beef, sheep

and goats require different grass management practices than monogastric (animals with one stomach) like pigs and chickens. By knowing the operation production frontier, producers will be able to make decisions about how many animals they will be able to hold in their operations. It is also based on the potential of their operation to provide pastures.

- Crop production frontier

The capacity to grow crops in an agricultural operation is determined by factors such as soil, fertility, water availability, temperature and the kind of crops the producer is willing to grow. The producer will be able to connect with crops production guide adapted by production region.

3.2. Agribusiness plan

"by failing to prepare, you are preparing to fail." -Benjamin Franklin.

It is not common that traditional agribusiness use a business plan to guide their farming and ranching operations. Most small and medium producers normally enter the agriculture industry with the main idea of production in their minds. After talking to and questioning 128 Latino producers about their agribusiness purpose, the common response among many of them was that, they had a business plan, but "it is in my mind."

The business plan is becoming a must-have tool among most businesses to succeed in a competitive market industry. Many theorists refer to business plans as a guide map that will help entrepreneurs achieve their end business goal. In the

agriculture industry having a business plan is more complicated because there are higher degrees of uncertainty about the environmental conditions created by climate change and the availability of natural resources. This is one of the main reasons why it is necessary to create a business plan that helps farmers and ranchers plan for those kinds of frequently unpredicted events.

An agribusiness plan will help producers to give themselves an identity and an answer to many of the questions they have had in their minds. It will clarify why they are doing agricultural business, what production activity is best and harmonize with their purpose of farming. A agribusiness plan will help them to know how to do specific farming activity and how these activities will generate profits, where to market the product and how producers and their activities connect with local communities where consumers live.

In addition, a farmer with an agribusiness plan will easily connect with financial resources if needed. Most non-fam business use business plan as a tool to connect with investors in their businesses.

In the last 10 years farmers around the world, and in the United States specifically, have faced a large number of unexpected natural events. In the Midwest, farmers have faced natural disasters related to excessive rain and prolonged period of drought. A recent example is the drought observed from June to August 2018. Most small and medium ranchers were forced to sell their livestock at low prices because the market for pasture failed and prices for hay bales increased. An agribusiness plan in place might help to minimize the negative impacts of these natural events on the farm and ranches. Producers with a plan but unable to predict climate behavior are more aware of their inventory to supply their operations. Having a plan also influences the option of having insurance for unexpected events, as well as an easy connection to claim USDA farm support for loss if available.

3.3. Agribusiness plan structure

Selecting or adopting the farm business structure model might be one of the biggest challenges for new and beginning producers, not only in the U.S. but also in other farming economies around the world. Most farmers and ranchers involved in our study immigrated mainly from Mexico and Central America to the United States, where most of them grow on a small farm. When they moved to the U.S. they brought their cultural heritage, customs and beliefs of how to do farming and ranching activities. The nature of their farming was a way of life that didn't need to be connected to, or highly dependent on formal business structures or models. It is required in the U.S. to have a structure to be able to generate profit in a very competitive socioeconomic environment, where cost of living increases demand a constant and sustainable income either from in or outside the farm. For more information about selecting a business structure refer to the manual Financial Capacity Building of Latino Farmers and Ranchers Manual Spanish (1) https://farmanswers.org/Library/Record/manual_para_desarrollar_la_capacidad_financie

The manual referred to above will help producers understand how to create a business plan for their farm and how to follow up with financial activities on the farm.

3.3.1. Farm and ranch production plan

What is a production plan?

All farms have the purpose of producing a product. Producers will learn how to create a production plan based on each participant's production activity. For

example, a livestock producer will be able to have an idea of his income by knowing how many animals he will be able to market at specific time. Projections of herd of cattle will be learned as a tool for planning.

3.3.1.1. Farm and ranch production indicators

Production indicators are used in the production plan to estimate farm and ranch production projections in the short and long term.

3.3.2. Financial plan

3.3.2.1. Farm and Ranch Financial management

Like any other business, farm and ranches need to be handled in the same way. Most small and medium producers involved in our analysis don't have a financial plan to manage their operation.

This manual introduce producers to two main financial instruments to help them increase their understanding of the money in the farm. The understanding of these two tools will also help producers understand and connect with financial resources outside the farm, such as FSA financial support programs. The road to become sustainable might force the producers to acquire farm and ranch loans. All loans providers require producers to show the financial history and current financial statements of their operation. By writing down production expenses and income from sales, producers will start not only documenting how the money is spent in the operation, but also that the producer is growing the habit of controlling the financial life of the farm.

Once the producer has acquired the habit of working with these two financial tools and documenting farm transactions, it will be easy for him to connect with financial opportunities such as those offered by the Farm Service Agency and other farm agencies.

Financial organizations such as private banks and financial services from the government always require a producer's history of financial transactions. It can be up to three years in those cases when real state is involved. In most cases when producers need a loan for production, the history of financial transactions is one year. Those loan transactions can be repaid in different periods of time, up to 40 years in real estate buys and up to seven years in most of the microloans from local banks and government agencies.

3.3.2.2. Managing financial instruments

One of the biggest challenges that small and medium producers face when they start transitioning their production activities into a business is a model to get familiarized with the financial instruments needed to accomplish that goal. Out of 128 Latino producers interviewed about how they manage the finances in their farms and ranches, not one of them follow financial instruments to manage their production activities. A few of them maintain their transaction records but they don't have an accounting book or software such as Quick Books that help them organize transactions.

This session helps producers increase their understanding of the two main financial instruments normally used and required by government and non-government institutions to facilitate financial resources to the farm. These are the

cash flow and the balance sheet instruments. As producers increase the use and habits to manage at least these two financial instruments, they will start accomplishing their financial goals. However, the financial analysis will help the producer make a decision about continuing or stopping his farming and ranching activities as a way of making money. Still, producers can keep farming as a hobby or a part-time job.

a. **Farming and ranching cash flow**

Cash-flow is the instrument that allows the producers to register in all monies coming from selling his products and also allow the producers to register all expenses needed to produce those products in a defined period of time. Cash flow statements can be done day today, monthly or yearly, it will depend on how much money the agribusiness move. For instance, some producers might be already doing cash flows analysis when planning the monthly expenses of the household. In farming and ranching it works in the same way.

a. Cash flow statement for seasonal and perennial production crops. Seasonal producers have cash flow statements during the specialty crops production season. The production season in the Midwest goes from March through September.

Perennial crops producers and livestock ranches use cash flow statements that correlate, ideally with their estimated production projections for their products year to year. Financial projections are connected with production projections over a longer period of time. For instance, if a producer has a beef production operation based on a grass-fed system, this producer will

need to project the development of his herd over the years until he is able to sustain farming activities inside the farm or ranch production frontier.

Example of cash flow of a beef producer:

	Jan-March	April-June	July-Sep.	Oct-Dec.
Cash income				
Bulls and cows sales	$2500	$0	0	1500
Steers sales	$3500	$2500	2500	2500
Pasture sales	$1000	$500	500	0
Total income	$7000	$3000	3000	4000
Cash expenses				
Farm inputs (seeds, fertilizing, Equipment maintenance etc.)	$500	$100	$100	$100
Veterinary services	$600	$400	$200	$100
Gasoline	$500	$500	$500	$500
Other Services	$1000	$1000	$1000	$1000
Total cash expenses	$2600	$2000	$1800	$1700
Net Cash Flow	$4400	$1000	$1200	$2300

b. **Balance sheet**

This is a financial instrument that helps producers visualize the economic value of their operations by including all farm assets, liabilities and equity in a given time. This instrument connects with the cash flow instrument because the cash flow informs the balance sheet about the existing cash assets in the operation. It is very important for producers to understand and manage a balance sheet of their operation because it will allow them to make informed decisions about projecting farm income and expenses.

The balance sheet is also a very important instrument to connect with outside farm resources. This instrument is normally requested by USDA agencies and private institution service providers when a producer wants to expand his operations or needs to start a new product that requires a farm or ranch loan.
It is recommended to have a reference balance sheet for a specific time to be able to compare how the farm is performing over time.

One easy way to start creating a balance sheet for the farm is by using current resources that help producers to visualize their property values. For instance, the Farm Service Agency at the USDA uses a balance sheet instrument to determine whether producers qualify for loan programs.

The USDA-FSA-2037 farm balance sheet can be used as an example to help producers enhance the financial understanding of their operations. It can be retrieved from this link
https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/Farm-Loan-Programs/pdfs/direct-loan-apps/Form_FSA_2037_Farm_Business_Plan_Worksheet.pdf

There are 5 main categories needed in a balance sheet analysis:

a. Assets

   Assets are things that become cash. Assets refers to all the cash, equipment, buildings, livestock and inventories without debt in the operation. It is also noted as assets = liabilities owner's equity.

b. Liabilities

Liabilities are the debts that need to be paid in a short or long period of time or a long period of time. They refer to all the debt the producer has, the farm mortgage, equipment debts and anything that the producer has a responsibility to pay for.

c. Equity

Equity refers to the gain value of the liability. All assets in the farm without debt are considered equity.

d. Revenue

Revenue is all money collected by the farm based on sales.

e. Expenses

All payments made to cover production costs and maintain the sustainability of the farm.

3.2.2.3. Financing farming and ranching activities

This intention of this manual is to help producers eventually become debt free. However, most small and medium producers start farming without having enough cash to operate and it becomes very hard for them to grow and success. The approach we are using for financing the farm operations are meant to sustain the farm without debt in the future. At all points of analysis when the cost of money is lower than the projected income of the farm, it will be a good debt to grow the farm.

a. Bank loans

Farmers can opt to request money for farming from private banks; there are many ways to reach them in local communities. Because, private banks ask for higher interest rates than government institutions, the access to those loans is easier. However, if there is no product that brings consistent income to the farm, a loan from a private bank is not a good option to go for.

There are specialized institutions to support farming activities. The more active institution in this field is the Farm Credit Service Financial, this institution can be reached in this link https://www.myfcsfinancial.com/

b. Government loans

These loans are normally offered to producers when they are unable to obtain a loan from commercial banks. The government is not in the loan market and avoids competing with banks. The government is able to support those producers who are unable to obtain loans from banks. The main government institution to provide loans to producers is the USDA through the Farm Service Agency. The FSA offers producers two main options to apply for farm financial resources:

a. Microloans and operating loans

Depending on the production needs of the producer, he can opt for a microloan when his expenses are equal to or less than $50,000. He also can apply for production and equipment loans over the $50,000 limit. Those loans are classified in a different category and require more paperwork to qualify to receive them.

b. Farm ownership loans

Many new and beginning farmers and ranchers have a common problem of accessing credit to buy real state for farms and ranches. It is mainly because there are many requirements to qualify for a loan, land prices keep increasing, and those people with a farming and ranching vocation normally don't have a good financial and income history. The most common problem observed among people applying for these loans are related to not having good personal financial records, no farming experience and no farming financial records. Currently, the price per acre varies from $5,000 to $10,000, depending on whether it is tillable or non-tillable land and the farm's location. If a farmer wants to buy a 100 acre farm, at the price of $5,000 per acre, he will need to borrow $500,000. If he has an interest rate of 5%, he will need to pay $2,084 just for monthly interest without paying on the principal. The amount of money to be paid on the principal amount ($500,000) borrowed will depend on the amortization period. The loan can be 15, 20, 30 or 40 years. The longer the amortization period, the lower the payment to principal, but more money is paid in interest.

The model to borrow money to buy a farm described above doesn't motivate producers who want to make a living from the farm. They will need a profitable production plan to engage it. The good news is that it is possible to achieve and an agribusiness plan will show the way to do it.

a. Direct farm loan

These loans are made directly by the Farm Service Agency, but the amount that can be borrowed is limited. Currently it is a maximum of $300,000.

b. Guarantee loans

The guarantee loan is made through a commercial bank. The FSA acts as a mediator agent guarantees to the bank that the producer is going to meet the conditions of the loan. This loan amount limit is up to $1,429,000 to buy farm and ranch real state.

For more information about this loan visit the FSA in this link: https://www.fsa.usda.gov/programs-and-services/farm-loan-programs/beginning-farmers-and-ranchers-loans/index

c. Grants

Farmers have many options to bring free cash to their operations if they engage in growing their capacity and their production activities. Acquiring grants might require the farmers to commit to doing specific activities on their farm. The NCRSARE offer grants for farmers who wish to advance with knowledge and practices in sustainable farming and ranching. For more information, follow the link: https://www.northcentralsare.org/Grants/Our-Grant-Programs/Farmer-Rancher-Grant-Program

d. Own sources

The first common option to finance farming activities among farmers involved with the creation of this ESA Curriculum is use of their own money or borrowing from family members. Most small producers avoid as much as possible acquiring loans to produce. It is mainly because most of them haven’t been able to see the complete picture brought with a business plan.

3.2.3. Market plan

3.2.3.3. Understanding the market of agricultural products

To what extent do I know how to sell my farm and ranch products?

The largest challenge observed among Latino producers, who attended a series of workshops preceding this manual was the market access, the kind of production activity farmers engage in will determine where they can find markets. The market is described as the place where consumers, those who demand the products, meet the farmer who offer his production.

Markets can be very sophisticated or very simple to access. This topic will be expanded when a producer engaged in developing an agri-business plan. Further analysis of supply and demand of agricultural products will be discussed and farmers will be exposed to fair trade principles.

3.2.3.4. Marketing of agricultural products

How do I sell my products?

i) Selling fresh product: This concept is also known as from farm to table products. Producers are exposed to different options for marketing and pricing their agricultural products, this includes but is not limited to:
   a. Conventional markets such as selling with contracts with groceries stores and large commercial markets.
   b. Accessing traditional markets such as farmers markets and local vendors and auctioneers.

Additional options to marketing their production will be:

c. Developing new markets. Community Support Agriculture (CSA) systems. Side roads, pick it up from the farm, etc.

d. Accessing on-line markets. Most producers has access to internet. In our sample of Latino farmers most producers mentioned to have internet access and use smart phone as the main tool to enter social networks. Training sessions introduce participants to on-line marketing too. Most producers are able to connect with internet using smart phones. For instance, a Facebook group of Latino producers was created to help them gain access to farming resources. https://www.facebook.com/groups/1650513891857603/

Growing options for on-line markets:

- Facebook local markets
- Craigslist
- Zip code

ii) Selling value added products: There are many ways to provide value added to farming products. Producers who add more value to their agriculture products using artisans or agro-industrial processes are able to enhance profits in multiple ways. They are adding long-life to their harvest. Giving an extra value to products in many cases it doesn't mean more money in the short term for the same products, in many cases gain is embedded in the ability to market the same product in the future and not taking a lost in the present by wasting or composting it.
The USDA Value-added agriculture definition is as follow:

- A change in the physical state or form of the product (such as milling wheat into flour or making strawberries into jam).
- The production of a product in a manner that enhances its value, as demonstrated through a business plan (such as organically produced products).
- The physical segregation of an agricultural commodity or product in a manner that results in the enhancement of the value of that commodity or product (such as an identity preserved marketing system).

iii) Pricing farming and ranching products:

All small and medium producers will follow the existing prices of commodities in the market. As a small producers and with limited supply of products the only option is to explore and investigate how much consumers are normally paying for that specific product in a specific market. Then, a producer can start offering the product at that price or below, if it needs to be sold fast. However; when defining the prices we want to ask, producers will need to consider the quality of the product. He will need to define who are the audiences or the consumers who will be willing to pay a premium price for this specific product. If that is not possible then the producer should be listed his products in a different price range.

For example, if we are offering products which production process was based on agroecological practices, or were produced under an organic certification system. Then producers will be able to market their products at specific markets, such as farmer markets or certified grocery stores and receive a premium price.

3.2.4. Management plan

The reference guide used to instruct producers about this section of the business plan is the link: https://farmanswers.org/Library/Record/manual_para_desarrollar_la_capacidad_financie

a. Production records. A large proportion of small and medium producers interviewed in a sample of 128 producers in Missouri don't have the habit of keeping production records. Recently, many of them were unable to access USDA programs because they were unable to prove their production activities.

b. Management of farm inventory. Refer to chapter 4 of guide: https://farmanswers.org/Library/Record/manual_para_desarrollar_la_capacidad_financie

c. Farm and Ranch Taxation. Refer to chapter 4 of guide: https://farmanswers.org/Library/Record/manual_para_desarrollar_la_capacidad_financie

3.3. Reference readings and materials

1. Balance Sheet. Retrieved from https://www.apapracticecentral.org/business/finances/balance-sheet

2. Cash-flow analysis retrieved from https://www.thebalancesmb.com/cash-flow-analysis-for-small-business-owners-2947137

3. DiGiacomo G., King R. Nordquist D. (2003). Building a Sustainable Business: A Guide to Developing a Business Plan for Farms and Rural

Businesses. Minnesota Institute for Sustainable Agriculture. Sustainable Agriculture Research and Education (SARE). https://www.misa.umn.edu/publications/buildingasustainablebusiness

4. FSA Business balance sheet retrieved from https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/Farm-Loan-Programs/pdfs/direct-loan-apps/Form_FSA_2037_Farm_Business_Plan_Worksheet.pdf

5. Gonzalez E. and Schoenberg E. (2016). Manual para Desarrollar la Capacidad Financiera de Granjeros y Rancheros Latinos Principiantes. University of Missouri Extension. Retrieved from https://farmanswers.org/Library/Record/manual_para_desarrollar_la_capacidad_financie

6. USDA-AGMRC. USDA Value-added Ag Definition. Retrieved from: https://www.agmrc.org/business-development/getting-prepared/valueadded-agriculture/articles/usda-value-added-ag-definition

4. Session 4. *Social and Economic Community Development*

Picture source: Barbados entrepreneurship foundation

This manual helps producers to increase understanding about community involvement. Findings from a research-based approach from a sample of 128 Latino producers in Missouri to document the challenges they face to enhance their involvement in community life beyond the farm were discussed. An education approach to connect those findings with producers needs to increase their feeling of community belonging and integration is offered. Social and cultural integration scales were used to collect information and document the challenges that small and medium producers have in their rural communities where they live.

Leadership to community resources is one of the main challenges small and medium producers face. This session is helping producers to expand their awareness and capacities to connect with local leaders, local farm and ranch service providers, government representatives, and university extension service providers. It also help producers to know how to develop bonds with other producers who grow the same crops and livestock.

The instruction of this session also is based on a community capitals framework approach analysis. The analysis of community capital frameworks is strategic planning and measurement approach that analyzes communities and community development efforts from a systems perspective. Where, normally cultural and social capitals appears to play a very important role in the community capitals framework (Emery and Flora 2006; Pigg et al. 2013). However, the strength of other capitals among farmers might be influenced by the current level of assimilation and integration farmers have in their local communities.

To increase this capacity, we are providing information and community links to resources, so producers start sustaining production networks in the communities where they live.

4.1. Producers' Capitals. Farm and ranch capacities

4.1.1. Human Capital

Producers will understanding how human capital will influence their skills and abilities to transition into sustainable production methods. We refer to human capital to the level of formal education received, language communication if English is a second language.

4.1.2. Cultural Capital

It refers to the capacity of the producers to become involved with the local communities where they move to. Cultural capital is linked to the customs and habits of how producers perform their agricultural production practices in a region.

4.1.3. Social Capital

Farmers and ranchers will be able to understand how their level of community involvement will help increase their inclusion in the community and expand their production networks. Social capital also helps farmers and ranchers understand how their social interactions in the community might affect levels of solidarity and trust with other community members.

4.1.4. Political capital

This capital refers to the capacity of producers to understand and influence social and economic policies that influence favorable market environments for their farms.

4.1.5. Production capital

This refers to the capacity of producers to be able to optimize technical production activities and maximize the benefits.

4.2. Community capitals

The community capital refers to the capacity of the local community where producers perform farming and ranching activities to respond to producers' needs and community members' demand for food.

4.2.1. Cultural. Diversity of population, ethnicity, heritage and traditions.

4.2.2. Market. How products are acquired by consumers, local markets and regional markets.

This manual refers to market capital to the network capacity in the community to help farmers and consumers develop long-term business relationships. Are there enough markets options to allow producers to sell their products? To what extent are market venues able connect with suppliers of environmentally friendly inputs with farmers?

4.2.3. Financial. This capital refers to the availability of holistic financial resources in the community who are willing to invest and financially support producers who want to pursue agro-ecological practices. More lending options with a sense of producing food with care to the environment and own producers. The exiting financial capital in the community might only be the traditional options that might care more about good profit margins instead of the local, social and environmental impact.

4.2.4. Natural. Also known as physical capital in the community, natural capital refers to the natural resources available to producers. Community natural resources, tourism attractions and natural parks influence farmers' to connect.

4.2.5. Political. This refers to access to public resources and power in the community. It refers acceptance among the larger ethnicity group in the community toward new community members from a different social background. It also can be perceived as a feeling of discrimination among new community members when they interact with local communities or request program support for their farms and ranches.

4.3. Collective action

Producers are introduced to the challenges of participating in collective action initiatives.

- Small group and large group
- Social and collective incentives

4.3.1. Farmer and rancher cooperatives

Picture: own office garden

4.4. References, exercises and readings materials

1. Emery M. & Flora C. (2006) Spiraling-Up: Mapping Community Transformation with Community Capitals Framework, Community Development, 37:1, 19-35, DOI: 10.1080/15575330609490152. Retrieved from https://www.tandfonline.com/doi/abs/10.1080/15575330609490152

2. Gonzalez E.U., Jeanetta C.J., O'Brien J. D. (2015). Exploring Beginning Latino Farmers and Ranchers' Willingness to Become Involved in Community Activities in Rural Missouri. Proceedings of the 13th Annual Conference Latinos in the Heartland: Growing Together in New Destination Areas. Cambio de Colores. Retrieved from: https://mospace.umsystem.edu/xmlui/bitstream/handle/10355/48882/2015-GonzalezJeanettaO%27Brien.pdf?sequence=1&isAllowed=y

3. Kenneth Pigg, Stephen P. Gasteyer, Kenneth E. Martin, Kari Keating & Godwin P. Apaliyah (2013) The Community Capitals Framework: an empirical examination of internal relationships, Community Development, 44:4, 492-502, DOI: 10.1080/15575330.2013.814698. Retrieved from https://www.tandfonline.com/doi/abs/10.1080/15575330.2013.814698

4. Olson M. (1971). The logic of collective action. Harvard University Press.

5. United Nations (2018) Agroecology and Sustainable Development. Assessment of Agriculture knowledge, science and technology development. Retrieved in 2018 from: https://www.panna.org/sites/default/files/AgroecoBriefFINALsmall.pdf