THINK SYSTEMS, DESIGN SUSTAINABLE:
A CONTENT ANALYSIS OF SUSTAINABLE AGRICULTURE PLANS. GUIDELINES TO
DESIGNING YOUR OWN PLAN

By

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Abstract

The objective of this study was to determine guidelines about core content which should be included when designing a sustainable agriculture plan. Despite the increased awareness over the past decade, there appears to be a substantial lacking of directions for the application of sustainable agriculture. There is a significant gap in bridging the rhetoric and theory with real life application of principles and design. This paper constructs a set of guidelines for designing a sustainable agriculture plan.

The definition of Sustainable agriculture has been undoubtedly discussed over the last decade. While there are several different ideas, they all typically recognize the three facets of sustainability: environment, livelihood, and the community. There have been several Sustainable agriculture plans designed and published; however, few if any, offer a set of standard easy to follow guidelines that someone could use as they look to implement the principles of sustainable agriculture. The lack of clarity amongst previous attempts to outline a sustainable agriculture plan may have its roots in several causes such as the motivations of those distributing the information to the relative maturity of the concepts. However, in reviewing previously published plans there are recognizable themes and general principles to be used by someone interested in putting together their own Sustainable agriculture plan.

In the hopes of highlighting and outlining some of the more basic and applicable themes several aspects of academic research were employed. To begin, fifty sustainable agricultural plans were obtained and reviewed to develop an initial list of characteristics. Twenty of the plans were randomly selected and used to fine tune the characteristics. When the categories were selected they were weighted and assigned a number value. This created the coding index.
The categories are important but so is the way of looking at them through a Systems Thinking approach as they are all interconnected. The categories are not subject to rigid guidelines and leave room for flexibility but intend to provide a structured way to understand recommendations to develop the appropriate context of an actionable sustainable agriculture plan.

*Keywords*: Sustainable Agriculture, Sustainability, Systems Thinking
“It is not the strongest of the species that survives, nor the most intelligent that survives, but the species that survives is the one that is able best to adapt and adjust to the changing environment in which it finds itself”

*Paraphrased from Origin of the Species and attributed to Charles Darwin*
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Chapter I

Intro

History

Since its beginning, agriculture has been a platform for technical and social evolution, and has had change at its core. Agriculture has always been important and correlated to livelihood as it directly impacts food and fiber needs of our species. A constant, easily seen change since the 1800’s is yield over time. Additionally, agriculture has always had an impact on the environment, as it is the key ingredient. In the past, there have been strong impacts from crop farming such as the dust bowl era, deforestation, chemical usage, and seed trait and genetic advances that call for less machine and chemical uses, better plant health and more yield. Both, economics and environmental matters impact society and have caused very distinct changes to occur in different communities. For example, the early phase known as the “dawn of civilization” causing the division of the social classes to become evident in Western cultures; and the well-known green revolution in the late 1960’s introducing technologies to improve crop health, pest control, and increase food supply.

Recognizing the unprecedented economic prosperity that occurred across much of the Western World following the end of World War II, questions have emerged surrounding society’s ability to continue its upward momentum. The concerns have arisen in terms of natural resource availability and usage. We arguably see the first evidence of these concerns following the oil shortages of the 1970’s with the emergence of smaller compact vehicles; more recently concerns over the health of the planet and high gasoline prices have led to the creation of cleaner alternative fuel vehicles. While fuel prices and global atmospheric conditions dominate the
nightly news headlines, several less flamboyant concerns have emerged in parallel to these well publicized concepts. Sustainable agricultural practices usually fall alongside discussions about peak oil use and greenhouse gases.

Need for the Study

Unfortunately, while one can find a treasure trove of ways to conserve fuel and reduce ones carbon footprint, there is currently not an easy way to obtain guidelines or direction on what to consider or how to develop a sustainable agriculture plan. Although it may seem simple for someone with the desire and motivation to do so, there has not been a formal framework established for writing a sustainable agriculture plan, nor regulated standards. With published plans there appears to be a susceptibility to either get bogged down in details or remain too broad, both scenarios making it difficult to either re-enact or difficult to measure the success of the plan. There is a need for some best practices to be defined. There is also a need for these best practices to be easily understood and accessible.

Statement of the Problem

As alluded to earlier, growing concerns over resource availability and sustainability have propelled the ideas and concepts of Sustainable agriculture into the emerging lexicon of popular topic. Due to a cloudy popular definition, compounded by the lack of practical models for implementing its principles, sustainable agriculture may mean different things to many different people. This paper works to more clearly define the subject headings necessary to compose a sustainable agriculture plan. Currently, there is a need to define best practices when writing a sustainable agriculture plan to enable, both, an understanding of and to provide directional guidance for a successful sustainable agriculture strategy.
Furthermore, there are not any published guidelines for or solid recommendations on what should be included in a Sustainable agriculture plan or any formal evaluations methods of plans in general. Following the research phase of this project, it was concluded that three major areas need to be addressed in the establishment of a sustainable agricultural plan, these three areas are purpose, context (established through abiding by the coding index guidelines), and using the systems thinking approach.

**Purpose**

The purpose of this study was to establish and define parameters for developing an actionable sustainable agriculture plan. With a combination of exploring Sustainability Indicators (SI), Sustainability Assessments (SA), and Sustainable Measurements (SM) this research identified a framework and attributes suitable to serve as an actionable and “true” Sustainable agriculture plan and outlines definitive qualities of a plan.

**Objectives**

1) Define characteristics and content that is needed to embody a strong, actionable Sustainable agriculture plan.

2) Serve as a guide to creating a Sustainable agriculture plan.

3) Provide a tool/recommendation of measurement and evaluation.

**Definitions**

In order to explain a Sustainable agriculture plan, the foundation of Sustainable agriculture should first be defined. Sustainable agriculture consists of three legs of direct accomplishments:
1. To sustain production of food and fiber; a contributing factor for the overall dietary health of a community/population.

2. To protect and sustain the environment and its resources; that will in turn play a major role in the sustainability of production.

3. To sustain livelihood; a direct influence in gaining and growing social support that will maintain a healthy society.

The legal definition of sustainable agriculture defined by the USDA

The term "sustainable agriculture" means an integrated system of plant and animal production practices having a site-specific application that will over the long-term meet the following requirements: 1) Satisfy human food and fiber needs. 2) Enhance environmental quality and the natural resource base upon which the agriculture economy depends. 3) Make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls. 4) Sustain the economic viability of farm operations. 5) Enhance the quality of life for farmers and society as a whole. This definition is a primary element of the legislation of the Sustainable Agriculture Research and Education (SARE) program of NIFA.

(USDA, U.S. Code Title 7, Section 3103, 2009, Current through Pub. L. 113-52)

Agricultural practices involve the consumption of many of our natural resources.

Conventional Agriculture involves rapid technology developments, large scale farming, high-yielding practices, etc. to meet the productivity, social, and economical needs of today (Gold, 2007). By securing a healthy future for these resources, it enables a strong, progressive, and stable future for these practices and supports future generations to have equal opportunities. When these resources are depleted by result of unsustainable practices, the environment, community, and future generations all suffer along with putting the viability of future agricultural operations at risk. Principle 4 addressed in the United Nations conference in June 1992 states that “In order to achieve sustainable development, environmental protection shall constitute as an integral part of the development process and cannot be considered in isolation” (Report of the United Nations Conference on the Environment and Development, 1999, paragraph 7, principle 4).
Systems thinking is a major thread through sustainable agriculture and a key piece to success. The Systems Thinking Approach is defined:

As is a holistic approach of study that focuses on the way that a system’s constituent parts integrate and how systems work over time and within the context of larger systems. The Systems Thinking approach contrasts with traditional analysis, which studies systems by breaking them down into their separate elements. Systems Thinking can be used in any area of research and has been applied to many areas of study.

By way of Systems Thinking, system behavior results from the effects of reinforcing and balancing processes. If reinforcement is unchecked by a balancing process, it eventually leads to collapse. A balancing process is one that tends to maintain equilibrium in a particular system. Attention to feedback is also another essential component of system thinking… (Margaret Rouse, 2005, paragraphs 1-2)

Principle 4 directly supports Rouse’s definition by not allowing for isolation or silos in design.

Assumptions

Sustainable agriculture and systems thinking both require flexibility, adaptability, and the power to embrace and work with change. There are many outcomes and variables that are not able to be controlled.

Sustainable agriculture is set on the foundation that our resources can be responsibly managed to secure their health and future prosperity. The three legs of sustainability contribute equally to the structure and are very important to preserve agriculture. It is important to note, social and economic vivacity can be at risk as easily as environmental health with a massive cost to our society if not recognized, cultivated, and cared for. Bob Willard, a sustainability expert and author of many sustainability resources and tools for sustainability in business explains how the 3-legged stool metaphor reinforces the three dimensions that are required for us to enjoy a quality life— and shows that society is unstable if one of the legs will not support the stool. The
downside of this metaphor is that the economic, environmental, and social legs look separate and equal. However they are all interdependent on each other, so you must look at all the pieces of the stool and the support they provide together.

Figure 1
Three Legged Stool of Sustainability

Chapter II

Literature Review

Defining sustainable agriculture has come with a paradigm shift. The change of thinking floats from the traditional ‘science’ thinking to ‘systems’ thinking. Systems thinking does not deny the value of science; it embraces it, while considering complimentary factors through recognizing other contributions to the situations and the effects of decisions and actions. This
means recognizing the whole, considering all three legs of sustainability (as noted above) as braided together and interconnected. This concept deeply values the cause and effect of each decision. Instead of having simply true and false values we need to recognize a continuum of resources, community, and economic contributions to agriculture (ASI Sustainable Agriculture Research and Education, (UCDAVIS, 2010).

A recognizable change highlighted in the Sustainable Food Consumption and Production in a resource-constrained world 3rd SCAR Foresight Exercise by the European Commission is less the emergence of unforeseen new driving forces, but rather being confronted with a new quality of change. For example, they suggest driving forces behind global warming are interconnected with environmental, social, and institutional changes. Each of these driving forces will feed back and amplify the others, leading to a non-linear system behavior with abrupt and surprising advances. The situations ahead differ in complexity, duration, scale, and velocity from any faced before during human history.

Crutzen and Stoermer (2000) introduced the term Anthropogenic, which marks the beginning of the Earth as a self-organizing system (sustainability) driven by economic, environmental and social changes. New and typical is the interconnection of human and natural systems at planetary scale. Due to the interconnectedness of the combined scarcity challenges and the limited understanding of the feedback loops, in particular between human and natural systems and across spatial and temporal scales, the future is more uncertain. In addition, we are unprepared to deal which such interconnected and highly dynamic issues. (A new quality of change: un-quantified feedbacks amplify changes, uncertainty and risks 3.1, Sustainable food consumption and production in a resource-constrained world, ec.europa.eu, 2011. Section 3.1, p.19)

The key to understanding sustainable indicators requires accepting this paradigm shift and recognizing that a system exists within each environment. The key is adapting to and adopting the Systems Thinking Approach.
“Given the superior power and scope of the new idea, we might expect it to prevail rather quickly, but that almost never happens. The problem is that you can't embrace the new paradigm unless you let go of the old” (Marilyn Ferguson, 1980, p.27)

For example, the policy framework for sustainable development is being and has been influenced in the UK by several recent policy papers on energy, sustainable communities, proposals for substantial reforms of agriculture and planning regulations. The Department for Education and Skills (2003) published a sustainable development action plan for education and skills as it is an easier said than done task to embrace the new and let the old ways of working go. Amongst the 5.5 million people in the UK who call themselves professionals there is already a growing realization that they need help in understanding how to put the principles of sustainability into practice (Martin, 2002).

Professionals in all sorts of roles increasingly have Sustainable Indicators that are subjective and dependent on stakeholder groups and their dominate viewpoint. There are typically a range of quantitative approaches to measure sustainable indicators for each environment providing a long term view of sustainability. It is important to explain expectations of the set indicators identified with each situation (International Institute for Sustainable Development; Retrieved from http://www.sustainablecommodities.org/, 2013).

The International Institute for Sustainable Development describes sustainable development as a process of evolution in which people take actions leading to development that meets their current needs without compromising future generations. While recognizing evolution as the thread through sustainability, one must recognize that the drivers, pressures, and responses may change through time affecting the results of each indicator and its progress. Over time
indicators should be reviewed looking at their impacts to the whole of the system as well as the stakeholders involved (Bell, Morse, 2008, p. 102-170).

In the journal article, “Systems Thinking and Practice in Agriculture”, author Richard Bawden (1991) theorized that we need to recognize the need for a new science of agriculture that embraces both "production enhancement" and "impact assessment" while exceeding them both. He summarizes that the necessity of this paradigm towards a new science of agriculture and the worthy implications for the sciences in agriculture and society. His work supports the paper’s assumption that a key to success in sustainable agriculture is to embrace a Systems Thinking approach.

Robert Gibson along with his co-authors explains key components of sustainability assessments in their book Sustainability Assessment, Criteria and Processes (2005). The origins of environmental assessments grew from a wave of public environmental concerns in the developed nations around the 1970’s due to increased consumption and industry booms. The book lays out basic components for the Sustainability assessment processes, which are as follows: 1) Rules and the application of rules that stipulate what undertakings are subject to assessment requirements. 2) Guidelines for determining levels of assessment and review required. 3) Definition of the range of environmental considerations including biophysical, socio economic, and cultural. 4) Requirements to evaluate existing circumstances. 5) Provisions for scoping. 6) Prerequisites to evaluate and mitigate predicated negative effects. 7) Overall evaluation of effects and mitigations methods. 8) Provisions for public and technical review of the undertakings and assessment of the work. 9) Specific means to ensure that the assessments and findings align with approvals in a scalable fashion. 10) Requirements for monitoring and enforcing compliance with approval conditions (Gibson, R., 2005, p. 14-17, Box 2.1).
The authors of Sustainability Assessment, Criteria and Processes, also discuss in detail Sustainability Requirements as decision criteria, which should be weighed upon heavily in the design of a Sustainable agriculture plan. The elements for the criteria are: socio-ecological system integrity, livelihood sufficiency and opportunity, intra-generational equity, resources maintenance and efficiency, socio-ecological civility and democratic governance, precaution and adoption, and finally immediate and long term integrations (Gibson, 2005, p. 116-118, Box 5.1). While this criteria is significant in itself, it also can play an important role in limiting risks while considering the cause and effects of risks upon the previously afore mentioned criteria, and should be considered while not only writing a Sustainable agriculture Plan, but also while executing one. As with most research in the “real world” positive results are not a guarantee, similarly as a controlled environment is not guaranteed. We must anticipate concession and sacrifices which that requires providing basic guidance on what is or is not tolerable and how such judgments can be made. Additionally, requirements are only generally stated with little practical experience in regards to integrity, civility, opportunity, and equity. Assessments and decision making processes must therefore be designed to acknowledge and address the general requirements and of a specific framework. While the requirements can be used as a checklist for the planning process, the circumstantial variables of the socio-ecological context should also be used to define risks, opportunities, and expectations (Gibson, R., 2005, p. 119).

The purpose for sustainability assessments ensure comprehensive long term recognition of the criteria and decision making with effects on progress towards sustainability. It serves a constant tool to assure sustainability is being achieved through supervision based on criteria and allows for coarse correction if needed. The Good Practices in the National Sustainable Development Strategies of OECD Countries also highlight the need for indicators and
assessments as two of seven best practices identified in Sustainable Development Studies (United Nations, 2006).

Chapter III

Methods

Research is an attempt to discover something (Wimmer & Dominick, 2003). The intention of this analysis was to discover and define appropriate context and framework for designing a sustainable agriculture plan. The research described in this section will provide a definition to “Sustainable agriculture plan” and outline clear guidelines as to what is required of a sustainable agriculture plan. This qualitative study relies on content analysis to answer the two questions prefaced earlier: (1) What is a sustainable agriculture plan? (2) What content should be addressed in a sustainable agriculture plan? In this section, through content analysis, the answers to these questions will be reconnoitered and explained. This section will also articulate how this qualitative research was evaluated to include the sample, units of study, definitions, coding, and reliability.

In Basic Content Analysis, author Phillip Weber, describes Content Analysis as classifying textual material, reducing it to more relevant, manageable bits of data (Weber, 1990). Another subject matter expert, Fiske, who wrote Creating Sustainable Work Systems: Developing Social Sustainability, defines it as quantifying relationships between variables by coding individual units within a group (Fiske, 1990). Rather than relying on a particular sustainable agriculture plan’s authors approach, each section of the selected sample population has been coded to reveal necessary components encompassing a reliable sustainable agriculture
There are ten steps in validating content analysis research (Wimmer and Dominick, 2003, p.145);

1) Formulate the research question or hypothesis
2) Define the population in question
3) Select an appropriate sample from the population
4) Select and define the units of analysis
5) Construct the categories of the content to be analyzed
6) Establish a quantification system
7) Train coders and conductors a pilot study
8) Code the content according to established definitions
9) Analyze the collected data
10) Draw conclusions and search for indications

The staff of Virginia Polytechnic Institute and State University approve the thesis; A Content Analysis of Student Conduct Codes written by Janice E. Martin in 2004 which contained a sampling study of twenty classified subjects. This content analysis will also have a sampling of twenty subjects; 20 sustainable agriculture plans. Each section of each plan will be classified and coded for comparison.

Chapter IV

Research overview

Population: There are various types of sustainable agriculture plans. There are national, government enforced plans; location or community specific plans; publicly or privately
sponsored urban plans or rural plans; smallholder plans to large corporation plans; as well as funded and non-funded plans. All these different types of sustainable agriculture plans are included the sample plan population. There may be other types or characteristics of plans that are not included in this sample population.

Sample/Participants: To increase the reliability, original large sample plans were selected to represent as many different parts of the population as possible. The sample was chosen using a stratified sampling process which involves selecting independent samples from a number of subpopulations within the population. From a collection of fifty sustainable agriculture plans, twenty were randomly selected. Two plans were purchased as hard copies and 48 were obtained through university extension service web archives, governmental web archives, and academic search engines and libraries.

Units of Study: First a sample of 50 plans, published and available was obtained. The plans were reviewed, commonalities among them were noted, and a large list of data characteristics was compiled. Then, 20 plans out of the 50 were randomly selected. The random selection of 20 out of the 50 was performed by plan titles being unsystematically assigned a number and a third party choosing numbers one through twenty without knowledge of the titles and their assigned number.

The selected plans were read and studied to narrow the data selection of the common characteristics which could be categorized and later coded for analysis. If a selected plan did not have sufficient or viable data, it was rejected, and another plan was randomly selected out of the fifty. Plans which received a score less than 70 will be discussed, and used to show the insufficiency or lack of viable data to be considered. The plans rejected from the 20 were categorized in a second group that will support the coding and scoring requirements. There were
2 plans in the second data pool. These plans and their lack of sustainable agriculture context support the coding system and the fore mentioned guidance. They were either not actionable, or did not show any road map of a plan. One of the rejected pieces was put together as a comprehensive sustainability rating system and shows a lot of measurement but was difficult to understand and was not actionable. It scored 11 on scope, however there were only three words describing the scope and no means of arriving there. There were several measurements but it was unclear if they were SI’s, SA’s, or SM’s. The second plan that was rejected was more about an organization, their missions, and history but lacked the substance and content to pull out actionable items.

While the majority of the sustainable agriculture plans have the word “plan” in their title, that is not a requirement. The set of guidance given is a minimum score of 70 points earned (in the later explained coding index), with focus and understanding around a specific purpose. There are many University Extension Services that have sustainable agricultural plans in their annual agendas, set in the job descriptions, and role criteria, but are not labeled it as a formal plan. This supports the framework and guideline’s leniency of Plan not being called out in the title while still being considered a sustainable agriculture plan.

Context: Sustainable agriculture is an approach which is profitable, environmentally sound, and beneficial to the involved and surrounding community. A “plan” is the map on how to design one’s sustainable agriculture endeavors. Much like a business plan, a sustainable agriculture plan is a document used to detail the strategy by outlining tactics and desired objective goals or an overarching end goal. Essentially, it provides detailed information about an operation/project tied to sustainable processes within a community and designs where they want to go and how they will get there. As many experts consider such a plan critical to the success of
a business, one could also conclude that to create a successful sustainable agriculture operation, big or small; a plan would be most beneficial. However, contrary to the vast knowledge and resources available to what a business plan should entail, sustainable agriculture plans have not had such definition. The guidelines set forth in this document remain somewhat broad to encompass to a wide range of goals. Jeff Schahczenski (2011) wrote on the topic of business plans in the Planning for Profit in Sustainable Farming, for a write up in the National Sustainable Agriculture Information Services publication (also reviewed as a Sustainable Agricultural Plan in this study). Mr. Schahczenski states that when it comes to sustainable farming and the necessity for a business plan, this can come with some watch outs one must consider the usefulness of a plan. They can have too detailed or too simple information. When considering sustainable agriculture practices and reviewing plans, the wide variety of details provided could leave room for misinterpretation or bog someone down. It is recommended to really understand your purpose when planning, and to make sure the plan doesn’t become more important than the content; all aspects need to reflect your purpose.

This research identifies key qualities identified in the sample plans. The qualities were deciphered starting with the fifty plans and then narrowed down (based on the twenty plans) relative to commonality of qualities, action-ability, and transparency. These qualities were then rated and assigned a value which made up the coding index. Mapping out guidelines to an actionable or duplicate-able sustainable agriculture plan must have a scope that defines the intention of the outcome. Another crucial element in the plan are the goal/s, which identifies the necessary steps to fulfill the purpose. The plan should address the three legs of sustainability which include; profitability, environmental soundness, and community enablement. Profitability is a positive gain from an investment, which can be measured by price to earnings ratios, or
return on investment. Environmental soundness refers to guidelines and policies said to impose minimal or no harm on the environment or restoration plan. Community enablement is defined by practices to develop and promote social and economic empowerment of the local community. Risk assessment or evaluation is a process in which assumptions and uncertainties are recognized and presented. Success measurements are a set of performance milestones to measure overall achievement. The consideration of public policy is not required but highly recommended. Addressing public policy identifies the body of principles that support the operation of a legal system in each sovereign government. Intra; Inter generational considerations are another important factor which enables success and sustainability. They generally address social, moral, and economic values that bind the engaged society. The values can vary in different cultures and change over time. Therefore, it is important to recognize laws and issues of the present time and be prepared to make coarse corrections as the project or operation evolves.
**Coding**: Coding is defined as recording and categorizing segments of data, it can also be described as a qualification system as proposed by Wimmer and Dominick, 2003. A meaningful segmentation of text in a transcript is assigned a code or category name to signify that particular segmentation of the data. The process continues until all data is assigned a code. In this section, the coding will reveal common elements established in the sustainable plan’s scope, plan segmentation, and recommended course of action. The coding assignments were allocated and ranked based on commonality among the plans, as well as the support the characteristic offers to information and action-ability of fulfilling a purpose. The relativity to Systems Thinking and sustainability also supported the order and values assigned.
An overall scope and a goal are each assigned an eleven (11). Eleven is the max score in the coding index. These two categories are pertinent to supporting the purpose, understanding the needs, and mapping the plan therefore they are ranked the highest. Each of the three legs of sustainability (with an objective) is assigned a ten highlighting their importance; profitability (10), environmental soundness (10), and community enablement (10). Each additional goal is assigned a four (4). Risk assessments are assigned an eight (8). Success measurements are assigned a five (5). Recognition of public policy and/or laws are assigned a two (2). Recommendations are assigned a two (2). Intra; Inter generational considerations (2). Each definition is assigned a one (1). This research defines that a plan should have a minimum score of seventy (70).

To determine context of the index, or if a sustainable agriculture plan contains the appropriate content, the data sections were categorized and coded. Guidelines: the net score is achieved in a cumulative manner to reach the minimum of 70 points. At minimum, three characteristics represented in the index should be accounted for. At least one clear goal or objective must be stated to qualify as an acceptable Sustainable agriculture Plan by means of these guidelines. Risk and sustainability assessments acknowledgments are highly recommended, but not required. Each characteristic can earn points up to five times. In order to earn multiple scores in one category the characteristic must be addressed in a subsequent manner or idea. This implicitly refers to thinking with a Systems Thinking approach by identifying how every aspect connects with one another through cause and effect.

Reliability. To measure the data, qualitative themes were assigned values. The values were then translated into a quantitative coding index. There are various academic opinions about content analysis and methods of choice used to reach conclusions that extend beyond a finite set
of data. Neuendorf (2002) suggests making and assigning a coding index and translating data from qualitative to quantitative is an acceptable and recommendable approach. However, she also insists that there be at minimum of two researchers participating in the study. According to Neuendorf’s guidelines and only one researcher, there could present issues with reliability to this content analysis. However this is only one published opinion and has not been outlined in any other known guidelines for content analysis research.

Continuing the discussion of the research and figures; the data, in essence, was categorized and generalized, and therefore may contain some interference based on probability. As previously explained, this research began with 50 sustainable agriculture plans. From a review of those 50 plans, a list of characteristics and context was made. The original list had 65 qualities. When the 20 plans were randomly selected they were reviewed again. The qualities were then consolidated down and paired to what was most evident in the twenty plans selected. From 65 qualitative qualities the coding index (list of desired characteristics) was narrowed down to 12. The 12 were chosen based on commonality and action-ability criteria within the 20 plans. Each of the 12 categories can be used up to five times. In efforts to keep this method easy to understand and to strategize, design, and evaluate a plan the characteristic headers are broad, which could affect the reliability to a degree in lack of structured direction. However, most important is when one sets out to design a plan, they must first have a purpose. That purpose will help bring meaning to the categories which will serve as a map to their plan. When evaluating a plan with the coding index reliability could be compromised if the author provides too much or too little detail without clearly defining their sections of the plan.
The following table shows the 12 categories and the count of times they are used in each of the 20 plans. Each category can be used up to five times. Some of the plans discussed and recognized a category more than five times but the scoring stopped at the fifth time.
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</table>
All Plans had at least one overarching scope that could be identified. Two plans presented two main scopes. Every other category (out of the twenty plans) had at least one zero score. All plans had at least one of the legs of sustainability accounted for specifically. Sixteen out of twenty had all three legs clearly accounted for in their actions. The average use of each category was at least once. The category most recognized was environmental soundness. The category used least amount of times by count, was an overall scope, as most plans had a mission statement of vision that was graded as the overall scope. While it was used the least amount across all categories, it was the only category used in all of the 20 sampled population plans. Many of the plans did not have definitions or recommendations as they were specific tactics towards an overall achieving a scope with defined goals for a predefined population.

Table 2
Category Usage between Sample Data

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<td>1.1</td>
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<td>2.15</td>
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<tr>
<td>Environmental soundness</td>
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<td>65</td>
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<td>2.1</td>
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<td>1.8</td>
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Chapter V

Discussion

Propriety study

Fifty plans in total were reviewed to aid in selecting a wide range of categories of the coding index. Of the 50 plans, 20 were randomly selected. In the first selection of the 20, two were omitted as they lacked context and they did not have sufficient content to understand the scope to replicate action on what was documented. This supported the coding technique as the omitted plans did not reach the minimum score of 70.

Each of the categories was assigned a corresponding score based on strength related to action-ability and clarity it gave the plan. The plans do not have to encompass all of the categories, but were required to have a minimum score of 70, mixing and matching categories. This method of scoring doesn’t limit or dictate how a plan is constructed but it rates important aspects that should be addressed and serves as guidelines in a sustainable agriculture plan. The desired notion is that the strategy of the plan can be replicated or used as a foundation for others interested in implementing tactics for future Sustainable Agriculture Plans or purposes.

An area recognized in the majority of sustainable agriculture plans is the importance of the stakeholders. In some plans, more than others, the vast spread of stakeholders is addressed; some stakeholders are directly involved and others are affected by the outcome of actions taken while executing the plan. All plans recognize (in some form) Community as an essential piece of sustainable agriculture. The recognition of the community element is noteworthy, as Systems Thinking supports this defined way of thinking and deems necessary to consider all parts of an
operation, and community could likely be the largest. Community/society is directly affected by outputs of all three legs of Sustainable Agriculture; food and fiber sustainability, environment and its resources sustainability, and livelihood sustainability. However, Adrian Pitts author of Planning and Design Strategies for Sustainability and Profit suggests that while all three legs are important, the economically aspects could be the most important (2004) It is clear they must all be accounted for and recognize as connected parts. While they all have their own value they cannot be successful without the acknowledging the cause and effect they have on one another.

All plans had defined goals, some more tactical than others. A goal/s is important to measure success and to clearly set direction. Most plans had recognition of Intra; Inter generational considerations, however it wasn’t always highlighted. Although, the essence of sustainability is generational consideration, some plans were simply keener in recommendations and techniques relative to the generational ‘effect’, while other plans had an immediate intention to fix a current issue.

Some major variances were recognition of public policy and/or laws and risk assessments. The larger plans, reflected greater recognition of public policy. The meaning of “larger” doesn’t define an actual plan but instead it relates to the scope of the project and objective pool. Risk assessments were another area of variance. Plans that focused on ‘fixing’ an issue through sustainable agriculture were less likely to address risk assessments in their plans. Plans that included scopes of development (starting something versus fixing something) outlined risks more often.

All plans scored higher than the minimum of 70, excluding the rejected plans. The coding index logic only allows for the same category to be coded up to 5 times, any subsequent
reference of the same category above 5 is not assigned a value to ensure there are multiple categories referenced to reach the minimum.

Table 3
Net Score of Sample Plans Reviewed

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Study Limitations

There were some populace limitations in relation to the research of this study. The randomness of the data was limited to being published online or in a book so this sample is also not necessarily a perfect representation of all sustainable agriculture plans. This study is also limited because of its focused on individual situations. One may conclude that they do not need our guidelines to write a sustainable agriculture plan. This research did include a large range of countries and individual circumstances; moreover our guidelines fit each instance studied in the content review. Most plans scored significantly higher than the minimum with the potential to score higher. The minimum score could be disputed however, to communicate sufficient context in an easy to understand manor the minimum is recommended to be used. This is supported by
example of the two rejected plans, and they are not easy to understand nor are duplicable.
Additionally, it was difficult to connect topics and recognize the Systems Thinking approach.

*Supporting Examples*

The Dudley Smith Initiative is a successful program dedicated to improving agricultural strategies to achieve intra; inter-generational sustainability. The team is made up of many different parties both public, private, educational, and community influencers and members. The program is operated out of Illinois. The processes and ideals solidify this content analysis and take this theory to tactical levels.

The Dudley Smith Initiative recognizes the needed paradigm changes in agricultural research of focusing purely on the monoculture nature of modern farming. The program researchers stress the importance of looking at the farm as a system and operate through interdisciplinary research. “By understanding the interactions among the components of the agricultural and community system, including its natural resources, economic base and social elements, the Dudley Smith Initiative intends to make agriculture sustainable over the long term” (University of Illinois, 2013).

The Dudley Smith Initiative acknowledges that systems research and outreach is dynamic and will change over time as new knowledge, technologies, and generations generate more relevant questions and effects on the system. Recognizing the natural evolutions in every system is why the recommendations and guidelines to creating a Sustainable agriculture plan stay at a higher level putting more stress on strategy versus tactics.
Another example of supporting practices relative to the guidelines set forth in the above are those employed in the North Carolina Sustainable Agriculture Research and Education Program (SARE) held at North Carolina State University. Their core program values address our main recommendations of sustainable agriculture plan guidelines which are, 1) Integrity in exploring agricultural issues by pursuing a System Approach, 2) Shared learning and respect of all concerned, 3) Concern for economic, environmental, and social well-being of present and future generations. Their first value supports our direction and the need to shift from traditional monoculture thinking to Systems Thinking to see the interconnection of all elements and the effects of each decision. The second is a good summary and reminder of the importance of each part. Furthermore building upon the concept that learning is a continual process and we must embrace change with respect towards all things and their evolution. The third core value is a clear reflection of the three legs of sustainability which are referenced often and are key qualities to Sustainable agriculture plans. Throughout their programs they also recognize decision criteria and assessment processes, which are highly recommended in plan considerations and designs.

Both of these initiatives involve several different stakeholders from the farmers, university extension workers to governmental and non-governmental organizations, their objectives are education and research through hands on experiences. While we have the same value, theories, and mapping processes, the objective outputs are slightly different. In the outputs of the projects and research from the two examples above you get tactical histories of plans, action steps, and achievements. The research of this study gives a high level directional view for how to begin or rank a Sustainable agriculture plan.
Recommendations for Future Research

The study of sustainable agriculture is becoming more and more popular, yet the standards are not shared. One commonality between the supporting examples and this research is the encompassing idea of the Systems Thinking Approach by way of comprehending purpose, researching, and planning. Reviewing the Systems Thinking approach in-depth with Sustainable agriculture planning and organizational leadership within sustainability models would be a recommended follow-up research study. One avenue to explore with this theme would be through organizations and extensions with a history of completed plans and review specific outcomes; successes and challenges of the whole system.

Another follow-up study or build on the prior would be done would be to review to practices, platforms, or guidelines that impede upon success when executing a sustainable agriculture programs or plans. More time could also be spent on risk analysis as well as any of the categories listed in our coding index, by providing additional recommendations to the approach. The topic of sustainable agriculture has been emerging and developing recently and there are a lot of opportunities for shaping it.

Conclusion

The purpose of this study was to establish and define parameters for developing an actionable sustainable agriculture plan by defining characteristics and content that is needed to embody a strong, actionable sustainable agriculture plan, serve a guide to creating a sustainable agriculture plan and provide a tool/recommendation of measurement and evaluation. The coding index consisted of commonalities identified in the sustainable agriculture plans. The coding index serves as a guide of what to consider when documenting a sustainable agriculture plan, however it is not limiting as it does not require that all categories be fulfilled. The index also
serves as a measurement and evaluation tool to measure context and assure that sufficient substance is included in a sustainable agriculture plan.

Conclusively the qualitative qualities which map out guidelines to an actionable and duplicate-able sustainable agriculture plan should all build up and support a purpose with a scope and goals. The three legs of sustainability which include: profitability, environmental soundness, and community enablement are important and are all connected through recognizing the systems and accepting and embracing change.

By implementing the systems thinking approach the context of a plan will prove stronger risk assessment and success measurements to support the sustainability aspects. Addressing public policy and intra- inter-generational considerations shape support mechanisms towards the sustainability aspects and are enablers towards success, often times contributing towards community support. Providing transparency within sustainable agriculture is critical to continue the evolution towards success in all of the above qualities. The qualities and categories can be used more than once and not all of them must be addressed, however it is critical that the systems thinking be adopted when preparing a sustainable agriculture plan. The critical significance is the profound effects on the way the whole farm is operated proving new insights and clearer definitions linking integration and success (Doyle, C. J., 1990).

This study provides direction and strategic guidance of attributes to instruct on what is suitable to serve as an actionable “true” sustainable agriculture plan and defines qualitative qualities of a plan. While providing these guidelines it does not limit or confine an author or agriculturalist into a specific format, but does highlight qualities that encourage a level of transparency and ideals to be communicated through the plan. A material output from this study
provides a framework form of content and characteristics that should be present in a successful and implementable sustainable agriculture plan as well as an evaluation tool for sustainable agriculture plans. Lastly, this paper encourages and coaches on the importance of designing with a Systems Thinking approach and the framework and evaluation form provides the opportunity to design and evaluate in such a manner. (The form is available in the appendix.)

A content analysis of several existing sustainable agriculture plans was executed and compared. The study concluded that 1) there is a minimum amount of content required, which can be measure by indexing and scoring specific components through the coding index where the characteristics are defined. 2) There are interconnected categories needed to fulfill context requirements that make up a framework and guide to creating your own plan. Systems thinking is critical when considering any plan relative to sustainable agriculture. 3) The characteristics in the coding index and guidelines outlined above serve as a measurement tool to evaluate plans.

Through Charles Darwin’s work, Origin of Species (1859), he was paraphrased: it is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is the most adaptable to change. This implies we must be adaptable to change, not only in our manner of doing things and embracing sustainability but also in the approach we think about and plan for the future. Appreciating and embracing change will be the key to survival.
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34


Appendix

1. Coding Index
2. Coding Index score card.
3. Sustainable Agriculture Plans (Twenty)
## Coding Index

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# Plan

**Title**

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**Max score** 380

**Total Plan Score (Sum R1:R5)**

Must meet a minimum of 70 points total to qualify as a Sustainable Agriculture Plan

* Category Reference Notes:

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* R means reference to the note number, if there is a point the evaluator wants to make relative to a particular score i.e.: R 1.3, giving points for identifying a third scope to the plan
Sustainable Agriculture Plans

A random selection of 20 sustainable agriculture plans from a population of 50 sustainable agriculture plans in which were all collected through academic online searches; both at no cost and purchased. Each of the below plans meet the minimum net score of 70 on the index scale to be considered.

List:

4. Creating a More Sustainable Vancouver: A continuing, dynamic plan for a better future
10. NATURAL RESOURCE ASPECTS OF SUSTAINABLE DEVELOPMENT IN CROATIA (Agenda 21);


12. Iowa Local Food and Farm Plan, January 2011


14. Strategic Document for the Urban Sustainability Program;
   http://www.cityfarmer.org/NunezUA.html

15. Sustainable Agriculture: Cooperative Extension Service's Strategic Plan for New Mexico;
   http://aces.nmsu.edu/pubs/_h/h-162.html

16. Sustainable Agriculture;

17. Strategic Plan for Sustainable Agriculture Sydney region;


19. Republic of Korea, Agriculture;

20. Sustainable Development, A strategy for Ireland;