Helping Farmers Make Complex Choices:
A Sustainable Decision Tool for Farmers

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Executive Summary

The Farm Prosperity Project was a collaborative research and education project involving a multidisciplinary team of cooperators from North Carolina State University, Land of Sky Regional Council, Warren Wilson College, the Appalachian Sustainable Agriculture Project, and three land preservation non-profits active in the project region: Carolina Mountain Land Conservancy, American Farmland Trust, Southern Appalachian Highlands Conservancy. The project aimed to offer technical support to farmers facing complex decisions in a region distinguished by changing markets and intense land development pressure. Leadership on the project was divided into three teams with responsibility for project work on one of three focus areas: High Value Crops, Farmland Protection or Decision Modeling. These teams were assisted in their work by a group of 32 farm families who agreed to participate in the project in focus groups, on-farm interviews and educational workshops.

The Modeling Team's main role in the Farm Prosperity Project was to conduct research to understand the nature of farmer decision-making, to determine the suitability of a standard set of sustainability indicators for use by farmers in the study region and to develop a decision aid for farm managers that would foster sustainability. The participatory nature of this research informed the development of a do-it-yourself, values-based decision tool for use by farmers rather than a quantitative, data based expert decision model. The decision framework developed by the Modeling Team integrates the use of sustainability indicators in the practice of Whole Farm Management with a sustainable choice model. Drawing on the utility of the Multi-Criteria Evaluation approach to complex decision-making, this sustainable choice model integrates research-based knowledge of sustainable agriculture and rural community development, consumer theory, and decision theory.

The Modeling Team created a draft of the decision tool guide as a booklet. The booklet guides the farmer through five steps to create a farm sustainability profile useful to farm management decisions and provides directions for the use of two different choice models to support the selection of "best fit" enterprise and farmland protection options for the farm. The booklet includes worksheets and directions to select and prioritize a set of indicators for the farm, personalize performance charts for each indicator selected, plot the farm sustainability profile, and use the farm sustainability profile as a management tool to monitor farm performance and evaluate the impact of different management options on farm sustainability. The guide includes the best available technical information on the farm performance of 32 sustainability indicators and includes an example of a Western North Carolina farm family using the tool to make decisions about how farmland protection and new enterprises might influence farm profitability and total family income.

The Decision Tool developed in this project has several strengths and weaknesses:

Decision Tool Strengths

- Uses standard sustainability indicators and choice models with strong research base
- Provide farmers a tool that appears to improve clarity in goal setting, ability to monitor farm performance, and clarity and confidence in their management choices
- Compatible with Whole Farm Management and directly supports goal setting, resource assessment and monitoring activities
- Can be used with existing stand alone Resource Assessment and Enterprise Analysis tools
- Easy to use, iterative process with "DIY" simplicity
- Focus is on supporting farmer choices for their farm with consideration of the many dimensions of their farm and community.

Decision Tool Weaknesses

- Requires awareness of goals
- Requires the use of Whole Farm Planning practices
- Many sustainability indicators are poorly supported with existing technical literature
- Little or no information about benchmarks for sustainable performance of most indicators
- No research base to support use of user-defined indicators
- Choice processes have not been tested for farmer usability and robustness

The Modeling Team recommends that additional participatory research be conducted before the Decision Tool is released for use by farmers and technical advisors. More research is needed to test the utility of the Decision Tool Guide in farm decision-making, to better develop the technical information on sustainable farm performance presented in the guide, and to improve overall design and layout. In addition, research to test the impact of tool use on farm sustainability and farmer decision-making is also necessary before release of the tool for use by farmers.

This research has also highlighted the astounding lack of useful technical guidance for farmers wishing to use sustainability indicators in Whole Farm Management. In particular, there is almost no research-based information on benchmarks and performance values for standard farm-based sustainability indicators. This information is critical to the use of sustainability assessment and monitoring of farm family and rural community well-being. The research-based development of farm performance benchmarks and simple methods of monitoring sustainability indicators is essential if society wishes to reap the multiple benefits of a sustainable agriculture.

Sustainability and Choice

… *sustainable development, which implies meeting the needs of the present without compromising the ability of future generations to meet their own needs, should become a central guiding principle of the United Nations, governments and private institutions, organizations and enterprise* (UN World Commission, 1987).

Sustain, v. …..3. To keep (a person or community, the mind, spirit, etc.) from failing or giving way ME. 4. To keep in being; to cause to continue in a certain state; to keep or maintain at the proper level or standard; to preserve the status of….(OED, 1980).

The reference to 'sustainability' relating environmental issues to poverty and economic growth was introduced to the United Nations and to the world as a guiding principle by the Brundtland report of 1987. The shorter Oxford English Dictionary in 1980 gave 12 listings defining the verb *to sustain*. In essence it was defined as 'to prevent failure of person or community,' or to cause continuation in a 'proper level or standard'. The Brundtland report's 'definition' of sustainability, that has become commonly accepted worldwide, emphasizes the *ability* of future generations to achieve their needs (often defined as a desired level or standard of living). Thus the key to understanding sustainability is to define the qualities of life that we wish to sustain and to understand the resources and processes that provide future generations the ability to meet these levels.

With an understanding of the wants and needs of a community that wishes to sustain itself and the knowledge of the resources needed to achieve sustainability, the community can make decisions and design policies that bring together the dimensions of sustainability they have defined for their community.

Unfortunately sustainable choices are not so easy when there are multiple goals, many stakeholders, lots of uncertainty and more to consider. Successful management of this complexity is the *process* of sustainability, the *how* part of solving the problems identified in the Brundtland report and the *how* part of achieving the goals set out by communities and enterprise. Thus when understanding sustainability we can identify two elements – the content and the process – of sustainability.

The *content* of sustainability includes the identification, understanding, and benchmarking of the 'proper standards and levels' for each sphere (environmental, social, and economic). The *process* of sustainability involves how the above information is identified and collected and also how it is used in order to make decisions and design policy. The complexity of the sustainable choice often decreases the desire to pursue such actions thus leading to people to say they want to make sustainable choices, or environmental choices, but they can't afford it, don't think their decisions really matter, or just can't think about it because it is too hard!

In order to bring sustainability onto the radar screen for farmers and rural communities, two conditions are required:

- They need to be motivated to do things differently. This can occur either internally though shifting value systems or leadership in a firm, or externally from society, consumers, other external stakeholders (e.g. stock holders).

- They need to know that there are *other* options and *how* too choose between these other options.

In other words, it is one thing to *want* to do things differently, it is another thing to know *how* to do them differently!

The Farm Prosperity Project

The Farm Prosperity Project aimed to offer technical support to farmers facing complex decisions in a region distinguished by changing markets and intense land development pressure. The Modeling Team contributed to this effort through research to understand the nature of farmer decision-making, to determine the suitability of a standard set of sustainability indicators for use by farmers in the study region and to develop a decision aid for sustainable farm managers. The participatory nature of this research informed our choice to develop a do-it-yourself (DIY) values-based decision tool for use by farmers rather than a quantitative, data based expert decision model. The decision framework developed by the Modeling Team is based on the use of sustainability indicators in the practice of Whole Farm Management and a sustainable choice model. Drawing on the utility of the Multi-criteria evaluation approach to complex decision-making, this sustainable choice model integrates research in sustainable agriculture and rural community development, consumer theory, and decision theory.

A brief review of the literature supporting the underlying concepts that informed our approach to the development of the DIY model is presented in the next section of this report.

Multi-Criteria Evaluation

The multiple dimensions of sustainability (social, economic, and environmental, as well as scale dimensions, etc.) and the uncertainty surrounding these complex dimensions impose complexity on decision-making by individuals and communities. Further, these complexities and the potential for conflicting values raise the problem of comparability of alternative choices and compensation between these choices.

Multi-Criteria Evaluation (MCE) is a generic term for a variety of approaches to managing complexity in decision-making that are all rooted in decision theory and economic choice theory (Belton and Stewart, 2002). Some examples include Analytical Hierarchical Programming, Goal Programming, Outranking, Multiple Attribute Utility Theory, etc. These approaches have in common that they all allow multiple dimensions to enter the social decision process. They also

all must apply some subjective approach to weighting criteria. Multi-Criteria approaches differ in how they weight criteria and how they include the multiple dimensions. Which approach to use depends on the decision characteristics of a community. These characteristics include how communities view the dimensions of the decision process as goals or constraints, whether they have a focused problem at hand or are in a general planning process, and how they consider the alternative values in their community.

Belton and Steward (2002) discuss the appealing characteristics of the MCE approach to the support of sustainable decision-making given the various elements involved in making sustainable choices: conflicting values, complexity of issues, multiple dimensions, uncertainty, and the need for various goals and constraints. This approach can accommodate critical criteria and flexible goals, different scales of analysis (e.g. individual, community and regional) and different interests (e.g., social, environmental, or economic). It offers a method that contributes to the process of constructing a solution, but does not give a single solution. This approach offers a flexible framework that allows for multidisciplinarity to enter decision processes, but doesn't determine choice; rather it articulates options, a whole set of values, and technical information relevant to the decisions under consideration

The MCE approach also easily accommodates the uncertainty that exists in complex social decision processes (Belton and Stewart, 2002; Cornelissen et. al. 2001; Wood et. al. 2007). Uncertainty can be introduced either by stochastic attributes where the future is unknown, or due to fuzziness in understanding, i.e. the community cannot adequately describe what they see. Fuzziness can come from variation in how different observers see things, or in the definition of a set. The result is another category of information in the analysis, fuzzy numbers that give approximations rather than "crisp" values, yet they are not qualitative.

Finally, MCE methods are well developed in the literature. For example, the application of MCE to environmental and natural resource decision processes are often applied to specific economic sectors such as agriculture or to particular resources such as water, or forests (e.g. Manangon and Tempesta (1998), Stewart and Joubert (1998), Stewart and Scott, (1995), Romero and Rehman (1989)). MCE approaches are also more generally applied to regional planning in, for example, Giaoutzi and Nijkamp (1994).

Whole Farm Management in Sustainable Agriculture

Numerous studies have shown that understanding farmer preferences regarding the adoption of new technologies, including management practices that improve farm sustainability, is difficult (e.g., Wilson, 1997, Paolisso, et. al, 2000, Napier and Bridges. 2002, Upadhyay, et. al., 2003). This difficulty arises as a result of the complexity of factors that influence farmer perceptions of the costs and benefits – social, economic and environmental - associated with the adoption of sustainable practices on their farms (Salamon, et. al., 1997, McCann, et. al 2006, Parker and Moore, 2008). In a recent review of 25 years of research, Prokopy, et. al.(2008) reported that education levels, capital, income, farm size, access to information, positive environmental

attitudes, environmental awareness, and utilization of social networks emerge as some of the variables positively associated the adoption of best management practices by U.S. farmers.

Whole Farm Management is a management strategy that is particularly relevant to sustainable agriculture (Janke, 2000). Although this approach to farm management was developed primarily to assist farmers wishing to improve environmental quality on their farms, whole farm management has expanded in the last decade to include sustainability considerations through the use of sustainability indicators (Freyenberger, et. al., 1997).

Whole farm planning typically involves a four step iterative process: goal setting, resource assessment, planning, and monitoring the plan for progress towards goals. Although shown to be a useful and effective management approach, whole farm planning tools have not been widely adopted by farmers, in part because of the time involved in the complex record keeping required by existing tools (Janke and Freyenberger, 1997).

Farmers who have adopted whole farm planning report improved profitability, more satisfaction with their quality of life, and increased natural resource quality on their farms (e.g. Mackenzie and Kemp, 1999 and Miller, et. al. 2003). Research into improving the adoption of whole farm planning recommends taking a participatory approach to the development of simple farm-based tools based on observations and record-keeping that is traditional for farming operations, or that is complementary to common farm tasks (Boody, 2001).

A multidimensional perspective offers the best approach to improving our understanding of the complexities of farmer perspectives on the use of a sustainable management decision tool. McDougall and Braun (2003) report that participatory research methods are particularly well-suited to investigations of this nature. Methods that support direct observation and interaction between farmers and researchers as farmers engage with the tool during development will provide critical information about the willingness and the ability of farmers to use existing tools. In addition, these methods gather information that can be used to improve tool training procedures and to increase farmer awareness and acceptance of the tools. The approach is especially important if we hope to create change on the ground in communities, with producers, consumers, community leaders, etc. These benefits of participatory research methods are widely accepted in many disciplines, including those engaged in sustainable agriculture research and education (e.g. Doll and Francis, 1992, Campbell, A. 1995, Bergström and Goulding, 2005, Robertson and Swinton, 2005).

The development of tools suitable for farm sustainability assessment is an active area of research involving agricultural researchers, technical advisors and policy makers worldwide (e.g., Becker, 1997, Smith and McDonald, 1998, Andreoli and Tellarini, 2000, Rossi and Nota, 2000, Nambiar, et. al., 2001, van der Werf and Petit, 2002, Hani, et.,al., 2003, Bylin, et. al., 2004, Flores and Sarandon, 2004, Vilei, 2007, Marta-Costa and Poeta, 2008). Researchers in Australia and Europe have led this work and offer a variety of indicator-based approaches for sustainability assessment of agriculture and rural communities. Such indicator-based methods have been developed for a variety of users – farmers, rural communities, and policy makers at local, regional, national and

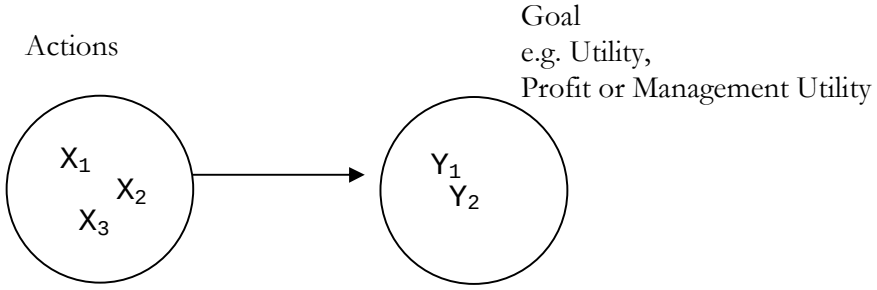
global levels (King, et. al 2000). In 2005, the Framework for Assessing Sustainability Levels in Belgian Agricultural Systems (SAFE) project completed a comprehensive international review of agricultural sustainability indicators in use at that time (Maljean, et. al, 2004). These researchers report that the research, technical assistance and policy-making communities are converging on a coherent system of indicators for the assessment of farm sustainability.

The SAFE project provides a specific example of a holistic farm-scale approach to sustainability assessment using the European Union Hierarchical Framework: Pillars – Principles – Criteria – Indicator – Reference Values (Maljean, et. al, 2004). The pillars are the three sustainability themes – environment, economic and social. Principles are associated with the multiple functions performed by the agro-ecosytem and can be viewed as goals or objectives. Criteria are quantitative or qualitative characteristics of the agro-ecosystem which can be assessed. A set of indicators should provide a representative picture of the sustainability of agricultural systems in their environmental, economic and social dimensions and references values provide a benchmark against which to evaluate performance on each indicator. The relationship between principle, criteria and indicator for a selected set of farm-scale sustainability criteria used in the SAFE sustainability assessment are shown in Appendix A.

Sustainable Choice Model

In consumer theory we typically model a consumer maximizing satisfaction represented by a utility function. This function may or may not have multiple goods from which a consumer is choosing, consider environmental issues, allow for altruism, account for uncertainty etc. Further there may be a single budget constraint, or a consumer may face additional constraints upon their choices. The producer choice process is similar as we generally assume a single function to be maximized such as profit or management utility constrained by whatever physical or monetary constraints may be appropriate for the firm or industry(Henderson and Quandt, 1980). No matter the model variations, the general choice framework can be represented by Figure 1 below.

Figure 1: Representation of the simple decision model

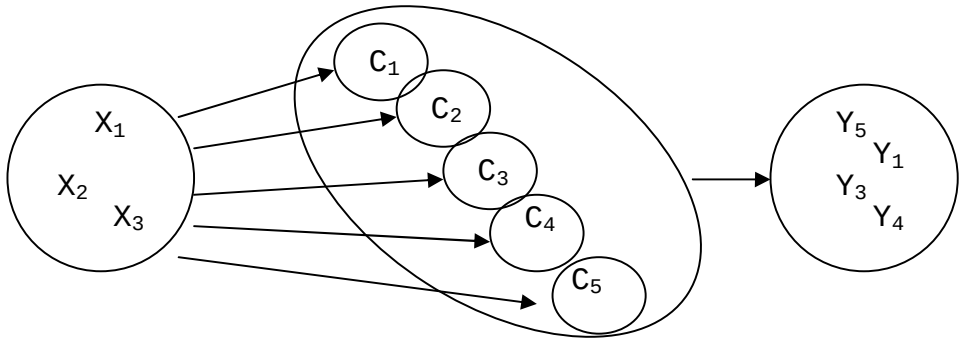


$$Y=f(X_1, X_2, X_3) \quad (1)$$

In Figure 1 we have a set of actions, X's, that are selected by a decision maker to impact the single goal, Y (these options may have already been narrowed by the decision maker). In this example there are three options in the set. There is a one-to-one correspondence between these two sets, meaning that each combination of values in the action set (left hand side) will yield only one value for the Goal (right hand side). Equation one represents the relationships given in figure 1. Decision-makers select a set of actions such that Y is maximized. This is a summary of the typical choice model in economics. When we introduce sustainability as a goal for decision-makers we add a layer of complexity to this decision process.

In Figure 2 below the decision-maker has identified a set of sustainability criteria (C_1, C_2, C_3, and C_4) that together yield a level of utility depending upon the performance level of the criteria. The criteria performance levels are dependent upon the action choices made from set **X**. As we can see from Figure 2, just as above, there is a one-to-one correspondence between the actions in set **X** and each of the criteria in set **C**. Each criterion is a function of the combination of X's chosen from **X**. The relationship between the criteria and the level of utility achieved by the decision-maker is similar to that given in Figure 1 between the set **X** and set **U**.

Figure 2: A new layer in the decision process brought in by the sustainability criteria



$$Y=f(C_1(X_1, X_2, X_3), C_2(X_1, X_2, X_3), C_3(X_1, X_2, X_3), C_4(X_1, X_2, X_3), C_5(X_1, X_2, X_3)) \quad (2)$$

Figure 2 looks daunting, as does equation 2, however, decision-makers are able to make complex decisions and often do so in their lives. For example the decision to purchase a car requires that we consider multiple characteristics of the auto and then make a choice across different combinations of these characteristics. The same occurs in the home choice and in the choice of insurance. These choices are however different than the process presented in figure 2.

The home or car choices are cases where the criteria or attributes describe one option for the decision-maker to choose, X_1, for example in figure 3. This choice of X_1, a specific car at the dealer, yields a specific level of utility. It would be analogous to a decision-maker choosing one criteria from the set, C above in figure 2. Multi-attribute goods were first introduced into choice theory by Kelvin Lancaster in the 1960's (Lancaster, 2006).

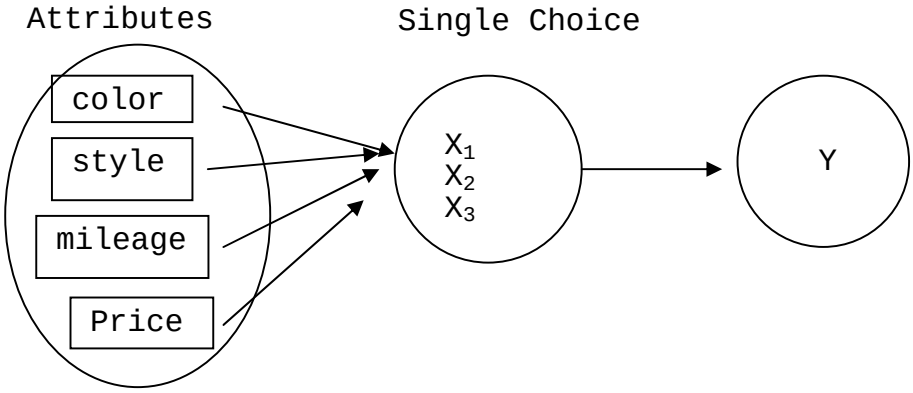


Figure 3: Common Complex choices made by decision-makers

Despite consumer and producer ability to make complex choices, such as those shown in figure 3, it does not mean that they do so often (the examples are all cases of decisions that are made only a few times at most in ones life), nor are decision-makers necessarily effective in doing so. Decision-makers also make decisions with multiple goals such as those shown in figure 2. In either case, decision-makers often use rules of thumb to make complex decisions. For example they may identify a small group of characteristics such as the color, mpg, and price in order to narrow their choices for a car. Or they may use a critical threshold for a single criterion such as size, or safety to narrow or make a choice. For auto or home decisions these strategies may be appropriate coping strategies for decision-makers, however depending upon these approaches when decision-maker choices can have important impacts on society's resources may not be prudent. If we wish to promote sustainable choices then decision support will be valuable.

In order to assist decision-makers to consider the sustainability criteria in the mid layer shown in figure 2, the set **C**, they need help with the identification of the set **C**, establishment of their benchmarks in set **C**, identification of the set **X**, and an understanding of the relationship between the sets **X** and **C**. These steps will help decision-makers gain significant clarity about their options and impacts; however it will not help them make their choice. This involves making the connection between set **C** and the goal, or **Y**. In other words decision-makers need to understand which criteria are most important to them and the trade-offs they are willing to make between these criteria.

Decision Theory, which provides the approaches needed to do the next step, gives us a model based on the familiar utility maximization approach , as well as, alternative approaches such as *satisficing* (Simon 1959; Belton and Stewart, 2002) or *outranking* (Belton and Stewart, 2002). The approach used by decision-makers depends upon the problem under analysis, its scope, time

frame, budget etc. In other words, the problem structure is a critical first step that can determine the methods choices (Belton and Stewart, 2002).

Farmer Decisions

The farmer decision can be classified as a set of repeated or single problems (daily or seasonal or annual choices, or lifetime choice such as expand farm) impacting multiple stakeholders (farmer, his/her family, neighbors, customers, employees, broader community), which can be in the form of simple sorting or ranking problems, or of complex choices needing more detailed description in order to understand consequences and outcomes. The range of alternatives are likely small (such as crop options, tillage techniques etc.) and it is likely farmers are 'do-it-yourself' (DIY) decision makers. Given these characteristics of farming choices we developed a DIY framework that can be applied by farmers for their individual on farm choices.

Recall the sustainable choice model presented above in figure 2. A decision tool for sustainable farm choices must provide support in four areas:

- Identification of Alternative Actions (X's)
- Identification of Sustainability criteria (C's)
- Choice Analysis
- Monitoring and Assessment of Choices made

All choice situations have this basic structure that includes a set of alternatives to be evaluated against a set of quantitative or qualitative criteria representing the multiple stakeholders' tastes and preferences.

Sustainability Indicator Set Development

A comprehensive review of technical and research literature on the use of sustainability indicators and Multi Criteria Evaluation approaches to sustainability assessment and decision-making in agriculture was conducted in the summer of 2005. One aim of this review was to select a set of validated, farm-scale sustainability indicators likely to be useful and relevant to decision-making of farmers located in the Prosperity Project study area.

The initial set of 47 indicators selected for this research (See Appendix A) was drawn from the farm-scale sustainability indicators recommended by the Framework for Assessing Sustainability Levels in Belgian Agricultural Systems (SAFE) Project (Maljean, et. al. 2004). A set of 357 potential indicators was compiled from this review and expert multi-criteria evaluation was used to refine this list to a core set of 87 coherent, well performing and relevant sustainability indicators (Sauvenier, et. al., 2006).

The Prosperity Project Modeling Team revised the SAFE set of indicators based on expert recommendations made by Prosperity Project collaborators to improve relevance to important issues related to development pressures and farmland preservation, high value enterprise selection and farm management considerations. Multiple meetings with project collaborators, lead by the Modeling Team, revealed opportunities for combining indicators, revising indicators and reorganizing the indicators into three new categories to better address project focus areas. This initial set of Prosperity Project indicators is reported in Appendix B.

Selected indicators from the Prosperity Project set was tested for relevance at a regional farmers marketing conference in February 2006 using a poster board dot survey of self-selected conference attendees. Three poster boards were created, each one presenting a set of sustainability indicators categorized as Farm Family Well-being, Community Well-being or Environmental Well-Being. Each poster board provided a brief explanation of each category and presented an array of indicators along with a definition of each.

Respondents were asked to place dots near any indicators that were important to the decisions that they made about their farm. Respondents were also asked to recommend any additional indicators important to their farm decision making that were not presented on the poster boards. The list of indicators with definitions included in the poster survey is reported in Appendix C.

Exploring Farmer Decision-Making

In order to create a decision tool useful and relevant to farmers we used a participatory approach to design a tool based on the sustainable choice model presented above and informed by the farmer decision behavior and skills observed in this project. McDougall and Braun (2003) report that participatory research methods are particularly well-suited to investigations of this nature.

The participatory approach used in this project included a variety of methods applied in an iterative fashion:

- literature-based decision model development as discussed above,
- focus group research for direct observation of decision behavior,
- integration of the decision model and focus group observations into initial decision tool design, and finally
- face-to-face farmer interviews and survey implementation for additional direct observation and testing of discrete tool elements.

Farmer Cooperators

Thirty-two farm families were recruited to participate in the Prosperity Project by the High Value Crops Team. Twenty-three of these families volunteered to participate in Modeling Team research as members of farmer focus groups and/or as on-farm interview respondents.

Some of the farmers participating in the Modeling Team research were recruited by Prosperity Project collaborators; others were self-selected in response to publicity about the project accomplished through project mailings, project-supported workshops and local news coverage. As a group, Prosperity Project farmers are representative of farming community in Western North Carolina The average farm size is 35 acres, but ranged from 4 to 750 acres. The average age of the principle operator was 55 years. Project farmers report farming for as few as 4 to as many as 75 years. Most farms have at least one family member working full-time on the farm and most families relied on crop cultivation and animal husbandry for a significant portion of their annual income. About 20% of the sample farmed full-time and all the farm families earned some off-farm income.

The farms in this project have a diverse product base - selling both meat and vegetables, or trees and trout - but usually rely on a key marketable product as their main source of income. Some farmers process their goods to add value to the raw resource. Among the value-added crops and special enterprises represented in the sample are greenhouses, nursery stock, agritourism, website marketing and processed foods.

Farmer Focus Groups

The focus group agenda included discussion of farmer decisions made recently on their farms and review and discussion of a decision case study (see Appendix D). These were planned as open-ended discussions designed to gather qualitative material revealing how the farmers approached decisions, both of their own and one given to them, the questions they asked, and the information they used.

Using standard focus group methods (Miles and Huberman, 1994), we analyzed the information gathered in the groups using the sustainable choice model discussed previously. The analysis reviewed the goals, constraints, information, and options the farmers considered, proposed or

questioned. We were interested to observe how farmers considered their goals, if they considered more than one goal and what these goals were. We also studied how they considered their constraints and what constraints they had. We reviewed how the farmers created their choice options and how they decided between them. Finally we looked at what information they used in decision-making and what information they felt they needed.

Farmer Interviews

Based on the results of the focus group research and using the sustainability indicator set described previously, we designed and implemented a farmer face-to-face survey. The purpose was to identify the indicators farmers used and their level of use, their ability to define qualitative indicators, the need for and their ability to identify and define new indicators, their ability to discern between indicator performance levels and the utility or satisfaction that is received from those levels, and finally the farmers' ability to prioritize indicators using alternative ranking and weighting methods. We tested a cafeteria selection process for the sustainability indicator set. We used the 'thermometer' (Stewart and Joubert, 1998) for indicator definition (e.g. performance and satisfaction levels), and we used the dot allocation method, simple ranking, and a pairwise comparison method for the ranking and weightings section. A sample survey can be found in Appendix E.

Sustainability Indicator Set Revision

The results of farmer surveys suggested that additional revision of the indicators would improve the utility of the tool. Working as a research assistant with the Modeling Team, Sophia Levin-Hatz reviewed the relevant literature and developed two new indicators that were added to the decision tool set: a development pressure indicator and an innovative family income indicator that improved the utility of tool by integrating three existing income indicators (total family income, farm income and ratio farm income/farm debt).

Indicator Definition: Indicator Report Card

A review of the technical literature was conducted by the Modeling Team to prepare farm performance scorecards for each indicator included in the decision tool booklet. These scorecards presented information about each indicator useful to decision-making on the farm. Each scorecard includes the following information, if available in the literature: a definition, frequency of use by Farm Prosperity farmers, recommendations for simple on-farm monitoring techniques, benchmark or baseline values for sustainable farms, a three category descriptive range of farm performance and recommended sources for additional information about the indicator. Technical literature used to develop the performance scorecard was selected based on the following source ranking in an effort to create farm performance sheets relevant to farmers in the Prosperity Project study region: 1) produced or recommended by NC Cooperative Extension, 2) Cooperative Extension from other states in similar climates, 3) Southeast regional sustainable farming organizations, 4) Cooperative Extension in other states, 5) USDA and other national government departments and agencies, and 6) international sources.

RESULTS

Farmer Dot Survey

The results of the dot survey conducted at the ASAP Marketing Opportunities Conference are reported in Appendix C. These results provide strong evidence that the indicator set is relevant to the decision-making of the farmers completing the survey. Although the sample size was small (20 self-selected farmers), the selection of nearly every indicator by at least 20% of all the respondents, combined with the lack of recommendations for additional indicators suggested that the indicators presented in the survey are recognized and are regularly used by the farmers who completed the survey.

Final Sustainability Indicator Set

The initial indicator set selected from the SAFE project indicators is reported in Appendix A. This set was selected based on a review of research literature. The final indicator set included in the Decision Tool can be found on page 6 of the Decision Tool booklet (see Appendix G). The content and form of the final indicator set reflects a participatory approach to the research and development of the Decision Tool involving farming conference attendees, farmer focus groups and interviews, input from Prosperity Project collaborators and Modeling Team review and revision and indicator development as described in the Methods section.

Decision Tool Design

During the focus groups and interviews we discovered the following:

- Farmers often must make decisions or at least interact with multiple people with different utility functions.
- Farmers have a need for information and expertise
- Understanding the connection between actions and outcomes would be very helpful to farmers.
- Developing options that relate to their constraints from their external environment would also be very helpful.
- Farmers were very creative when it came to identifying and brainstorming new options for the case study farm.
- Farmers paid close attention to their different criteria and recognized important constraints.
- Farmers had no way to compare multiple options and when they tried they used a pair-wise comparison approach with only 1 criterion or at most 2.
- Farmers wanted help to make decisions "I don't know how to make the decision."
- Farmers requested information and education over and over again. They wanted to learn about options available to them, about the possible outcomes from those options, what constraints should they consider and about the risk associated with different options.
- The potential for decision trees to help sort out choice options became evident.

Based upon these results and a literature review of MCE tools and applications we designed the tool to the following specifications.

Selecting, Defining and Understanding Indicators

The tool would begin with a cafeteria of vetted indicators from which the farmers would select those that suited their farm best. This more generic approach (i.e. allowing farmer choice instead of specifying a set for them) provides the farmer the ability to choose the appropriate criteria for the choice situation in which they find themselves and that best suits their farm. This allows the farmer to structure the choice situation, gain clarity on conflicting values, create a common language for discussion amongst stakeholders, anticipate future contingencies, and look for and understand potential secondary effects (Belton and Stewart, 2002). These pieces provide the basis for 'good' decision-making!

The 'Thermometer' was the indicator format selected to accommodate easily the following two areas: the performance level and the decision-makers judgment (satisfaction level or utility) about the performance levels. The performance level is an objective description of the different levels possible for the indicator. Technical experts can provide this information, or it may come from a farmers experience on their farm, or both. The satisfaction level is very subjective and represents how a farmer feels about an indicator's performance. It represents the farmer's preference regarding that indicator for their farm.
The performance and satisfaction scales bring clarity to farmers about their current state and what may be possible. It also helps them understand where they are with one indicator as compared to another indicator. It is important to elicit a farmer's satisfaction about an indicator; otherwise there is an assumption that the farmer's goal is to achieve the 'high' performance level for all indicators. However, a farmer may discover that mid-level performance may be acceptable especially if accepting the mid- level of an indicator may allow for another indicator to achieve the high performance level. Essentially, understanding their preferences about the indicators allows farmers to explore the trade-offs they may be willing to make in order to optimize farm performance across a variety of indicators.

We tested a seven-point scale that allows the farmer to discern differences in their satisfaction and preferences for the performance levels of the indicator. In addition, we tested two types of evaluation scales: the satisfaction scale and an attention scale. The first addressed a farmer's preferences for a particular performance level of an indicator, the second served as a signal for a need for change. Figure 4 on the next page is an example thermometer format.

Figure 4: Thermometer Format for Farm Performance Assessment

Performance Level	Feeling	
High	↑ BEST	
Medium	BETTER	Now here
	OK	
	BAD	
Low	WORST ↓	Current State

The face-to-face interviews revealed that the farmers were well able to select from the cafeteria provided. We also found that after farmers selected indicators that they commonly used, they were comfortable prioritizing those indicators. All three ranking and weighting approaches were acceptable to farmers, thus we have chosen to use all three in the decision tool where they are needed. Further we found that farmers were able to effectively use the thermometer format and were able to understand the difference between indicator performance levels and their satisfaction with those levels. They were able to view a range of performance levels, set their "satisfaction scale" and locate their current state. Of most interest, we found that farmers were comfortable with the non-linearities inherent in the satisfaction judgments; however we found that a five-point scale was sufficient for the purpose of eliciting preference levels. Finally, although the attention scale may be useful at times for monitoring and assessment, we found that the satisfaction scale was more relevant to farmers for decision-making.

The indicator set includes several qualitative indicators such as time with family, cooperation with farmers, or related to local history. The focus groups and interviews demonstrated that farmers considered these important indicators, regularly used these indicators and could define these indicators in a qualitative and meaningful way. We used a direct rating approach (Belton and Stewart, 2002), reference points, and qualitative positioning methods for the farmers to define these indicators. No measurable scale was attempted.

Determining Farm Options

The focus groups revealed that farmers had many ideas for alternative enterprise and farmland preservation options; however, they were not necessarily able to systematically review those ideas to determine those that were best suited for their farms. The focus groups results identified that a narrowing process relevant to many kinds of farms would be useful support for farmers.

The FPP project was specifically designed to assist farmers to explore the possibilities of alternative crops and land conservation as options for increased profitability through lower costs and higher prices and lower taxes. Furthermore the land conservation options may allow farmers to maintain their farm and pass it along to future generations.
The Modeling Team recommended that the High Value Crops Team and the Farmland Protection Team develop simple decision trees as a method for assisting farmers in the selection of alternatives for their farm. Decision trees are useful because they create a flow of questions and directions that can identify the relevant options for farmers to consider given their interests, concerns, and constraints. The addition of these decision trees to the decision tool was also appealing because of their utility in resource assessment, one of the four steps in Whole Farm Management.

Making Choices: Connecting the Criteria to Farmer Satisfaction

Preference models give us an understanding of the different ways decision makers' preferences and values can be used to make choices. We discuss three briefly in order to give our reader some understanding of the three general types of models and methods available for the choice analysis. All three approaches require a set of identified and defined criteria for a decision maker and a set of alternatives. More details of these approaches can be found in Belton and Stewart (2002).

Valued focused decision models construct a process where a decision maker's preferences and values regarding different criteria or goals are associated with a number representing a cardinal utility value. Equation 3 shows the mathematical representation for the Value function with which an option's 'value' is determined.

$$V=w_1C_1(a_1) + w_2C_2(a_2) + w_3C_3(a_3) + \ldots\ldots + w_nC_n(a_n), \quad (3)$$

where a_i is the value score for each criteria, C_i, resulting from the choice of some action X. w_i is the weight given to C_i by the decision-maker compared to the other C's. Essentially this approach provides another layer of measurement to the criteria definitions discussed above. The attachment of a preference measurement allows the decision maker to compare one choice option (say A) across all the criteria with another option (say B) to determine preference, e.g. that option A is the preferred option when compared to option B. This additional layer or scaling factor provides a commensurability between criteria allowing comparisons across criteria of different measures e.g. comparing apples with oranges! The defined index or scale for each criterion is used along with a qualitative procedure to attach a decision maker's preferences to a scaling factor. Evaluation of the options with each criteria and then summing values can lead to an overall ranking of a choice option. It can also allow a decision maker to consider the trade-offs between options and criteria. Simple adaptations of this approach include the Even Swap approach (Hammond et. al. 2001).

The *Satisficing approach* is actually a process that can be used when maximizing is too complex due to several evaluation criteria, which is often! The Satisficing process uses the defined criteria mentioned above. Then the most important criteria are evaluated first to narrow the choice options available to a subset of options using those criteria. All options that meet

some 'satisfactory' level of the most important criteria remain. Then considering this subset of options we move along to the next most important criteria and again evaluate this subset keeping only those that are 'satisfactory'. This continues until we have proceeded through all criteria. If more than one option remains, the process can be repeated. This process is especially useful in preliminary investigations when a short list of options needs to be extracted from a longer list. However, as noted by Keeney (2002), the satisficing approach alone may lead to one of the common mistakes made in value judgments.

The *Outranking procedure* instead considers the defined criteria as a package but then evaluates the package looking for similarities and differences in the levels achieved by each option for each criterion. For example when comparing options A and B, if it is found that they are similar or the same in all options but one, then the option that is 'dominant' in the remaining criteria will be preferred. However, typically there is not only one criterion in which difference is found where a clear choice can be made. There are two 'measures' used in Outranking, concordance and discordance. These can lead to one of four outcomes:

1. Definite preference for Alternative A
2. Definite preference for Alternative B
3. Indifference between alternatives
4. Incomparability between alternatives

In the first two cases clear difference between options exists that allow clear identification of a single 'best' solution. In the remaining cases this is not so. In case 3, indifference occurs between two or more options, thus the decision maker must find an additional criterion with which to make their decision, or else choose randomly! In case 4 the options are not comparable as they may differ significantly in the criteria, but there is insufficient information to determine which criterion is more important (e.g. the additional layer of value has not been determined in the model). In this later case the value function approach may be needed, or an additional criterion that can differentiate options may be needed. Using the concordance and discordance values, methods exist that allow aggregation of the analysis to determine a single solution between options.

Based upon the literature review, farmer focus groups, and the face-to-face interviews, we developed a choice process that includes all of the above. It was important to us that the approach integrate well into a DIY tool, thus simplicity that maintains the integrity of the choice process were our primary criteria for selecting choice processes for the tool. Interestingly, the satisficing approach is useful when critical thresholds are present, the outranking approach is useful to remove non-dominant options, and finally the value-focused approach as represented by the even swap and distance metric approaches are useful for the final option selection. Thus the tool incorporates each method as it fits best. The process developed by the modeling team is summarized below into five steps that are described in more detail in the decision tool overview section below.

1. Do you have any *critical* indicators? Using the satisficing approach, critical indicators are used to narrow the option set.

   a. Are there any indicators that must have some minimum value or else you cannot consider the option?
   b. If so, determine if the minimum has been reached for those indicators.
      i. If it has, all is well.
      ii. If not, then determine if you will drop the option where that value level has not been met. Since it is a critical indicator, it is expected that you will drop that option. If you find you do not want to drop the option then you are discovering that the indicator may not be critical.

2. Do you have any *irrelevant* indicators?
   a. Do any of the indicators have the same value across ALL options? If so, drop those indicators from the matrix.

3. Do you have any *non-dominant* options? Using the outranking approach, non-dominant options are identified and removed.
   a. Are there any options where the indicator values are lower than all values for all other options? If so, drop that option. Continue until all non-dominant options are removed.

4. Create your new simplified Impact Matrix with the remaining options and indicators.

5. Begin the CHOICE process using the even swap and/or distance metric approaches. These two approaches are briefly described below. Detailed instructions on their application to sustainable choice are provided in the decision booklet.

The Even Swap Approach

The Even Swap approach breaks choice into several additional steps rather than a single step comparing all indicators for all options simultaneously. The farmer will consider the trade-offs between indicators by 'evening out' one indicator and then comparing it with another. Note that only the simple impact table of remaining indicators and options is required for this process. The indicators are not weighted. Our tool uses evaluations of preference levels for each indicator. This method requires the least amount of information: indicators and their value judgments, options, and expected outcomes.

Distance Metric Approach

The Distance Metric approach is best for those decision makers who prefer a quantitative evaluation method. This approach compares available choice options to an ideal option where each indicator performs at its highest satisfaction level. This is a hypothetical option that, if possible, would be the most desirable option. The option closest to the ideal is the one that should be selected. This approach requires a numerical standardization of the outcome table so that the outcomes can be measured for each option. Therefore rather than a table that shows the qualitative values for each indicator and each option instead a quantitative standardized value that

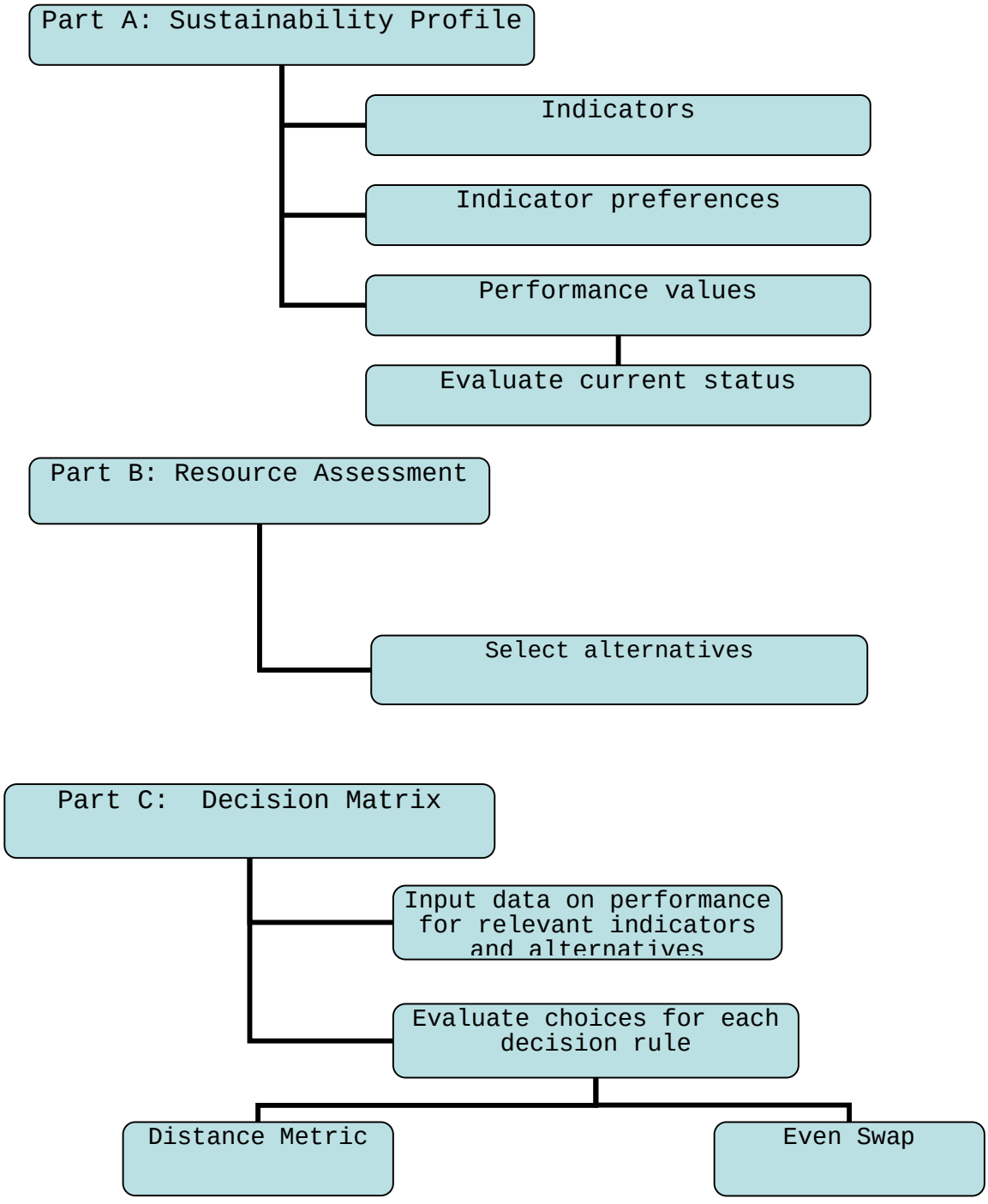
represents the qualitative value is given in the table. The distance from the ideal is then calculated. This approach requires that the farmer determine the specific weights for each remaining indicator and if any significant risk probabilities exist they are calculated for each uncertain option.

Decision Tool Overview

On the following page, Figure 5 depicts the decision process developed by the Modeling Team. We envision the tool as a three part decision process. Parts A (Sustainability Profile) and B (Resource Assessment) can stand alone and provide decision support to a farmer, but they do not complete the decision or choice process. These parts only provide support in understanding what is important to the farmer, their current state, and the alternatives they could consider for changes. Part C (Decision Matrix) requires the completion of parts A and B in order to take the decision process to the evaluation stage where a choice can be made.

The information role of technical support in the decision process occurs in all three parts of the decision process. The technical advisor can provide the technical information needed to define and evaluate the indicators in Part A. In part B, these advisors provide the technical expertise needed to guide resource assessment and estimate farm performance under different options. The technical advisor could also provide support for the choice analysis and interpretation of the choice outcomes generated by Part C.

Figure 5. The Decision Model Process Developed by the Modeling Team.



The decision process as presented above is not fully represnted in the Draft Decision Tool booklet created by the Modelling Team. Part B, Resource Assessment, is not included in the booklet. The modeling team envisioned a highly integrated tool that offered specific guidance to farmers on the potential for high value crops and farmland protection to improve farm sustainability. We envisioned farmers working through Part A to develop a sustainability profile for their farm and then moving onto Part B to develop several promising alternatives that could then be tested with Part C. We collaborated with the High Value Crops and Farmland Protection teams on the development of a simple resource assessment process using decision trees to help farmers focus on the best potential options for their farm; however, these decision trees were not completed in time for inclusion in this report. We have included an example of the draft decision trees that we presented and discussed in project meetings with the High Value Crops and Farmland Protection Teams in Appendix F.

The draft Decision Tool booklet guides the farmer through five steps to create a farm sustainability profile useful to farm management decisions and provides directions for the use of two different choice models to support the selection of "best fit" enterprise and farmland protection options for the farm. The booklet includes worksheets and directions for completing the worksheets provided to select and prioritize a set of indicators for the farm, personalize performance charts for each indicator selected, plot the farm sustainability profile, and use the farm sustainability profile as a management tool to monitor farm performance and evaluate the impact of different management options on farm sustainability. The guide includes the best available technical information on the farm performance of the full set of 32 sustainability indicators and includes an example of a Western North Carolina farm family using the tool to make decisions about how farmland protection and new enterprises might influence farm profitability and total family income.

The Decision Tool Guide has not been tested. As described previously, elements of the decision tool were tested by personal interviews with Prosperity Project farmers. The draft Decision Tool Guide created by the Modelling Team can be found in Appendix G.

Farmers need help making sustainable decisions. The farmers participating in this research explicitly asked for help in making decisions to improve farm prosperity. They are looking for support information as well as ways to evaluate the complex choices they face. Furthermore, Prosperity Project farmers were able to complete complex exercises in order to select indicators, define old and create new indicators, and rank them according to their importance to decision-making on the farm.

The Decision Tool developed in this project has several strengths and some weaknesses:

Decision Tool Strengths

- Uses standard sustainability indicators and choice models with strong research base
- Provide farmers a tool that appears to improve clarity in goal setting, ability to monitor farm performance, and clarity and confidence in their management choices
- Compatible with Whole Farm Management and directly supports goal setting, resource assessment and monitoring activities
- Can be used with existing stand alone Resource Assessment and Enterprise Analysis tools
- Easy to use, iterative process with "DIY" simplicity
- Focus is on supporting farmer choices for their farm with consideration of the many dimensions of their farm and community.

Decision Tool Weaknesses

- Requires awareness of goals
- Requires the use of Whole Farm Planning practices
- Many sustainability indicators are poorly supported with existing technical literature
- Little or no information about benchmarks for sustainable performance of most indicators
- No research base to support use of user-defined indicators
- Choice processes have not been tested for farmer usability and robustness

We recommend that additional participatory research be conducted before the Decision Tool is released for use by farmers and technical advisors. More research is needed to test the utility of the Decision Tool Guide in farm decision-making, to better develop the technical information on sustainable farm performance presented in the guide, and to improve overall design and layout. In addition, research to test the impact of tool use on farm sustainability and farmer decision-making is also necessary before release of the tool for use by farmers.

This research has also highlighted the astounding lack of useful technical guidance for farmers wishing to use sustainability indicators in Whole Farm Management. In particular, there is almost no research-based information on benchmarks and performance values for standard farm-based sustainability indicators. This information is critical to the use of sustainability assessment and

monitoring of farm family and rural community well-being. The research-based development of farm performance benchmarks and simple methods of monitoring sustainability indicators is essential if society wishes to reap the multiple benefits of a sustainable agriculture.

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Appendices

Appendix A. Sustainability Pillars with associated criteria and indicators selected from those recommended by SAFE.

Principle	Criteria	Indicator
Ecological	Healthy Soil	soil C balance
		earthworm count
		degree, timing of tillage (soil loss potential)
	Within Carrying Capacity	ratio N fixing/arable crops
		ratio annual/polyannual crops
	Efficient Resource Use	N, P, K balance
		energy input/biomass output
		water input/biomass output
	Biodiversity	# functioning habitats/ecosystems
	Eco-regulation	degree of farmscaping
		pest pressure w/o chemical use
Economic	Material Level Subsistence	cash income
		ratio income/region income
		return on invested capital
		ratio own capital/total farm investment
		ratio farm income/debt payment
		# people earning on-farm income
		farm income
		ratio farm income/gov. payments
	Supports Regional Economy	financial contribution to regional economy (buying and selling products and services)
		income diversification
		# people living on farm and working in region
Social	Well-being	# people living on farm
		farm family health and education
		farmer's health and education

Social, cont.		plans for farm successors
		farm model for others
		# professional tours of farm
		level of satisfaction of farmer and farm family
		planning skills/participation
	Local Participation/Responsibility	membership in private/gov./farmer's organizations
		off-farm income
		volunteer in community
		cooperation with other farmers
		cooperation with conservation groups
		participation in gov. programs
	Accessibility of Landscape	general excursions to farm
		roads/trails through farm
		U-pick sales
		on-farm sales
	Awareness	farmer's awareness of farm's ecology/natural resources, social and cultural environment
	Visual Elements	size, context, structure, shape, texture, light and color, contrasts, variation, chaos and order
	Smells/Sounds	well-balanced and pleasing (natural), stinking/sharp and penetrating(industrial), continuous or temporal gusts
	Subjective Identity	related to local history/nature
		provides personal inspiration
		options/accessibility for participation
	Objective Identity	identity of farm in landscape and landscape in region (ecological, historical, local elements)

Appendix B – Prosperity Project: Initial Indicator Set

Farm Family Well-Being Indicators
Total family income *combined income from all sources?*
Total farm income *total income from all farm-based enterprises?*
Ratio farm income/total income *proportion of total income from farm-based enterprises?*
Ratio farm income/farm debt *proportion of farm income to farm debt?*
Time for Family Activities *time to participate in activities as a family?*
Family Heath/Heathcare *maintain good family health/ have desired healthcare?*
Satisfaction from farming *farmwork brings family a feeling of satisfaction?*
Whole Farm Plan *farm operated according to a written whole farm plan that includes farm goals, resource assessment, monitoring, and evaluation of progress towards goals?*
Plan for Farm Sucessors *plan to continue operation by family in the future?*
Family Education *resources for desired education of family members?*
Model Farm *farm used as example of a successful farm?*
Community Activities *time to participate in religious/community groups?*
Ratio Family/Other Farm Labor *family members employed on the farm?*
Ratio Family/Other Farm Residents *family members live on the farm?*
Community Well-Being Indicators
Local Sales *proportion of total farm income is from local markets?*
Ratio Farm/Regional Income *total farm income relative to average regional income?*
On-Farm Jobs *farm employs off-farm local residents?*
Local Purchases *proportion of total farm purchases from local suppliers?*
Cooperation w/Other Farmers *active member of a local farm org., farmer's coop. or other informal group of local farmers?*
Cooperation w/Neighbors *good relationships with non-farming neighbors?*
Community Accessibility *local community access, on-farm sales or host events that welcome the local community to farm?*
Impact of Development *direct impact on farm (enterprises, practices, future plans)?*
Private/Gov. Programs *participate in private or government programs that benefit farm?*
Local Identity *consider farm history and relationship to local region?*

Aesthetic Appeal *some part of farm managed for sensory appeal (visual, sound, smell)?*
Visual Appeal *manage attractive crop rotation patterns, field borders, and entrances, keep working areas clean and organized, buildings and other structures in good repair and well maintained?*
Smells *promote natural smells of a healthy, productive farm, avoid creating stinking/sharp and penetrating smells that disturb farm residents and close neighbors?*
Sounds *promote natural sounds of a healthy, productive farm, avoid creating loud sounds that disturb farm residents and close neighbors?*
Environmental Well-Being Indicators
Presence of Earthworms *monitor earthworm populations on farm?*
Nutrient Budgets *monitor and follow plan to manage nutrient status of farm?*
Carbon Budget *monitor and follow plan to increase soil organic matter content?*
Legumes/Non-Legume Crops *balance mix of N-supplying and N-feeding crops?*
Annual/Perennial Crops *balance mix of annual and perennial crops?*
Energy Efficiency *ratio non-renewable energy use per acre of crop/livestock harvested?*
Water Efficiency *ratio water use per acre of crop/livestock harvested?*
Biodiversity *manage for variety of different habitats/ecosystems on farm?*
Pest Pressure *pest pressure on farm when no pesticides (organic or conventional) used?*

Appendix C. Results of ASAP Marketing Conference Dot Survey

Farmers attending the conference were invited to place dots on indicators that were important to decisions about their farm. A total of 20 farmers completed the survey. Numbers in front of each indicator are the number of dots placed by that indicator.

Farm Family Well-being

5 Total Family Income *What is our combined income from all sources?*
11 Farm Income *What does the farm contribute to our total income?*
14 Ratio Farm Income/Farm Debt Does the farm cover it's own costs?
9 Family Activities *Do you have time to together as a family to participate in activities you enjoy?*
10 Family Health *Do you maintain good family health and have the resources to obtain desired healthcare?*
11 Farm Successors *Do you have plans for the farm to continue operation by family in the future?*
5 Family Education *Do you have the resources for desired education of family members?*
7 Model Farm *Does your farm participate in research or demonstration projects, farm tours or other events as an example of a successful farm?*
7 Community Activities *Do you have time to participate in religious/community groups?*
5 Farm Labor *How many family members are fully employed on the farm?*
14 Farm Residents *How many family members live on the farm?*
(none offered) Other Indicators *What other useful indicators would you suggest we investigate?*

Community Well-being

10 Local Sales *What proportion of your total farm income is from local markets?*
6 Market Diversification *How many different local markets account for at least 10% of your total sales?*
4 Farm/Regional Income *What is the ratio of total farm income to the average regional income?*
1 On-Farm Jobs *How many permanent off-farm local residents does your farm employ?*
(none) Market Diversification *How many different local markets account for at least 10% of your total sales?*
12 Local Purchases *What proportion of your total farm purchases go to local suppliers?*
4 Local Off-Farm Jobs *How many farm residents are meaningfully employed near the farm?*
12 Cooperation w/Farmers *Are you an active member of a local farm org., farmer's coop. or other informal group of local farmers?*
10 Cooperation w/Neighbors *Do you maintain good relationships with your non-farming neighbors?*
6 Private/Gov. Programs *Do you participate in private or government programs that benefit your farm?*

12 Local Identity *Do you know the history of your farm and how it relates to the local region?*
14 Community Accessibility *Do you allow the local community access to or through your farm, make on-farm sales or host events that welcome the local community to your farm?*
(none) Other Indicators *What other useful indicators would you suggest we investigate?*

Environmental Well-being

9 Presence of Earthworms *Do you monitor earthworm populations on your farm?*
6 Nutrient Budgets *Do you monitor the nutrient status of your farm with soil tests and follow a nutrient budget?*
13 Tillage *Do your tillage practices (timing and degree) minimize potential for soil erosion?*
8 Carbon Budget *Do you monitor the organic matter content of your soil and follow a plan to maintain or increase it?*
8 Legumes/Non-Legume Crops *What proportion of your farm is planted in N-supplying and N-feeding crops?*
12 Annual/Perennial Crops *What proportion of your farm is planted in annual and perennial crops?*
5 Energy Efficiency *How much non-renewable energy does your farm use per acre of crop/livestock harvested?*
2 Water Efficiency *How much water does your farm use per acre of crop/livestock harvested?*
18 Biodiversity *How many different habitats/ecosystems are present on your farm?*
7 Degree of Farmscaping *What proportion of your farm is managed to create a pest suppressive environment with biointensive pest management strategies?*
5 Pest Pressure *When no pesticides (natural or synthetic) are used, what is the pest pressure on your farm?*
3 Other Indicators *What other useful indicators would you suggest we investigate?(3 suppression of invasives)*

Appendix D – Focus Group Case Study

Farm Prosperity Project Decision Case: Sunny Cove Farm

The Farm

The Family: Clinton (43) and Linda (40) Green and their sons Luke (16) and Will (14).
Production: 3 acres vegetables, 1 acre blueberries, old pastureland and timber on 60 acres.
Location: 30 minutes northwest of Asheville, NC via unimproved roads and interstate.
Setting: Traditional WNC mountain cove farm, crop production on portion of 15 acres of old pasture land bordering a bold stream, timber on steeper south and east facing slopes above the area in crop production. Timber is a mixed regrowth stand of poplar, white pine and oak approximately 70 years since a previous clear cut.
Buildings and equipment: Three bedroom farmhouse, workshop/equipment storage shed with electricity, old dairy barn in good condition with cement floor, running water and electricity, 1 hoop house with propane heating, 1 small tractor and implements used for vegetable production.
Financials: Linda's job pays $15,000, plus half benefits paid for by employer. The Clintons are twenty years into a 30 year mortgage on the land at 4% with Farm Credit, payable in two annual payments of $2500 each. Equipment and vehicles owned with no equipment debt. They have $10,000 in retirement and other savings, and their land and structures are valued at $500,000. The Clinton's have enrolled their farm in the county's present use value tax program.

Two Challenges

Limited Profitability: Although Asheville tailgate market sales of fresh vegetables and fruits, plus Linda's part-time job with the county have supported this family for the past 10 years, it is becoming clear to Clinton and Linda that the family needs additional income as the boys approach college age. Concerns about farm profitability were also raised during on-going family discussions about the potential for the farm to support one or both boys after college.

Development Pressure: Over the past 10 years, the Clintons have been approached many times by developers offering big money for their 50 acres. These offers have grown much larger and more numerous in the last few years. With county zoning looming and property taxes rising as a result of high dollar retirement developments being built nearby, the Clintons are worried about a potential increase in

property taxes and the impact of all the new residents on the rural character, the environmental quality of their valley and their ability to farm. It is very important to Clinton and Linda that their property remain a working farm far into the future. At the same time, they are concerned that the farm is the only inheritance they will be able to leave their children.

Background

Good Stewards: Clinton and Linda Green are widely admired as among the best of the "new generation" farmers in Buncombe County. With attention to proper rotation and the use of cover crops and composts, they have improved the quality of the soil on their production acreage while producing consistent yields of high-quality crops. They were awarded the Carolina Farm Stewardship Association "Sustainable Farm of the Year" award a few years back.

Changing Markets: Although Clinton and Linda have loyal customers at the Asheville two tailgate markets they attend, profits have been down somewhat as competition has increased over the years. In addition, they decided not to certify their farm as organic, so they lost a significant source of additional income marketing through the Carolina Organic Growers Cooperative. They have been unable to recover this income through an alternative market.

The Decisions

New Products? Faced with a need for more income to put the boys through college and possibly support one or both of them on the farm in the coming years, the Clintons and their sons are considering one of two options:

1. **increase the acreage in production** of the fresh fruits and vegetables they are presently growing to sell to current direct markets as well as additional new direct and wholesale markets

2. **shift to value-added products**, such as jams, pie fillings and pickles, made from the fresh products they currently grow and sell value-added products to current direct markets and additional new direct and wholesale markets

Farmland Protection? Faced with the prospect of continued development pressure and their hope that one or both of their children will decide to take over the farm, the Clintons are also considering one of two farmland protection options:

1. Short Term Conservation: Programs that place **limited term restrictions** on land uses. For example, state and federal programs like the Conservation Reserve Program, Wetlands Reserve Program, and NC Agricultural Conservation Cost-Share Program pay landowners to place temporary restrictions on portions of the farm to address specific natural resource concerns. In addition, the Voluntary Agricultural District program, administered at the county level, provides some protection from development pressures to participating farms for a 10 year period. There are public funds available for the Clinton's to take advantage of this option.

2. Permanent Conservation: Programs that place **permanent restrictions** on land use through the donation or purchase of development rights. The funding for these purchases could come from a variety of government, private or nonprofit sources. The rights are held perpetually by a suitable nonprofit or government organization. The proceeds of the sale go to the farmer. This approach allows the farmer to receive cash for the development potential of their land while still generating income from farming. There are private funds available for the Clinton's to sell the development rights to their farm.

Your Recommendations

How would you enhance profitability with farm production? If you were in the Clinton's position, what issues would you find most important to the question of how to improve profitability? What would you decide to do – more sales or new products?

How would you choose a farmland protection program? If you were in the Clinton's position, what concerns would you have about the two options for protecting the farm? What issues would be most important in your decision? What would you decide to do – term or permanent conservation easement?

Can new products and farmland preservation work together to improve profitability? If you were in the Clinton's position, could you imagine ways that farmland preservation might contribute to the profitability of new crops/products, or visa-versa? What issues would be most important to your efforts to combine both for the most positive impact on farm profitability?

Appendix E – Sample Survey: On Farm Interviews

FPP Farmer Survey – Indicator Use, Levels, and Preferences

Interviewer Introduction: Sustaining the family farm into the future requires thinking broadly and deeply about the farm and making choices that ensure it's long term survival. What is important for sustenance of the farm?

A sustainable farm must support three main goals:

- provide a good quality of life for the farm family,
- contribute to community well-being, and
- promote environmental quality.

We first want to know what you consider most important to you and your family. Please brainstorm a list of 5-10 things that are most important to you and your family. Anything you want to write down works here.

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

Keeping all of these goals in mind while making choices can be difficult. It is easier with the use of indicators.

Indicators measure farm sustainability in the same way that a doctor uses your temperature as a quick test of your health or teachers use grades to report academic performance. They tell us – indicate to us – whether we have accomplished our goals, achieved what we want.

One goal of the Farm Prosperity Project is to develop a group of indicators in common use by WNC farmers. You can help us today by telling us some of the indicators that YOU use when making choices that help you judge whether

- your family is happy,
- your finances are sound,
- your community is strong, and
- your environment is healthy.

What are YOUR indicators of family, community, and environmental well-being?

This process is all about YOU and what is important to you, what you care about, what you pay attention to…. when you make decisions about your farm.

Thanks for helping us today. Let's get started.

PART ONE: Indicators of Family, Community and Environmental Well-Being

A. Farm Family Well-Being: ensuring YOU and YOUR family are happy, healthy, and financially secure.
I will read a list of indicators found important by farmers in other places when making choices about their farm. Tell me how often you consider these indicators when you make decisions on your farm - often, sometimes, or never - or if you would consider using it in the future.

Indicator	always	often	sometimes	rarely	never	future
Total Family income *combined income from all sources*						
Total Farm income *total income from all farm-based enterprises*						
Farm Contribution to total family income *proportion of total income from farm-based enterprises*						
Farm Self-supporting *proportion of farm income to farm debt*						
Time for Family Activities *time to participate in activities as a family*						
Family Health *maintain good family health*						
Satisfaction from farming *farm work brings family a feeling of satisfaction*						
Ability for Farm Succession *ability to continue operation by family in the future*						
Family Education *ability to gain desired education of family members*						
Community Activities *ability to participate in religious/community groups and activities*						
Balance of Family/Other Farm Labor *proportion of family members employed on the farm*						
Balance of Family/Other Farm Residents *proportion of family members living on the farm*						

Other Indicators *What other ways are you aware of your family's and your own well-being that is not mentioned above? Are there any other ways that you think about and keep track of your family's well-being that we have not included here?*

B: Community Well-Being and Connection to Community: ensuring the community is thriving and you are part of it.
I will read another list of indicators found important by farmers in other places when making choices about their farm. Tell me how often you consider these indicators when you make decisions on your farm - often, sometimes, or never - or if you would consider using it in the future.

Indicator	always	often	sometimes	rarely	never	future
***Local Sales** *proportion of your total farm income from local markets*						
Farm Income Compared to Average Income *total farm income relative to average regional income*						
On-Farm Jobs *number of jobs filled by local residents*						
***Local Purchases** *proportion of total farm purchases from local suppliers*						
Cooperation w/Other Farmers *active member of a local farm org., farmer's coop. or other informal group of local farmers*						
Cooperation w/Neighbors *good relationships with non-farming neighbors*						
Community on Farm *community visit farm*						
Local Identity *consider farm history and it's relationship to local region*						
Visual Appeal *consider visual appeal of farm to community*						
Smell Appeal *consider smell 'appeal' of farm to community*						
Sound Appeal *consider sound 'appeal' of the farm to community*						

***We are using ASAP's *Appalachian Grown* definition of local – within 100 miles of Asheville.**

Other Indicators *What other ways are you aware of your happiness or satisfaction with respect to the community that are not mentioned above? Are there any other ways that you think about and keep track of the communities' well-being that we have not included here?*

This is our last list of indicators found important by farmers in other places when making choices about their farm.

C. Environmental Well-Being Indicators. ***Your farm is contributing to on-farm and community environmental quality. Tell me how often you consider these indicators when you make decisions on your farm - often, sometimes, or never - or if you would consider using it in the future.***

Indicator	**always**	**often**	**sometimes**	**rarely**	**never**	**future**
Presence of Earthworms *monitor earthworm populations on farm*						
Balanced Nutrient Budgets *monitor nutrient status of farm*						
Balanced Carbon Budget *monitor soil organic matter content*						
Energy Efficiency *ratio non-renewable energy use per amount of crop/livestock harvested*						
Water Efficiency *ratio water use per amount of crop/livestock harvested*						
Managed Biodiversity *variety of different habitats/ecosystems on farm*						
Pest Pressure *pest pressure on farm when no pesticides (organic or conventional) used?*						

Other Indicators *What other ways are you aware of your happiness or satisfaction with respect to the environment that are not mentioned above? Are there any other ways that you think about and keep track of the environment's well-being that we have not included here?*

PART TWO: Indicator Performance Levels

I have asked you about **which** indicators you use most often when making decisions on your farm and we have explored which you consider **most important**. Now I will ask you some more specific questions about some of the indicators that you consider important and that are harder to measure.

They are : Pick two (or more if time) of the **qualitative** indicators (from the list below) that THE FARMER has identified as ones they use and that are important (in the top five in the pair wise comparison)

1. _____ 2. _____

Indicator
Time for Family Activities *time to participate in activities as a family*
Family Heath *maintain good family health*
Satisfaction from farming *farm work brings family a feeling of satisfaction*
Ability for Farm Succession *ability to continue operation by family in the future*
Family Education *ability to gain desired education of family members*
Community Activities *ability to participate in religious/community groups and activities*
Cooperation w/Other Farmers *active member of a local farm org., farmer's coop. or other informal group of local farmers*
Cooperation w/Neighbors *good relationships with non-farming neighbors*
Community on Farm *community visit farm*
Local Identity *consider farm history and it's relationship to local region*
Visual Appeal *consider visual appeal of farm to community*
Smell Appeal *consider smell 'appeal' of farm to community*
Sound Appeal *consider sound appeal of the farm to community*

We want to understand **how you are aware of** the indicators. Specifically how you think about some of the less tangible indicators and how you would measure them with high and low levels of performance. Let's get started.

1. (Awareness and Name) We want to understand how you think about this indicator so that we can figure out a way to 'measure' it either with numbers or words. So tell us - what is it about this indicator that is important to you e.g. is it time, is it the nature of the indicator, such as number of people, who is there, is it your energy level? How are you aware of its presence in your life? In what important ways does this indicator influence you (or community, or environmental) well-being?
    i. SO → What would YOU call this indicator? Place the name at the top of the blank sheet (felt board).
    ii. Is there more than one way that you think about this indicator? If so create a second indicator and name it.

2. (Levels) Using the indicator sheet answer the following questions
    i. What is a highest possible performance level for this indicator? Describe it with words or numbers.
    ii. What is a lowest possible level for this indicator?
    iii. What is the middle like?

3. (Attention or Satisfaction) Select the approach that is easiest for the farmer to do.
Attention Using one of the Attention scale below, consider the different performance levels possible and place **your** sense of when you need to pay attention to this indicator and when you don't.

	Green	Going great no attention needed
	Mostly green	No attention needed
	Green yellow	All's fine, no attention needed
	Yellow Green	OK and pay attention
	Yellow	Caution pay attention
	Orange	More caution needed pay close attention
	Red	Stop and do something

a. Begin at the bottom of the performance level and locate where 'All's fine no attention needed' occurs. Can you find 'Going great'?
b. Now where does Caution set in? What about 'Stop and do something'?
c. (Or you can start at the top and look for Caution and then move down to Stop and back up to Going great.)
d. If you are able to place other colors please do so. The more we have the more we can understand farmer perceptions regarding these indicators.
e. Do you have a target level….hope to achieve for this indicator? Please tell us this level. Label with **TARGET**
f. Where are you now? Your current state? Label with **NOW**

OR

Satisfaction Think about how you feel about this indicator, for example at what performance level would you begin to feel **most happy** meaning when would this **FIRST** occur? For example, we would be most happy to have $1 million dollars to spend each year, but we may start to feel most happy with $100,000. Another example, the worst bodily temperature level may be 105ºF, but we may feel miserable at 102ºF. **If you wish to begin with any of the other feelings please do so.**

Best, Happiest
Better than good
Good or pleased
OK, acceptable, only fine, satisfied
Unsatisfied
Bad
Worst, disastrous

g. Repeat the exercise with the Worst level and then find OK.
h. If you are able to place other feelings please do so. The more we have the more we can understand farmer perceptions regarding these indicators.
i. Do you have a critical threshold level (a point of no return, no recovery) that you will not go below for this indicator? Please tell us this level. This can occur before the 'worst' state occurs.
j. Do you have a target level….hope to achieve for this indicator? Please tell us this level. Please tell us this level. Label with **TARGET**
k. Where are you now? Your current state? Label with **NOW**

PART TWO: Ordering Indicators

We are now going to find out how you prioritize the indicators. We will use three different methods since we want your opinion as to which method is easiest for you to use.

1. In the first exercise you will compare each indicator with another that you selected that you use always or often and tell us which is more important.
2. In the second exercise you vote for those community well-being indicators that you consider important whether you use them or not. Place dots next to those you consider important. You can give as many votes to an indicator as you wish. More votes means more important.
3. In the third exercise you will give a simple ranking from 1-7 of the environmental indicators

Please tell us your impression of the processes and answer the questions below.

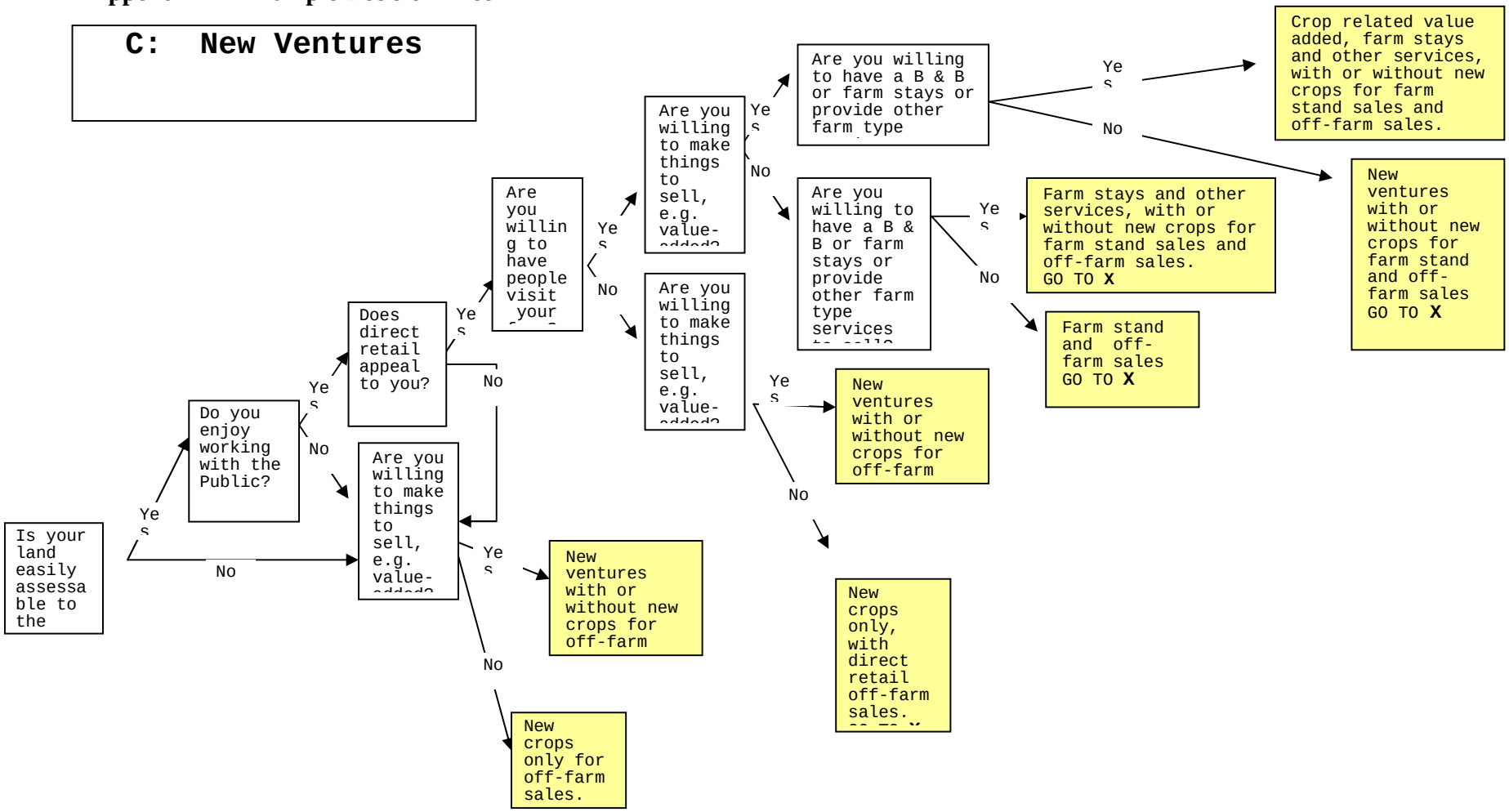
1. With many indicators which approach did you prefer?
    a. Pair wise
    b. dot
    c. general ranking
2. With only a few indicators, which approach did you prefer?
    a. Pair wise
    b. dot
    c. general
3. Did you find the Pair Wise comparison approach a useful exercise even though it was time consuming?
    a. Yes
    b. No
4. Do you think the Pair Wise comparison approach would be useful when you had only 5 indicators?
    a. Yes
    b. No

5. Do you prefer the Dot approach or the ranking approach?
    a. Dot
    b. Ranking

PART FOUR: Alternatives: Lastly considering your list of most important things to you and the indicators you stated you use, even sometimes, tell us what ideas you have for your farm that may cause any of your indicators or important items to increase?

Thank you for your time and help!

Appendix F – Example Decision Tree



The Sustainable Decisions Tool

For Western North Carolina Farmers

Table of Contents

A Western North Carolina Collaboration

This booklet is a product of the Farm Prosperity Project, a collaborative research and education project conducted in Western North Carolina (WNC) from June 2005 through April 2009. Drawing on the talents of a multidisciplinary research team with expertise in high-value crops, farmland protection and decision-making tools and the knowledge and experience of thirty-two cooperating farm families, the project explored the potential for combining farmland protection and improved farm profitability as a solution to the loss of farmland in the WNC region due to development pressure.

Prosperity Project Farmers

Prosperity project farmers contributed to the design and content of this booklet through their participation in focus group meetings and on-farm interviews. These families represent the diversity of the farming community in Western North Carolina. Project farmers report farming for a few as four to as many as seventy-five years on farms that ranged in size from 4 to 750 acres. Most farms have at least one family member working full-time on the farm and most families relied on crop cultivation and animal husbandry for a significant portion of their annual income.

The farmers in this project have a diverse product base- selling both meat and vegetables, or trees and trout- but usually rely on a key marketable product as their main source of income. Some farmers process their goods in some way to add value to the raw resource; others have plans to start selling value-added products. Among the value-added crops and special enterprises considered are greenhouses, nursery stock, agritourism, websites and jams and jellies.

Farmers looking into diversification and value-added enterprises face a number of obstacles. An older farmer expresses concern about the difficulties of transitioning late in the game. Other farmers find that their value-added ideas, though successful, can harm or out-compete other farmers in the area. Some farmers simply lack the funds to cover start-up costs or the manpower to initiate a new project. Still other farmers complain about the availability of proper advertising opportunities to reach the market and create a demand.

Most farmers are retailers and wholesalers. A few sell at tailgate markets and some sell to restaurants, distributors and food stores. Most are satisfied with the retail price they receive; specialty products with high seasonal demand, like trout and Christmas trees, fetch nearly any price on-farm and always sell out. However, the farmers unsatisfied with products complain that wholesale prices are restrictively low and sinking. They also point out rising fuel costs, the real costs of labor and time, fluctuating markets, and the increasing need to satisfy niche markets. Farmers remark that with a larger facility, the capacity to offer diversified products, and the availability of more effective advertising, they could sell more. Other short-term concerns for farmers include difficulty finding enough reliable labor, taxes, restrictions, time management, commuting, insurance, funding, and liability issues.

In general, farmers believe that effective marketing could increase their success. Marketing in other states, through a networking group or over the internet would raise awareness about local food availability and prices. When asked whether the local community supports the farm, most farmers responded yes, very much so, adding that the community buys produce, participate in activities, come

to markets, visit the farms and fields, show appreciation and express gratitude. As customers and neighbors, the local people interact positively with farmers.

The biggest long-term concern for the Prosperity Project farmers – development - also comes from their local community. Farmers experience the pressures of development close to home - adjacent properties are being sold at high prices and built upon, farms are being converted to trailer parks and subdivisions and realtors make frequent and tempting offers. The negative effects of construction include intruding sewage pipes, heightened traffic, erosion caused by construction, and a general unraveling of communities with the influx of high concentrations of people. Some farmers feel encroached upon or depreciated next to community housing demands.

A Decision Tool For Farmers

This booklet is a Decision Tool developed for as a management aid for farmers wishing to continue farming in a rapidly developing region like Western North Carolina. The booklet serves to support farmers as they work through the complex decisions required to achieve farm prosperity. Drawing on the concepts of sustainable agriculture, whole farm planning, and sustainable choice theory, this booklet guides farmers through a process to identify and use farm-based sustainability indicators to aid in farm planning. Use of these indicators helps to clarify the decision-making process so that farmers can choose a "best fit" combination of farm preservation and high value enterprises for their farm.

The Farm Prosperity Project was a collaborative research and education project involving a multidisciplinary team of cooperators from North Carolina State University, Land of Sky Regional Council, Warren Wilson College, the Appalachian Sustainable Agriculture Project, and three land preservation non-profits active in the project region: Carolina Mountain Land Conservancy, American Farmland Trust, Southern Appalachian Highlands Conservancy. Funding for the project was provided by the ***Agricultural Prosperity for Small and Medium-Sized Farms Program*** *of The National Research Initiative of the USDA Cooperative State Research, Education and Extension Service, Grant # 2005-35618-15645.*

Managing for Sustainability: Keeping the Whole Picture in Mind

Managing your farm for sustainability involves more than keeping an eye on the bottom line. By definition, sustainable farmers strive to achieve success on the *triple bottom line* – managing farm performance to promote the well-being of the farm family, the farm community and environmental quality. Sustainable managers appreciate the many ways, other than financial, that their farm contributes to family and community well-being.

Making decisions while keeping in mind this triple bottom line can be challenging. That old saying, *"Can't see the forest for the trees"* applies here – *the forest* is the whole picture of everything that your farm offers you and *the trees* are the management decisions requiring immediate attention. Sustainable farm managers take the time to understand the whole picture as well as the details of the decision and strive to make choices affecting the farm that lead to the greatest overall progress towards achieving farm family goals.

This *triple bottom line* approach to farm management is known as *whole farm* management. Although there are many whole farm management methods, they all involve the same basic series of four steps: 1. setting goals, 2. assessing resources, 3. making a plan to achieve goals with available resources, and 4. evaluating how well the plan is working. Whole farm managers believe that good decisions do not just happen—good decisions are the result of thinking through goals, clarifying relationships on the farm, collecting and organizing information, evaluating alternatives to find the best fit for the farm and the family and regular monitoring of the plan to be sure it is working well.

Painting the Picture with Indicators

Having a method to help keep the whole picture in mind through decision-making processes offers a better understanding of your choices and adds confidence to your decisions. One method for keeping the whole picture in mind is to choose *indicators* of farm performance that are important to you.

Indicators are simple measures of performance of any kind of complex system. You are probably already using many common indicators in your life. For example:

- When you go to the doctor for a checkup, your temperature is a quick and simple way to test your health. In other words, a temperature of 98.6 ^{o}F is an *indicator* of good health.

- The grades on a report card are an *indicator* of academic performance. In other words, a grade of A+ is an indicator of excellent performance as a student.

- The oil, temperature and fuel gauges on your car dashboard are an *indicator* of engine operation. If all systems are operating with normal ranges, your engine is running properly.

Using indicators provides a simple way to monitor the performance of a complex system. Indicators are also commonly used to track changes in performance as a result of a change made to the system. Take the student above as an example: If the student's grades drop to B's and C's after taking a part-time job, it might be time reconsider the benefits of the part-time work against the costs to performance as a student.

Measuring What Matters: Indicators of Farm Family, Community and Environmental Well-Being

Research has shown that there are a number of indicators of farm performance in common use among farmers in the U.S. and in Europe. These indicators are listed on the next page. Farmers use these indicators to assess farm performance and to help keep their farm on the path towards sustainability.

The use of a set of indicators helps farm managers keep in mind the multiple benefits of farming as they make decisions. These benefits are unique to every farm family, but often include things other than farm income, for example enjoyment of farm life, the satisfaction of working in a family business, or any other of the many benefits farming brings to a farm family. Using the indicators to help with making decisions can insure that the full range of farm life benefits are included – in other words, the whole picture of your life on the farm is kept in mind when making decisions.

Using Indicators in Farm Decision-Making

Indicators are useful to farm decision-making in a variety of ways. In whole farm planning, indicators are used as an aid in setting farm goals, to make planning decisions such as choosing among different crops, value-added products or markets, and to evaluate the success of changes in farm practices. Monitoring with indicators can be particularly useful as *early warning signals* that a change in management is not going as planned.

This booklet makes use of the whole farm management practice of using indicators to guide farm management decisions. Check the resources below to learn more about whole farm management practices.

Whole Farm Management Resources

Plan and Manage the Whole Farm, NC Cooperative Extension Service http://transylvania.ces.ncsu.edu/content/wholefarmplan

Holistic Management: A Whole Farm Decision-making Framework is a general overview of holistic management practices, including some examples of goal statements http://attra.ncat.org/attra-pub/PDF/holistic.pdf

List of Common Farm Performance Indicators

Family Well-Being Indicators

- Total Family Income *What is our combined income from all sources?*
- Time for Family Activities *Do you have time to together as a family to participate in activities you enjoy?*
- Family Health *Do you maintain good family health and have the resources to obtain desired healthcare?*
- Satisfaction from Farming *Does farmwork bring your family a feeling of satisfaction?*
- Farm Succession Plan *Do you have plans for the farm to continue operation by family in the future?*
- Family Education *Do you have the resources for desired education of family members?*
- Community Activities *Do you have time to participate in religious/community groups?*
- Ratio of Family to Other Farm Labor *What proportion of farm labor is provided by family members?*
- Ratio of Family to Other Farm Residents *What proportion of full-time farm residents are family members?*

Community Well-Being Indicators

- Local Sales *What proportion of your total farm income is from local markets?*
- Farm Income Compared to Average Income *What is the ratio of total farm income to the average regional income?*
- On-Farm Jobs *How many permanent off-farm local residents does your farm employ?*
- Local Purchases *What proportion of your total farm purchases go to local suppliers?*
- Cooperation with Other Farmers *Are you an active member of a local farm org., farmer's coop. or other informal group of local farmers?*
- Cooperation with Non-Farming Neighbors *Do you maintain good relationships with your non-farming neighbors?*
- Community On Farm *Do you allow the local community access to or through your farm, make on-farm sales or host events that welcome the local community to your farm?*
- Development Pressure *Have you protected your farm from development?*
- Local Identity *Do you know the history of your farm and how it relates to the local region?*
- Farm Attractiveness *Do you manage your farm to have visual appeal and avoid creating noises and bad smells that might disturb neighbors?*

Environmental Well-Being Indicators

- Presence of Earthworms *Do you monitor earthworm populations on your farm?*
- Balanced Nutrient Budgets *Do you monitor the nutrient status of your farm with soil tests and follow a nutrient budget?*
- Balanced Carbon Budget *Do you monitor the organic matter content of your soil and follow a plan to maintain or increase it?*
- Energy Efficiency *How much non-renewable energy does your farm use per acre of crop/livestock harvested?*
- Water Efficiency *How much water does your farm use per acre of crop/livestock harvested?*
- Biodiversity *How many different habitats/ecosystems are present on your farm?*
- Pest Pressure *When no pesticides (natural or synthetic) are used, what is the pest pressure on your farm?*

The Process: Five Steps to a Sustainability Profile for Your Farm

This section guides you through the steps required to create a sustainability profile for your farm. The sustainability profile is a picture representing the ways that your farm contributes to family, community and environmental well-being. It is based on the indicators that you decide are meaningful for your farm.

STEP ONE: Selecting Indicators – Worksheet #1

The first step is to select the indicators that you are currently using to tell you something about farm performance. The indicators in Worksheet 1 are grouped according to three aspects of farm sustainability: family well-being, community well-being and ecological well-being. In order to keep sustainability in your decision-making, be sure that you choose indicators from each group as you make your selections.

Begin Worksheet 1 by checking the box representing the appropriate frequency of your use of each indicator. After working through the indicator tables, take a few minutes to think about any other ways that you use to evaluate how well your farm performing. If you need some ideas to help get you started, you can take a look at the list of additional indicators used by Prosperity Project farmers included in Worksheet 1. To complete Worksheet 1, simply write any additional indicators that you use in the space provided.

STEP TWO: Ranking Indicators – Worksheet #2

The next step is to figure out which indicators are the most important to you – which indicators you think are the most useful for providing information about how well your farm is working. In order to do this, simply work through Worksheet #2: Ranking Indicators to complete priority testing and record the results as directed on the worksheet.

STEP THREE: Chose Your Farm Indicator Set

Finalizing an indicator set for your farm is the next step in the process of building a sustainability profile for your farm. After completing Worksheet #2, take a minute to review the indicators that you have included in the Indicator Rank Table. Be sure that there you have included in this table at least two indicators from each of the three aspects of farm sustainability: family well-being, community well-being and ecological well-being. If not, then add the highest ranked indicators from the missing aspects of farm sustainability as needed to the Indicator Rank Table.

Now, as you look at the group of indicators in the Indicator Rank Table, check to be sure that you are satisfied with the set as a whole. Do these indicators capture the most important characteristics of your farm? Do the indicators in this list represent the qualities of your farm that really tell you the most about how well your farm is working for your family, your community and your environment? If something seems to be missing, then review the full set of indicators one more time to see if you need to add another indicator. If you decide to add an indicator, it would be best to work through the ranking processes again, with the new indicator included. If you wish, you can just add the indicator the final set.

STEP FOUR: Evaluate Indicators for your Farm: Worksheet #3

The next step in building the sustainability profile for your farm is to learn more about the indicators that you have selected and to fit the indicators to your farm and your management style. Follow the directions on Worksheet #3: Indicator Evaluation to complete this step of the process for each indicator in your final set. When you have finished this step, you will have completed Farm Report Cards for each of the indicators that you have selected.

STEP FIVE: Create Your Farm Sustainability Profile: Worksheet #4

The final step of the decision tool process is to create a sustainability profile for your farm by following the directions on Worksheet #4: Creating Your Farm Sustainability Profile. With this step, you will plot farm performance on a web diagram to create a rich picture of farm sustainability.

Using indicators as a farm management tool is a widely used practice. In fact, you probably regularly use a number of indicators in both short and long term decisions made on your farm. Typical measures of farm performance include yield, farm income, costs of production, soil fertility, etc. These farm characteristics provide information that improves decision-making on the farm. Yield, income and costs indicators provide reassurance that the farm is operating properly, or they provide a signal to re-evaluate management practices in an effort to improve farm performance.

The farm indicator set that you have developed can be used in the same way that you have used other, more traditional, farm performance indicators. The difference between more traditional indicator sets, and the sustainability profile is this: the sustainability set paints a richer picture of farm performance. Instead of the more traditional focus on financial performance as the only measure of farm performance, the sustainability set include indicators of non-financial measures of family well-being. These aspects are often over-looked by a narrow focus on financial performance. It is well worth remembering the old saying "we measure what we value and we value what we measure."

Monitoring Farm Performance

There are a number of ways to use the sustainability indicators. The indicators can be used as a simple tool to monitor the performance of your farm over time – much as you are probably doing with income and production figures right now. Along with monitoring farm performance, the indicators can encourage you to focus on and find solutions for poor performance. And indicators can confirm your decision to not focus on some areas of the farm because they don't need any attention – they are performing as well or better than expected.

Making Farm Management Decisions

Sustainability indicators can also be used as an aid in making decisions about the future of your farm. Using the indicators in this way involves comparing alternatives to existing management practices by determining how the alternatives might change farm performance on each indicator. The next section describes the process of using indicator set as an aid in making management decisions.

Evaluating Progress Toward Farm Goals

The indicators can also fulfill the monitoring and assessment function of a whole farm plan. Used in this way, the indicators not only track farm performance, but also provide information to evaluate farm progress toward farm goals and a desired quality of life on the farm. You can find more information about the use of indicators for monitoring farm performance and as part of a whole farm management plan in the resources listed at the end of Chapter 2.

Using Indicators in Decision-Making on the Farm

Decision-making is fundamentally about choosing among different options. We all make decisions by first narrowing our choices to a limited number of reasonable options, weighing the costs and benefits of each option and then choosing the option that makes the most sense at the time. We all make decisions many times in a day and do this effortlessly for the most part when the decisions have little risk associated with them.

When decisions have significant risk and possible long term impacts, we often consider them more carefully. A common method for making a more careful choice between two options involves writing out the pros and cons of each option. Sometimes we do our best to imagine the likely future outcome of difference choices in order to more clearly understand the costs and benefits of each option and the tradeoffs involved in choosing one option over another.

Indicators can help in the decision-making process by improving clarity in a number of ways. Most simply, indicators can help you stay focused on the most important considerations involved as you weigh different options. Sometimes making choices between options is pretty easy – the best choice is clearly better than all the other options. But usually life is not that simple and a decision involves making tradeoffs between two options that are about equally attractive, but have different costs and benefits. Using indicators can help to clarify the differences between options by allowing for more direct evaluation of the tradeoffs between different options.

The first step in this process, using decision trees, is explained in the next section. The advice of your farm management consultant may be particularly helpful as you work through the decision trees and evaluate indicators for each of your best fit options.

Decision Trees: Exploring Your Options

NOTE: The Modeling team envisioned this section including directions for working through the High Value Crops and Farmland Preservation Decision Trees to find "best fit" options for their farm that combined land preservation and more profitable enterprises. We envisioned the inclusion of these two decision trees as a way to fully integrate the work of the three Prosperity Project Teams into the Decision Tool. To date, the Decision Trees have not been completed.

In the absence of completed Decision Trees, farmers using the Decision Tool can use the resources listed below to select potential enterprise and land preservation options for their farm. After the selection of possible alternative enterprises and land protection options has been completed, farmers can move onto the next section: ***Evaluating Options: Developing Alternative Sustainability Profiles.***

Enterprise Assessment Guides

Whole Farm Resource Inventory, Plan and Manage the Whole Farm, NC Cooperative Extension Service. http://transylvania.ces.ncsu.edu/content/wholefarminventory&source=transylvania

Evaluating A Rural Enterprise. 2002. P.Sullivan and L. Greer
http://attra.ncat.org/attra-pub/PDF/evalrural.pdf

A Primer for Selecting New Enterprises for Your Farm. 2000. T. Woods and S. Isaacs. Agricultural Economics Extension No. 00-13 University of KY.
http://www.uky.edu/Ag/AgEcon/pubs/ext_aec/ext2000-13.pdf

Farmland Protection Options

Keeping the Farm in the Family: Farmland Protection Tools for North Carolina Landowners. n.d. A Publication of the Farm Prosperity project.
http://www.cals.ncsu.edu/specialty_crops/pdf/fpOptions_brochure.pdf

Farmland Protection. American Farmland Trust Website.
http://www.farmland.org/programs/protection/default.asp

Landowner Resources. Carolina Mountain Land Conservancy.
http://carolinamountain.org/?do=resources

Evaluating Options: Developing Alternative Sustainability Profiles

You must have selected a group of indicators, completed Farm Report Cards and created a Sustainability Profile for your farm in order to evaluate alternatives as directed in this section. See Chapter 3 of this guide to learn more about how to create a Sustainability Profile for your farm.

Now that you have determined the alternative enterprises and land protection options that seem like a good fit for your farm, you can use the Farm Report Cards to help you think through the likely impacts on farm performance of the alternatives you have chosen. You already have experience using these tables to evaluate the current performance of your farm on each indicator.

To create sustainability profiles for your "good fit" alternative enterprises and land protection options, you first evaluate the expected performance of your farm under the "good fit" options that you have chosen and mark the expected performance on each scorecard. Predicting the expected performance of your farm for each of the best fit options requires a lot of knowledge and experience about farming system responses to change in management. You are encouraged to work with your technical advisor to evaluate the expected performance of each "good fit" option on your farm. Once you have determined the expected performance levels for each alternative, you can plot the sustainability profile for each "good fit" option under consideration on your current sustainability profile graph.

You can now use the sustainability profiles that you have created as a basis for comparison of your current farm performance and the expected performance of your farm under different options. After each option is plotted on the farm sustainability profile, you can compare the current performance of your farm with the expected performance of the "good fit" alternatives to see which option offers you the best farm performance, or the "best fit" option. Sometimes the best option is easy to choose, because the expected performance of one option is clearly better - the expected performance of that option is significantly higher on all indicators compared to all other options. But most of the time the best option is not so clear and choosing an option requires some tradeoffs. The next section describes two different ways to choose the best performing option.

This guide includes two formal methods to guide your selection of the best option from among the best fit options you have developed for consideration. The ***Even Swap*** method simplifies the comparison of options by reducing the number of indicators that you compare in order to identify the option that gives you the best farm performance. The ***Distance Metric*** method is a more complex method for choosing among the options. Although it takes more time and involves a number of mathematical calculations, this method allows you to include estimates of the uncertainty associated with performance of each indicator and also allows you to give more weight to the indicators that you think are most important in the decision about which option is the best fit for your farm. It is a good idea to work through both methods as a way to confirm your choice of the best option. If both methods result in the same choice, then you can be more confident in your choice. If you choose different options for each method, then it would be best for you to review the selection of options and your assessment of farm performance under the different options with the help of a technical advisor.

Worksheet #5: Selecting the Best Option with Even Swap

Worksheet #5 guides you through the steps involved in using the Even Swap method to choose the best option among the options that you are considering for your farm.

Worksheet#6: Selecting the Best Option with the Distance Metric

Worksheet #6 guides you through the steps involved in using the Distance Metric to choose the best option among the options that you are considering for your farm.

Appendices

Appendix A: Worksheets
Appendix B: Farm Report Cards
Appendix C: Using Indicators in Farm Planning: A WNC Example

Appendix A: Worksheets

Worksheet 1: Select Indicators for Your Farm
Worksheet 2: Rank Your Farm Indicators
Worksheet 3: Evaluate Your Farm Indicators
Worksheet 4: Create Your Farm Sustainability Profile

Worksheet 1 – Select Indicators for Your Farm

This worksheet helps you gather together in one list the different ways that you measure the performance of your farm. Just like the grades on a report card indicate student performance, these are the measures that indicate the performance of your farm.

On the following pages, indicators for each of the three categories of sustainability - farm family, community and environmental well-being - are listed on three separate checklists. Fill out each sheet by checking the box that best describes how often you use each indicator in management decisions, or make a note that you might be interested in using the indicator in the future. Then write in the space provided any other indicators that you use always or often that were not included in the list of indicators.

Now gather the indicators that you use always or often into one list by filling in the Full Indicator Set table on the next page. If you have selected more than 5 indicators from any one of the three categories (family, community or environment), review your choices to be sure you have accurately described your frequency of use. If you still have more than 5 indicators from a single category, then follow the instructions below to reduce the number of indicators in all three categories to a maximum of 5.

Once you have completed the checklists and reduced the number of indicators to no more than 5 per category, you are ready to move on to Worksheet #2 – Ranking Indicators.

Reducing the Size of the Full Indicator Set

There are a number of ways to reduce the numbers of indicators in your Full Indicator Set without losing the information offered by the indicators. The best way to reduce the size of the Full Indicator Set is to look for closely related indicator – pairs of indicators that keep track of the same or similar information. For example, if your indicator set includes both family income and family education, then you can drop family education (just cross it out on the checklist) and define family income to include the income required to obtain desired education. If your indicator set includes time for family activities and time for family vacations, you can drop family vacation and define family activities to include a yearly family vacation, and so on. Feel free to interpret the indicators to best fit your family needs. The important thing is not the way the indicator is measured, but the fact that you have indicators to help you keep in mind the things other than income that are important to your family's well-being as you make decisions on your farm.

If your Full Indicator Set is still to large after looking for closely related indicators and dropping one of them, then consider again the indicators that you use often. Prioritize this group of indicators in terms of how useful they are to your farm management decisions. To finalize your Full Indicator Set, include all the indicators that you use always, then fill in the remaining slots with indicators that you use often, starting with the most useful indicator and working down through the list until you have no more than 5 indicators per category.

If you still cannot reduce your Full Indicator Set to no more than 5 indicators per category after following the steps above, then it is probably best for you to consult with a cooperative extension agent for assistance before continuing on.

Full Indicator Set

Indicators you use always or often

Family	Community	Environment
1.	1.	1.
2.	2.	2.
3.	3.	3.
4.	4.	4.
5.	5.	5.
6.	6.	6.
7.	7.	7.
8.	8.	8.
9.	9.	9.
10.	10.	10.

Indicators you might use in the future

Family	Community	Environment

A. Indicators of Farm Family Well-Being: ensuring YOU and YOUR family are happy, healthy, and financially secure.
How often do you consider these indicators when you make decisions on your farm – always, often, sometimes, rarely or never? If you never use an indicator, would you consider using it in the future? Complete this worksheet by checking the boxes to answer the question for each indicator listed below.

Indicator	**always**	**often**	**sometimes**	**rarely**	**never**	**future**
Total Family income *combined income from all sources*						
Total Farm income *total income from all farm-based enterprises*						
Time for Family Activities *time to participate in activities as a family*						
Family Health *maintain good family health*						
Satisfaction from farming *farm work brings family a feeling of satisfaction*						
Farm Succession *ability for future operation by family members*						
Family Education *ability to gain desired education of family members*						
Community Activities *ability to participate in religious/community activities*						
Balance of Family/Other Farm Labor *proportion of family members employed on the farm*						
Balance of Family/Other Farm Residents *proportion of family members living on the farm*						

Other Indicators *Are there any other ways that you keep track of your family's well-being that are not included above? How often do you use these indicators? Record this information in the space below.*

B: Indicators of Community Well-Being and Connection to Community: ensuring that your farm is part of a healthy community. ***How often do you consider these indicators when you make decisions on your farm – always, often, sometimes, rarely or never? If you never use an indicator, would you consider using it in the future? Complete this worksheet by checking the boxes to answer the question for each indicator listed below.***

Indicator	always	often	sometimes	rarely	never	future
***Local Sales** *proportion of your total farm income from local markets*						
Farm Income Compared to Average Income *total farm income relative to average regional income*						
On-Farm Jobs *number of jobs filled by local residents*						
***Local Purchases** *proportion of total farm purchases from local suppliers*						
Cooperation w/Other Farmers *active member of a local farm org., farmer's coop. or other informal group of local farmers*						
Cooperation w/Neighbors *good relationships with non-farming neighbors*						
Community on Farm *community visit farm*						
Development Pressure *ability to prevent conversion of farmland to other uses*						
Local Identity *consider farm history and it's relationship to local region*						
Visual Appeal *consider visual appeal of farm to community*						
Smell Appeal *consider smell 'appeal' of farm to community*						
Sound Appeal *consider sound 'appeal' of the farm to community*						

***Local is defined as within 100 miles of your farm. Community is the population in close physical proximity to the farm or the community serving as the primary market for the farm.**

Other Indicators *Are there any other ways that you think about and keep track of the role your farm plays in your community's well-being that are not included above? How often do you use these indicators? Record this information in the space below.*

C: Indicators of Environmental Well-Being: ensuring good quality water, soil, and air on the farm
How often do you consider these indicators when you make decisions on your farm – always, often, sometimes, rarely or never? If you never use an indicator, would you consider using it in the future? Complete this worksheet by checking the boxes to answer the question for each indicator listed below.

Indicator	**always**	**often**	**sometimes**	**rarely**	**never**	**future**
Presence of Earthworms *monitor earthworm populations on farm*						
Balanced Nutrient Budgets *monitor nutrient status of farm*						
Balanced Carbon Budget *monitor soil organic matter content*						
Energy Efficiency *ratio non-renewable energy use per amount of crop/livestock harvested*						
Water Efficiency *ratio water use per amount of crop/livestock harvested*						
Managed Biodiversity *variety of different habitats/ecosystems on farm*						
Pest Pressure *pest pressure on farm when no pesticides (organic or conventional) used?*						

Other Indicators *Are there any other ways that you think about and keep track of the environmental well-being of your farm that we have not included here? How often do you use these indicators? Record this information in the space below.*

Other Indicators Used by Prosperity Project Farmers

Family Well-Being
Competent Employees
Family complaints/expressions of enjoyment
Active problem-solving
Ability to do farm work together (w/other family members)
Stress level
Family cooperation
Customer Satisfaction
Ability to take a vacation
Farm is social gathering place
Complimentary enterprises
Experience – previous successes, failures
Produce quality and quantity
Ability to host interns/guests
Ability to provide food for family

Community Well-Being
Neighbors visit farm store
Involved in local politics
Disruption caused by on-farm sales
Customer safety on farm
Customer respect for product (minimize damage when picking/eating before paying)
Compliments from community members on beauty of farm
New markets add to, rather than compete with existing local markets (developed wholesale market to cooperatively process and market excess production, rather than compete with on-farm direct sales)
Farmland preservation
Participating in research
Ability to donate/participate in community service
Ability to exchange/help neighbors
Awareness of local farms by community
Technical assistance relevant to farm
Community respect for farm/farm family
Neighbor visits to ask questions, compliment farm, offer encouragement
Community approaches farm for leadership on food/farming issues
Development Pressure

Environmental Well-Being
Pasture growth and quality
Forest health (managed to encourage wildlife)
Wildlife diversity – fox, beavers, fish, birds (5)
Use of Integrated Pest Management practices
Presence of plant pollinators
Insect biodiversity

Environmental Well-Being Indicators, *continued*
Aquatic biodiversity
Crop health – vegetative, floral, fruits
Bad smells
Soil erosion – don't want to see muddy water on farm (2)
Soil conservation – landscape management to prevent soil erosion (2)
Ground water quality – check for contamination
Surface water quality – is farm cleaning water passing through (2)
Water table levels/spring flow on farm
Amount of off-farm inputs needed
Air quality

Worksheet 2: Rank Your Farm Indicators: Finding the Most Useful Indicators

In this step you are trying to reduce the number of indicators that you will use in the farm sustainability profile. For ease of decision-making , it is best to use only the 6 to 8 most important indicators in the sustainability profile. Typically, this means that you will not use all of the indicators that you selected in Worksheet 1.

We provide two easy ways to help you select the indicators that are most important to you – an easy rank order method and a pairwise comparison method. When you have completed this step, you will have prioritized the indicators you use always or often from most to least important. Then you can choose the top 6 to 10 indicators that you will use to complete the sustainability profile for your farm.

Easy Rank Order

To rank the importance of the indicators that you use always or often, write each indicator on a note card or sticky note and shuffle them. Create enough space on a table or wall to be able to lay out all the indicator notes in two rows. To start, randomly choose two indicators, and ask yourself, "If I could use only one of these indicators to measure how well my farm is working, which criteria would I choose?" Then, move the chosen one to the top row and the other to the bottom row. Repeating this process, take two indicators at a time and place one in the top row and one in the bottom row until all the indicators have been placed.

Now review the indicators in the bottom row and ask yourself, "Are there any indicators in the bottom row that really should be in the top row?" If so, then swap that indicator for the least useful indicator in the top row. Repeat this step until you are satisfied with the placement of the indicators in the two rows.

Now working with just the indicators in the top row, compare pairs of indicators until you are satisfied with the placement of each indicator ordered from most to least important.

Move to the group of indicators in the bottom row and do the same thing – working in pairs, order the indicators from most to least important in the bottom row until you are satisfied with the placement of each indicator. Once you have completed this process, fill in the table on page 3 of this worksheet with the Easy Rank Order results from the highest ranked indicator to the lowest ranked indicator. You can now move onto ranking the indicators using a different method – pairwise comparison.

Pairwise Comparison

To rank the importance of the indicators that you use always or often, fill in the Pairwise Comparison Table on pages 4 and 5 of this worksheet and complete according to the directions included in the table. After completing the table, fill in table on the page 3 of this worksheet with the Pairwise Comparison results.

Compare Indicator Rankings

It is best for you to rank indicators from most to least important by both methods and compare the lists. If there are few inconsistencies in the rankings, then you can be confident that you have correctly ranked the indicators.

At this point it is also important to check that at least 2 indicators from each category made it into the group of highest ranked indicators because all three categories must be represented in order for the indicators to track farm sustainability. If you find that one category is not represented by at least two indicators, simply drop the lowest ranked indicator from the best represented category and replace it with the highest ranked indicator in the under-represented category.

It is common to find small inconsistencies between the two ranking methods, especially among indicators in the middle of the rank. You can resolve these inconsistencies by first taking a look at the top ranked indicators by both methods and checking to see that all three categories of sustainability are well represented. If one top ranked group is more balanced, then you could decide to go with that group. Alternatively, you can compare the indicators that are different in each group and simple decide which are more useful to you as indicators of family and community well-being. As you are choose among the inconsistent indicators, always keep in mind the goal of balance representation of all three categories of sustainability. At this stage, you can also look again for related indicators – a pair of indicators that are providing information about essentially the same farm characteristic. As you think about the inconsistencies in the two top ranked indicator groups, choose to keep the ones that result in the least number of related indicators in the final top group.

If you find large differences in ranking between the two methods (for example, indicator 1 is at the top of your indicator list when you rank order, but near the bottom of your pairwise ranking) then there are a few steps for you to take to try and resolve the inconsistency.

First, make sure that you conducted the pairwise comparison correctly. If so, then go back and review the definition of each indicator that you selected in the last step (Selecting Indicators Worksheet) to be sure you understand what each indicator tells you about the farm. After making sure you understand the indicators, review the list to be sure that you have correctly selected the indicators that you use always or often. Then repeat the rank and pairwise ordering steps described in this worksheet. If you still have major inconsistencies in your list, it is probably best for you to consult with a technical advisor to determine the cause of the problem before continuing on.

Once you are satisfied that the two sets of indicator lists are fairly consistent and that each category is represented by at least 2 indicators, you have identified your top 8 to 10 indicators. You are now ready to move onto the next step of the process.

Indicator Ranking Results

Easy Rank Order	Pairwise Rank Order

Final Indicator Set

PAIR WISE COMPARISON

In this exercise, you will rank the indicators from most to least useful to you by comparing every possible pair of indicators. The pair wise comparison process is different from the easy rank process because every possible pair of indicators is compared. It sometimes results in a different indicator order than the easy ranking, because the pair wise process is a more objective way of making comparisons among indicators. As you consider each pair of indicators, choose the indicator this is the most useful to you when thinking about managing your farm. Sometimes the comparisons are very difficult to make, or the comparison seems like comparing apples to oranges, so just do your best. Again, don't spend too much time worrying over each comparison. Trust yourself to make the right choice fairly quickly.

To rank the indicators using the pair wise process, first fill in the column labeled Indicator Name in the table on the back of this page with the indicators that you listed in Worksheet 1 (indicators that you use always or often). As you fill in the column, note the letter by each indicator. To complete the pair wise process, you will fill in the table row by row, by comparing each indicator with each of the other indicators (denoted by their letter in the columns across the top of the table). For example, in the first row you will compare indicator A with indicator B, then C and so on, through the last indicator pair.

This pair wise process helps you compare each indicator with all the other indicators and choose which one of each pair is more useful to you. To keep track of which indicator is most useful in each pair, follow this rule: if the ROW indicator is MORE USEFUL than the column indicator enter a 1 in the BOTTOM HALF of the box under each column, however, if the COLUMN indicator is MORE USEFUL than the row indicator enter a 1 in the TOP HALF of the box under each column. You can skip any box marked with an X as those boxes are just a repeat of pairs that you have already tested. Once you have finished all the comparisons, add up the BOTTOM half of the boxes in each ROW and fill in the Row Total Column at the left side of the table. Add up the TOP half of each Column and fill in the Column Total Row at the bottom of the table.

Now you can rank the indicators using the sum of the row total and column total for each indicator. Add up the row and column total for each indicator and complete column labeled Indicator Rank. The indicator with the highest row + column total is most useful, so it gets a rank of 1. The indicator that has the next highest row + column total is second most useful, so gets a rank of 2 and so on. Now you can fill in the Pair wise comparison ranking in _____.

	Indicator Name	Indicator Total (row + column)	Indicator Rank	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Row Total
1																		
2				X														
3				X	X													
4				X	X	X												
5				X	X	X	X											
6				X	X	X	X	X										
7				X	X	X	X	X	X									
8				X	X	X	X	X	X	X								
9				X	X	X	X	X	X	X	X							
10				X	X	X	X	X	X	X	X	X						
11				X	X	X	X	X	X	X	X	X	X					
12				X	X	X	X	X	X	X	X	X	X	X				
13				X	X	X	X	X	X	X	X	X	X	X	X			
14				X	X	X	X	X	X	X	X	X	X	X	X	X		
15				X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Column Total																	

Worksheet #3: Indicator Evaluation Worksheet

With this step, you will learn more about the indicators that you have selected for your farm sustainability profile, personalize the indicator for use on your farm and evaluate the current performance of your farm with respect to each indicator.

Farm Report Card

The front side of each Indicator Report Card has a farm performance table for the indicator. The left side of this table describes the range of possible performance values for the indicator from low to high performance. These performance ranges were created based on the best available technical information regarding the characteristics that may predict farm sustainability. In other words, sustainable farms tend to have the characteristics described in the medium to high performance range of each indicator.

The right side of the Indicator Report Card provides space for you to personalize the indicator to your farm. You do this by adding to this side of the table your personal level of satisfaction with possible range in farm performance for each indicator in your indicator set. Although you might think that farmer satisfaction level and farm performance level would be about the same, Prosperity Project farmers reported many different levels of satisfaction for the same level of farm performance. In fact, most of the time, Prosperity Project farmers rating of performance was not the same as the performance level scale.

The final step in this process is to estimate the current performance of your farm on the indicator and note it on the table.

If you have trouble completing the Indicator Report Cards, it is probably best for you to consult with a technical advisor for assistance before continuing on. Even if you did not have any difficulties with this step, you might find it helpful to review these tables with a technical advisor just to get another perspective on your evaluation of your farm's current performance and your satisfaction with that level of performance.

Directions for Completing the Indicator Report Cards

STEP ONE: Review Indicator Report Card Sheets

Gather all of the Indicator Report Cards for your final indicator set. You can find a Report Card for each indicator included in this booklet in the appendix, grouped according to farm family, community and environmental well-being.

Each Report Card has a Farm Performance Table on the front side and a description and other information about the indicator on the backside. Be sure to review the information provided about each indicator before filling out the Farm Performance Table for the indicator.

STEP TWO: Evaluating Farm Performance Using the Signal or Satisfaction Scale

In this step, you are guided through one of two methods to complete the Farm Performance Table: management signal or management satisfaction. At this point in the process, don't think about your farm's actual performance with regard to the indicator. At this step, you are asked to place a value on farm performance based on your experience as a farmer. What level of

performance is necessary for you to be satisfied with a farm's performance on a specific indicator? What level of performance signals success to you? What level of performance signals a problem that needs to be addressed or a situation that is unsatisfactory? We have provided two difference ways to express your experience of farm performance because different people think about it in different ways: the signal scale or the satisfaction scale. Choose the method that is most comfortable for you to work with.

Satisfaction Scale or Signal Scale?

The satisfaction scale has five levels – Worst, Bad, OK, Better and Best – defined in the box to the right. This range expresses different levels of satisfaction with the performance of the farm indicator. For example, if *customer relations* included in a indicator set, one farmer may only be satisfied if there are no complaints from customers, while another farmer might not mind a few complaints here and there. These farmers are both satisfied with different levels of performance on the indicator *customer relations*. To complete the farmer satisfaction side of the Farm Performance Table, first review the characteristics associated with low, medium and high performance of the indicator and think about how you react to these characteristics as a manager. At what level of performance are you satisfied? At what level of performance do you become dissatisfied to the point of thinking about making a management change?

Satisfaction Scale	
Best	Going great, completely satisfied
Better	Going well, somewhat satisfied
OK	Going well, but not satisfied
Bad	Not going well, some concern
Worst	Significant concern must be addressed

You can define performance with the signal scale instead the satisfaction scale – the difference between the two is that the signal scale uses the analogy of a traffic light to think about farm performance. The scale also has five levels – Red, Orange, Yellow, Yellow Green and Green - defined in the box to the right. This range expresses different levels of management response to the performance of a farm. Using the example of customer relations above, the first farmer may "see a red light" if there is just one customer complaint, while the other farmer would not "see a red light" until numerous customer complaints were made. These farmers pay attention to customer complaints at different levels of farm performance on the indicator *customer relations*.

Signal Scale	
Green	Going great no attention needed
Yellow Green	OK, no attention needed
Yellow	OK , but pay attention
Orange	Caution needed pay close attention
Red	Stop and do something

Both scales provide the kind of information that you need to complete your farm sustainability profile. Decide which one works best for you and following the directions below to complete a Farm Performance Table for each of the indicators in your Final Indicator Set.

Using the Satisfaction Scale

Start filling in the table by determining the performance level that is OK. Do this by starting at the bottom of the performance table and moving slowly up until you hit a level of performance that you would describe as OK. This level can be anywhere in the performance range and does not have to be at moderate performance. In fact, Prosperity Project farmers often placed their OK

above or below the moderate performance range. Once you have found your OK performance level, write OK at this place in the table.

Now, disregarding your first estimation of OK performance, find the OK performance level again, only this time start from the top of the performance table and move slowly down until you hit the level of OK performance. Write OK at this place on the table.
Now, check that both of your OK performance levels are about the same. If so, you can move on. If not, don't worry that your OKs landed at different places. Many Prosperity Project farmers had the same thing happen. This offers an opportunity to clarify your thinking about how the indicator helps you to understand your farm's performance.
After doing a little thinking about which of the two levels you have chosen is the best fit of the definition of OK performance, make your choice about the final location of OK on the table.

The next step to completing the farmer side of the table is to determine the Best performance. Starting at the bottom of the performance table, move slowly up the table until you hit the performance level you consider Best. This level can be anywhere in the range of performance levels, but should be above your OK performance. It does not have to be at the top of the "high performance" range, but might fall in the moderate or even low performance depending on your farm management experiences. Many Prosperity Project farmers determined that Best was in the moderate range for at least one indicator. Remember that this step in the process is personalizing the indicator to your thinking about farm management.

The final step to complete the farmer side of the table is to determine the Worst performance level, and then to add in the intermediate levels of Bad and Better. To find the Worst performance level, start at the top of the performance table and move slowly down the table until you hit the performance level you consider Worst. This level can be any where in the performance range, but should be below your OK level. Now, simply add in the intermediate levels to the table. Make your best estimate of where Bad fits in between Worst and OK and where Good fits in between Best and OK.

Using the Signal Scale

Start filling in the table by determining the performance level that is a Yellow light. Do this by starting at the bottom of the performance table and moving slowly up until you hit a level of performance that you would describe as Yellow. This level can be anywhere in the performance range and does not have to be in the moderate performance. In fact, Prosperity Project farmers often placed their Yellow above or below the moderate performance range. Once you have found your Yellow performance level, write Yellow at this place in the table.

Now, disregarding your first estimation of Yellow performance, find the Yellow performance level again, only this time start from the top of the performance table and move slowly down until you hit the level of Yellow performance. Write Yellow at this place on the table.

Now, check that both of your Yellow performance levels are about the same. If so, you can move on. If not, don't worry that your Yellow Lights landed at different places. Many Prosperity Project farmers had the same thing happen. This offers an opportunity to clarify your thinking about how the indicator helps you to understand your farm's performance. After doing a little thinking about which of the two levels you have chosen is the best fit of the definition of Yellow performance, make your choice about the final location of Yellow on the table.

The next step to completing the farmer side of the table is to determine the Green Light performance. Starting at the bottom of the performance table, move slowly up the table until you hit the performance level you consider Green. This level can be anywhere in the range of performance levels, but should be above your Yellow performance. It does not have to be at the top of the "high performance" range, but might fall in the moderate or even low performance depending on your farm management experiences. Many Prosperity Project farmers determined that Green was in the moderate range for at least one indicator. Remember that this step in the process is personalizing the indicator to your thinking about farm management.

The final step to complete the farmer side of the table is to determine the Red Light performance level, and then to add in the intermediate levels of Orange and Yellow- Green lights. To find the Red performance level, start at the top of the performance table and move slowly down the table until you hit the performance level you consider a Red light. This level can be any where in the performance range, but should be below your Yellow level. Now, simply add in the intermediate levels to the table. Make your best estimate of where Orange fits in between Red and Yellow and where Yellow-Green fits in between Green and Yellow.

STEP THREE: Evaluate Your Farm's Performance

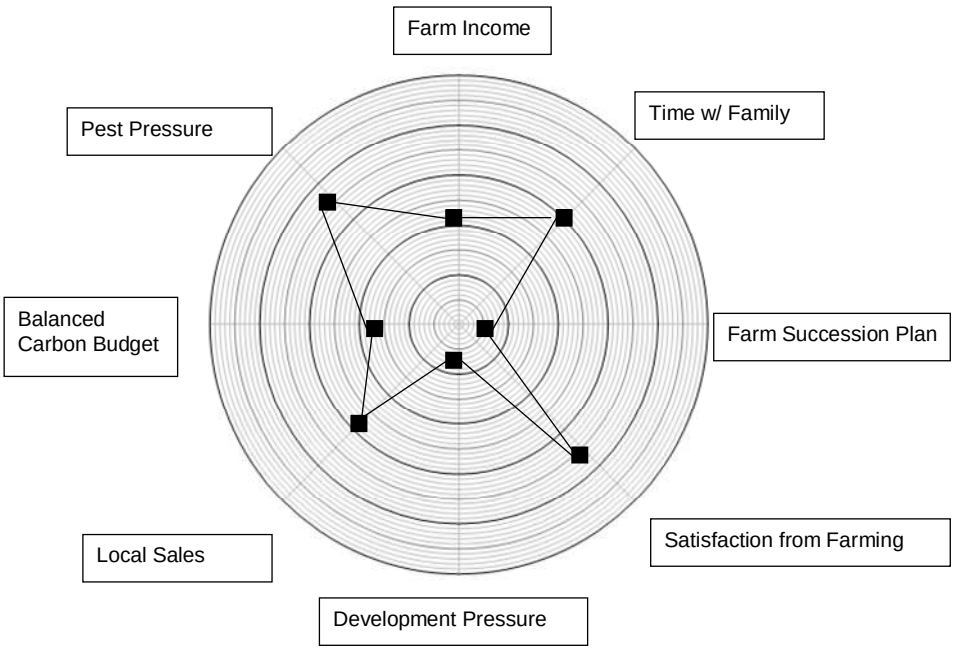
The final step needed to complete the Farm Performance Table is to determine your farm's current performance on each indicator and record this level of performance. To do this just make a mark, or write a phrase such as "my farm" or "current farm performance" on the farmer side of the table at the point in the range that you think best describes your farm's current performance on the indicator.

Work through this process to complete the Indicator Report Card for each indicator in your final indicator set. When you have completed Report Cards for all of the indicators that you have selected for your farm, you are ready to move on to the final step of the process – plotting your farm's sustainability profile.

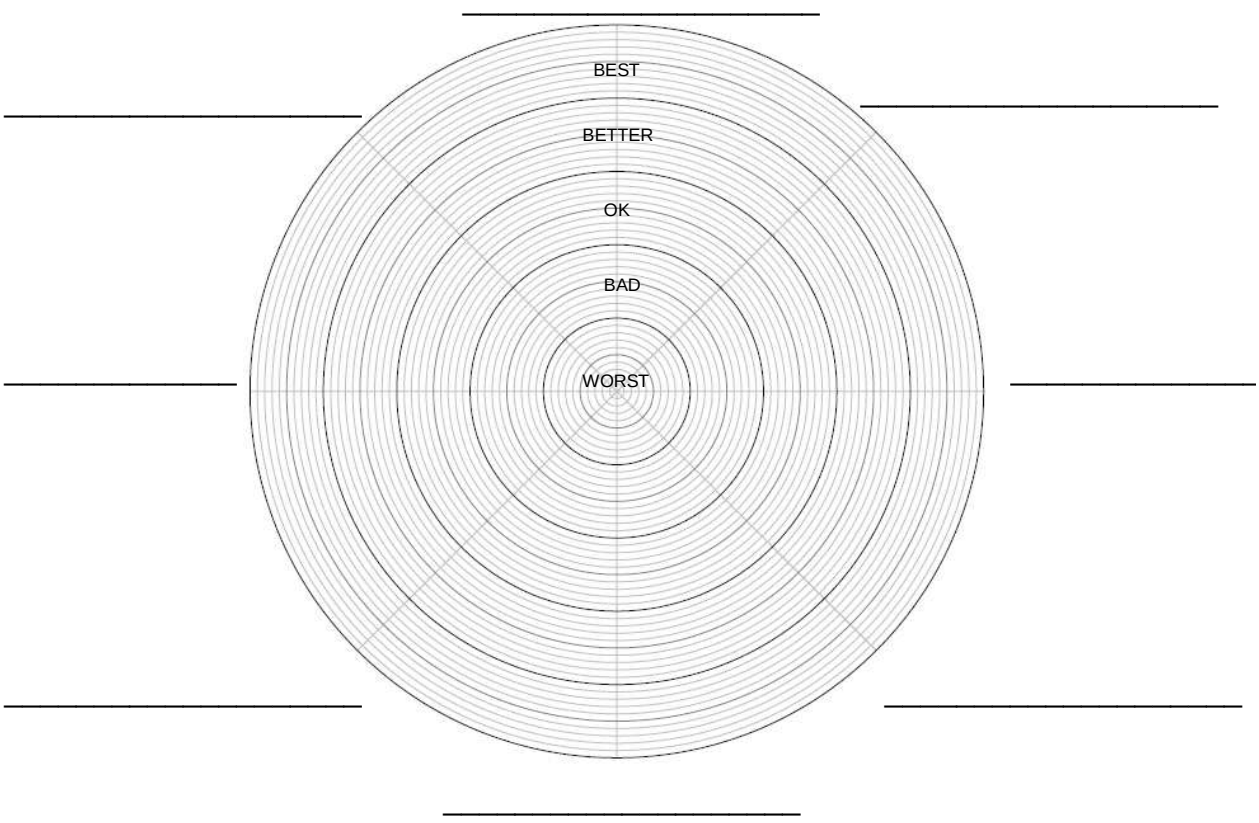
Worksheet #4: Create Your Farm Sustainability Profile

The last step in the process to create your farm sustainability profile is to plot the indicator values for your farm on a web graph like the one below. Using the graph on the opposite side of this page, you can compile farm performance on each of the indicators in your Final Indicator Set in one picture. To complete the graph for your farm, simply fill in the indicator names in the blanks placed around the outside of the graph and plot your evaluation of the current performance of your farm for each indicator on the diagonal line ending at each box. Performance levels are the circular regions in the graph that start in the center with Worst and increase as you move out to the end of the circle to Best. For ease of interpretation, you may want to group the indicators around the graph according to the three categories of sustainability: Family Well-Being, Community Well-Being and Environmental Well-Being.

If you have more than eight indicators in your final indicator set, you may simply add additional radial lines to the graph.



Sustainability Profile Name _____



This guide includes two formal methods to guide your selection of the best option from among the best fit options you have developed for consideration. The ***Even Swap*** method simplifies the comparison of options by reducing the number of indicators that you compare in order to identify the option that gives you the best farm performance. The ***Distance Metric*** method is a more complex method for choosing among the options. Although it takes more time and involves a number of mathematical calculations, this method allows you to include estimates of the uncertainty associated with performance of each option and also allows you to give more weight to the indicators that you think are most important in the decision about which option is the best fit for your farm. It is a good idea to work through both methods as a way to confirm your choice of the best option. If both methods result in the same choice, then you can be more confident in your choice. If you choose different options for each method, then it would be best for you to review the selection of options and your assessment of farm performance under the different options with the help of a technical advisor.

Worksheet #5: Selecting the Best Option with Even Swap

Worksheet #5 guides you through the steps involved in using the Even Swap method to choose the best option among the options that you are considering for your farm.

Worksheet#6: Selecting the Best Option with the Distance Metric

Worksheet #6 guides you through the steps involved in using the Distance Metric to choose the best option among the options that you are considering for your farm.

Worksheet #5: Selecting the Best Option with Even Swap

This worksheet guides you through the selection of the option that offers the best overall farm performance based on the indicators that you have selected. Now that you have identified your indicator set and potential best fit options, you are ready to evaluate the options that you have selected to determine which one is the best overall fit for your farm. The goal of this step is to clarify the differences in farm performance among the options that you have selected by focusing on the important differences in farm performance among the options. When farm performance on an indicator is the same under all options, the indicator can be dropped from consideration - reducing the number of indicators to consider and so simplifying the choice process

Step 1: Create a record of current farm performance and expected farm performance under the options that you wish to consider by completing the table below. You can use the space below the table to describe each option or for making notes about each option.

Indicator	Current Performance	Option 1	Option 2	Option 3	Option 4

Option 1:

Option 2:

Option 3:

Option 4:

Step 2: Now look over Table 1 and check to make sure that the values of *critical* indicators - indicators that must perform at a certain level in order for the option to be acceptable to you - are at an acceptable value for all the options under consideration. If any options fail this test, remove the option from consideration (just cross out the option by drawing a vertical line through the option column) and move on to the next step.

Step 3: Now look over Table 1 and cross out any *irrelevant* indicators – these are indicators that have the same value for all options. They are irrelevant because the performance of this indicator is the same no matter what option you choose. Remove any irrelevant indicators from consideration (just cross out the indicator by drawing a vertical line through the indicator row) and move on to the next step.

Step 4: Now look over Table 1 for any *non- dominant* options. These are the low performing options that have lower values than the options on one or more indicators and have the same values as all the other options for all other indicators. Remove any non-dominant options from consideration (just cross out the option by drawing a vertical line through the option column) and move onto the next step.

Step 5: Fill in the Table 2 below with the indicators and options that remain in Table 1 after you have crossed out irrelevant indicators, options with performance below a critical level for at least one indicator and the non-dominant options.

Table 2.

Indicator	Current Performance	Option 1	Option 2	Option 3	Option 4

NOTES:

Step 6: The Even Swap method helps to simplify the choice between options by imagining potential tradeoffs in indicator performance in an effort to create irrelevant indicators and then removing these indicators from consideration (like Step 3 above). You can do this by finding a trade off you are willing to make between two indicators that equalizes indicator values across all options for one of the indicators. You can then remove the equalized indicator (because performance on that indicator is the same for all options) from consideration and thereby simplify the choice process.

Begin by reviewing Table 2. Look for any indicators that have the same value for all but one of the options under consideration. Work through your own table using the logic of the example described below until you have removed all the indicators that can be made irrelevant through trade offs and all non-dominant options that emerge after irrelevant indicators are removed.

MAKING TRADE OFFS EXAMPLE

These steps to making tradeoffs refer to Table 3 below.

- Looking at Table 3, the indicator total family income has the same performance level for all options except for option 1. Although option 1 gives only an OK value for the Total family income indicators, it does give a BETTER value for the local sales indicator. Here is the tradeoff: Is the farmer in this example willing to give up some of the local sales value if family income were to improve up to BETTER? In this example, the farmer decides that reduced performance in local sales was acceptable, if family income increased up to BETTER.
- Why was the local sales indicator used to make the first swap? Because the farmer was not willing to reduce either farm succession or development pressure lower than OK (the critical level for these indicators), therefore they are left with local sales as the only trade off option.
- The table is adjusted below and the farmer can remove the family income indicator as it is the same across all options.
- Scanning the remaining indicators and options for dominance, we find that option 1 is non-dominant. So it is crossed out and we continue with the options 2-4 and the three remaining indicators.

Indicator	Option 1	Option 2	Option 3	Option 4
~~**total family income**~~	~~OK~~ ↑BETTER	~~BETTER~~	~~BETTER~~	~~BETTER~~
farm succession plan	OK	BETTER	OK	BETTER
development pressure	OK	OK	BEST	BEST
local sales	~~BETTER~~ (↓ OK)	BETTER	OK	OK

- Scanning the remaining indicators, another tradeoff becomes apparent: decreasing Local Sales to OK in Option 2 makes Local Sales irrelevant. In order to make this change, a gain in performance on another indicator is needed to compensate for the loss of performance in Local Sales. Development pressure is increased to

BEST, local sales is reduced to OK and local sales can be dropped from consideration. This trade off is shown in Table?? below.

When comparing these indicators we are asking – Is the BEST value in option 3 sufficient to make up for the OK values in the 2 remaining indicators for option 3? The even swap approach essentially tests to determine if this is true given the farmer's preferences between indicators. It does so with the hypothetical swaps.

Indicator	Option 1	Option 2	Option 3	Option 4
~~**total family income**~~	~~OK~~	~~BETTER~~	~~BETTER~~	~~BETTER~~
farm succession plan	OK	BETTER	OK	BETTER
development pressure	OK	~~OK~~ (↑ BEST)	BEST	BEST
~~**local sales**~~	~~BETTER~~ (↓ OK)	~~BETTER~~ (↓ OK)	~~OK~~	~~OK~~

- After working through the table ?? to remove all possible irrelevant indicators, create a new table like Table ?? below with the final set of indicators and options. Again it is time to scan for dominance of any options. In this example, Options 2 and 4 dominate option 3, so it can be removed.

Indicator	Option 2	Option 4
farm succession plan	BETTER	BETTER
development pressure	~~OK~~ (↑ BEST)	BEST

- Create a final table like Table ?? below with the remaining two options and 2 indicators with their original values. We now have a simplified impact matrix where it becomes clear that option 4 is the dominant option.

Indicator	Option 2	Option 4
farm succession plan	BETTER	BETTER
development pressure	OK	BEST

Step 7: Complete the Even Swap process by filling in the table below with the final set of options and remaining indicators with their original values and review to choose the dominant option,

Final Option/Indicator Set

Indicator	Current Performance	Option 1	Option 2	Option 3	Option 4

Notes

Worksheet #6: The Distance Metric: Measuring Differences Among Options

The Distance Metric approach measures the distance between your best-fit option and your ideal option. The quantitative nature of this approach allows the inclusion of numerical estimates of risk or uncertainty about the expected farm performance estimates and farmer assigned numerical weights to each indicator. The option with the least distance from ideal performance is considered the best choice among all the options under consideration.

The Distance Metric builds on the initial steps of the Even Swap method. You will need a completed Table 2 from Worksheet #5 to begin.

Step 1: Determine Relative Value of Indicators

Recall from above that the distance metric approach requires you to determine the relative importance of each selected indicator to your decision making by assigning a weighting factor to each indicator. You will use a simple dot system to figure out the weights for each indicator in Table 2. Simply divide 20 dots among the indicators in Table 2, by placing more dots by indicators that are more important to your decision making and less dots by those indicators that are less important. Calculate the weighting factor for each indicator in Table 2 (from Worksheet #5) by filling in Table 1 below. (See example calculation in first row).

Table 1

Indicator Name	# of dots out of 20	Indicator weight (# dots/20)
Family Income	10	10/20=0.50

Step 2: Convert Farm Performance Values in Table 1 to Numerical Values

The next step is to convert the indicator values of WORST through BEST to numerical values of 0 to 4, using the conversion below and then fill out Table 3 below with the numerical values for the indicators under each option. See the first row of Table 3 for an example.

Indicator Value Conversion

best	4
better	3
ok	2
bad	1
worst	0

Table 3

Indicator	Option 1	Option 2	Option 3	Option 4
Family Income	2 (OK)	0 (WORST)	3 (BETTER)	4 (BEST)

Step 6: Calculating Indicator Distance from Ideal

Using the indicator values recorded in Table 3, you can calculate the distance of each option from the BEST or ideal value (4) by subtracting the value of each indicator from 4 and placing the result in Table 4 as shown below.

Table 4.

Indicator	Option 1	Option 2	Option 3	Option 4
Family Income	2	4	1	0

Step 7: Calculating the Distance Metric

Using the weights for each indicator (See Table 1 above) and the formula given below, calculate the weighted distance of each option from the ideal. Note we have assumed in this example that the outcomes for each option are expected to occur with probability of 1, e.g. the outcomes are certain, thus p=1.

The distance metric formula is:

$$D_{it} = [\sum_j W_j^p (V_{tj} - V_{ij})^p]^{1/p}$$

Where:

D_{it} = the distance value of the ith option to the ideal option t.
W_j = the weight for indicator j and is raised to the pth power that represents the level of risk involved with receiving the outcomes from the ith option.
V_{ij} = the standardized value for the jth indicator for the ith option.
V_{tj} = the standardized value for the jth indicator for the ideal option t

Therefore, $V_{ti} - V_{ij}$ = the distance calculated in the table above. If p=1, then the formula simplifies to:

$$D_{it} = \sum_j W_j(V_{tj} - V_{ij})$$

Using this formula, fill in Table 5 below with the distance metric for each option. See the example in the first row of the table. To complete the last row of the table, simply sum all the values in each column and place the result in the last row. This value is the distance from ideal for each option included in the table. The option with the smallest distance metric is considered the best fit option.

Table 5

Indicator		Option 1	Option 2	Option 3	Option 4
	Weight	Wj(V1j-V1t)	Wj(V2j-V2t)	Wj(V3j-V3t)	Wj(V4j-V4t)
Total Family income	0.5	0.5 x 2 = 1	0.5 x 4 = 2	0.5 x 3 = 1.5	0.5 x 0 = 0
Total Distance (sum of all indicators)					

The uncertainty, or risk associated with each option is an important consideration when using the Distance Metric approach. The WNC example included in the appendix briefly illustrates how risk can be included in the distance metric analysis if desired.

Appendix B: Indicator Report Cards

Family Well-Being Indicators

- Total Family Income
- Time for Family Activities
- Family Health
- Satisfaction from Farming
- Farm Succession Plan
- Family Education
- Community Activities
- Ratio of Family to Other Farm Labor
- Ratio of Family to Other Farm Residents

Community Well-Being Indicators

- Local Sales
- Farm Income Compared to Average Income
- On-Farm Jobs
- Local Purchases
- Cooperation with Other Farmers
- Cooperation with Non-Farming Neighbors
- Community On Farm
- Development Pressure
- Local Identity
- Farm Attractiveness
- Development Pressure

Environmental Well-Being Indicators

- Presence of Earthworms
- Balanced Nutrient Budgets
- Balanced Carbon Budget
- Energy Efficiency
- Water Efficiency
- Biodiversity
- Pest Pressure

Indicator Name: Total Family Income

	Performance Levels	Farmer Evaluation
High Performance	**Farm Sustains Family and Future Generations** Total farm revenue covers all opportunity costs, direct costs, and retains earnings. Off farm income is not needed to support family. **Farm Supports Family** Total farm revenue covers all opportunity costs and direct costs. Off farm income is not needed to support family, but earning are not retained. **Farm Contributes** Total farm revenue covers direct costs and contributes to opportunity costs. Family income from off-farm sources used to subsidize some opportunity costs of farm.	
Medium Performance	**Farm is Self-Supporting** Total farm revenue covers direct costs but does not contribute to opportunity costs. Family income from off-farm sources used to subsidize opportunity costs of farm. **Farm is not Self-Supporting** Total farm revenue covers variable costs and contributes to fixed costs. Family income from off-farm sources used to subsidize some fixed costs of farm.	
Low Performance	**Farm Losses** Total revenue covers variable costs but can't contribute to fixed costs. Family income from off-farm sources used to subsidize fixed costs of farm. **Farm Debt** Total farm revenue is less than total variable costs. Family income from off-farm sources used to subsidize variable and fixed costs of farm.	

INDICATOR: TOTAL FAMILY INCOME (Sophia Levin-Hatz)

DESCRIPTION

The profitability of many farms in the U.S. is poor. In fact, most small farm households rely on off-farm income (on average, off-farm income contributes 80 to 100% of the total household income) and do not rely primarily on their farms for their livelihood. Most of their off-farm income is from wage-and-salary jobs or self-employment; however, making any generalizations about farm income is very difficult because of the complex structure of farming. In general, small farms are less viable as businesses than large farms – in 2004, the average operating profit margin and rates of return on assets and equity were negative for most small farms in the U.S. Nevertheless, some small farms of every small farm type reported profitable operation of at least 20 percent over operating costs. (from EIB-24 listed below)

This indicator, developed by Modeling Team research assistant Sophia Levin-Hatz, evaluates the financial health of the farm over a range of profitability conditions in order to represent the diversity of farm family needs and goals. This indicator breaks down the costs of production into two different categories: direct costs (variable costs + fixed costs of production) and opportunity costs (income potential lost by foregoing other more valuable land uses).

Most farmers view farm profitability as it is defined in low performance – the farm earns income after all variable and some fixed costs are accounted for. Higher performance is defined as the farm earns income after all direct costs, but not opportunity costs are accounted for. The highest performing farms earn income after all direct and opportunity costs are accounted for.

USE BY PROJECT FARMERS

This indicator was developed from three indicators tested on Farm Prosperity farmers: total family income, total farm income, and farm contribution to total family income. These three indicators were used respectively by 14, 17, and 13 of 23 farmers always or often.

MONITORING METHODS

None recommended. Financial information collected for income tax purposes would be useful in evaluating this indicator.

RANGE IN VALUE

None recommended.

ADDITIONAL INFORMATION

Farm Sustainability w/Financial Data – The Monitoring Toolbox. Land Stewardship Project.
http://www.landstewardshipproject.org/mtb/lsp_toolbox.html

Structure and Finances of U.S. Farms: Family Farm Report, 2007 Edition
By Robert A. Hoppe, Penni Korb, Erik J. O'Donoghue, and David E. Banker
Economic Information Bulletin No. (EIB-24) 58 pp, June 2007
http://www.ers.usda.gov/Publications/EIB24/

Indicator Name: Time for Family Activities

	Performance Levels	Farmer Evaluation
High Performance	Abundant time available for enjoyable activities with full family participation and family subgroups. Participate in activities as a family regularly on a daily and weekly basis. Participate regularly as a family in special events and social occasions such as holiday celebrations and family vacations.	
Medium Performance	Some time available for enjoyable activities with full family participation and family subgroups. Participation in activities as a family regularly on a weekly basis. Participate regularly as a family in special events and social occasions such as holiday celebrations and vacations.	
Low Performance	Little time available for enjoyable activities with full family participation and family subgroups. Some participation in activities as a family on a regular basis. Some participation as a family in special events and social occasions such as holiday celebrations and vacations.	

INDICATOR: TIME FOR FAMILY ACTIVITIES

DESCRIPTION

Having the time to participate in enjoyable activities with family is important to a sense of personal and family well-being. Although the value of enjoying time together as a family is universally recognized, the definition of "enough time" and "enjoyable time" is a very personal one. We have provided some general characteristics of performance on this indicator for you to consider.

We have also included performance levels as defined by Prosperity Project farmers. (include that 3 farmers volunteered that they specifically used ability to take vacation as an indicator of farm family well-being?)

USE BY PROJECT FARMERS

17 out of 23 used always or often

MONITORING METHODS

Land Stewardship Project's Monitoring Toolbox offers a variety of exercises for developing and monitoring specific measures of family quality of life and well-being.

RANGE IN VALUE

None recommended.

ADDITIONAL INFORMATION

Monitoring Quality of Life - The Monitoring Toolbox. Land Stewardship Project. http://www.landstewardshipproject.org/mtb/lsp_toolbox.html

Indicator Name: Family Health

	Performance Levels	Farmer Evaluation
High Performance	Family has sufficient health insurance and access to health care. Family members engage in healthy behaviors and participate in routine health care as recommended by medical professionals. Farm practices create healthy environment for farm residents. Low incidence of injury, illness, or disease among family members.	
Medium Performance	Family has sufficient health insurance and access to health care. Some family members engage in some healthy behaviors and sometimes participate in routine health care as recommended by medical professionals. Some farm practices create healthy environment for farm residents. Moderate incidence of injury, illness, or disease among family members.	
Low Performance	Family has does not have sufficient health insurance and access to health care. No family members engage in healthy behaviors. No family members participate in routine health care as recommended by medical professionals. Farm practices create unhealthy environment for farm residents. High incidence of injury, illness, or disease among family members.	

INDICATOR: FAMILY HEALTH

DESCRIPTION

It is easy to overlook your family's health in the day to day management of a farm, but family health and access to adequate health care is an important indicator of family well-being. Managing your own business is demanding and stressful and farm enterprises are particularly risky because there are so many factors beyond the control of the farmer. Farming is a dangerous occupation and presents numerous health risks to both the farmer and the farm family. Self-employed people tend to have lower levels of health insurance coverage. And rural communities tend to have less access to high quality health care. Taken together, these characteristics present a challenge to managing your family's health. We have provided some general characteristics of performance on this indicator for you to consider. We have also included performance levels as defined by two Prosperity Project farmers.

USE BY PROJECT FARMERS

12 out of 23 farmers use always or often

MONITORING METHODS

None recommended by NCSU Extension.

RANGE IN VALUE

None recommended by NCSU Extension.

ADDITIONAL INFORMATION

Indicator Name: Satisfaction from Farming

	Performance Levels	Farmer Evaluation
High Performance	Consistent feelings of satisfaction from all aspects of farm work – planning, production, processing, and marketing. Customers express appreciation, are loyal and refer new customers. Farm and farm family have high resilience to bad weather/markets or other factors that threaten to reduce farm profitability	
Medium Performance	Consistent feelings of satisfaction from many aspects of farm work – planning, production, processing, and marketing. Some customers express appreciation, are loyal and refer new customers. Farm and farm family have some resilience to bad weather/markets or other factors that threaten to reduce farm profitability.	
Low Performance	Consistent feelings of dissatisfaction from most aspects of farm work planning, production, processing, and marketing. Few customers express appreciation, are loyal and refer new customers. Farm and farm family lack resilience to bad weather/markets or other factors that threaten to reduce farm profitability.	

INDICATOR: SATISFACTION FROM FARMING

DESCRIPTION

Feelings of pleasure in a job well done, pride in the success of meeting business goals, joy in the beauty of working a well-managed crop in the early morning all add up to finding satisfaction in working on your farm. Life satisfaction is one important social consideration in agriculture. Without offering a satisfying life, even the most profitable and ecologically sound forms of agriculture will not be sustainable. Although the value of satisfaction from farming to family well-being universally recognized, the aspects of the farm life that contribute to satisfaction is a very personal one. We have provided some general characteristics of performance on this indicator for you to consider. We have also included performance levels as defined by five Prosperity Project farmers.

USE BY PROJECT FARMERS

13 of 23 farmers use always or often

MONITORING METHODS

None Recommended

RANGE IN VALUE

None Recommended

ADDITIONAL INFORMATION

Indicator Name: Farm Succession Plan

	Performance Levels	Farmer Evaluation
High Performance	Written plan for farm succession has full support of all family members and is legally protected to the fullest possible extent.	
Medium Performance	Farm succession plans have been discussed and are generally supported by family members. Some legal protections to assure farm succession plan are in place or under discussion.	
Low Performance	Farm succession has not been discussed or has been considered and dismissed by family. Little or no interest in planning for farm succession by family members.	

INDICATOR: FARM SUCCESSION PLAN

DESCRIPTION
Succession planning is the ongoing process of ensuring the continuation of the family business. The succession plan guides the transfer of the family business — the ownership, management and labor — to the next generation. Preserving family harmony and the continued success of the business are the essential objectives of succession planning.

The concept of a multi-generational family farm or ranch holds appeal for many, but the reality is that it may be more difficult to enable succeeding generations in the business than it was to create the original business. If you truly wish for someone close to you to carry on with your farm or ranch operation, then you need to begin succession planning now. It is not uncommon for succession planning to take more than five years, and it often can take 15 or 20 years. (from http://www.noble.org/Ag/Economics/SuccessionPlanningIsCritical/index.html)

USE BY PROJECT FARMERS
12 out of 23 farmers used always or often

MONITORING METHODS
None recommended.

RANGE IN VALUE
None recommended.

ADDITIONAL INFORMATION

North Carolina Farm Transition Network provides free information and assistance to landowners, farmers, and their families toward the goal of keeping land in farm and forest production as it passes between generations or otherwise changes ownership. http://www.ncftn.org/

Planning the Future of Your Farm: A Workbook on Farm Transfer Decisions is a workbook created by the North Carolina Farm Transition Network to help farmers and their families better understand the issues surrounding farm business and asset transfer planning. Accompanying worksheets are designed to help answer preliminary questions and gather information to prepare for a more productive interaction with professional advisors such as accountants, attorneys and financial planners. http://www.ncftn.org/planning/PFYFworkbook/

Indicator Name: Family Education

	Performance Levels	Farmer Evaluation
High Performance	All family members have access to and resources needed to achieve desired education.	
Medium Performance	Family members have some access to and/or resources needed to achieve desired education.	
Low Performance	Family members do not have access to and/or the resources required to achieve desired education.	

INDICATOR: FAMILY EDUCATION

DESCRIPTION

Educational needs differ in every family, but the opportunity to obtain desired education for family members is a common indicator of family well-being. Farm families often have limited resources for supporting college education, lack easy access to educational opportunities and have an on-going need for continuing education after graduation. Taken together, these characteristics can make obtaining desired education a challenge – as national statistics on education levels suggest. Rural residents are less likely that the U.S. population as a whole to have completed high school, attended some college, or hold a college degree. Yet there are clear relationships between family well-being and education level. Local educational levels are a critical determinant of income growth in rural communities.

We have provided some general characteristics of performance on this indicator and performance levels as defined by two Prosperity Project farmers.

USE BY PROJECT FARMERS

9 of 23 farmers use always or often

MONITORING METHODS

None recommended.

RANGE IN VALUE

None recommended.

ADDITIONAL INFORMATION

Indicator Name: Community Activities

	Performance Levels	Farmer Evaluation
High Performance	Abundant time available for engaging in desired community activities. Able to sustain meaningful participation in community activities on a regular basis.	
Medium Performance	Sufficient time available for engaging in desired community activities. Able to sustain some meaningful participation in community activities on a regular basis.	
Low Performance	Little or no time available for engaging in desired community activities. Unable to sustain meaningful participation in community activities on a regular basis.	

INDICATOR: COMMUNITY ACTIVITIES

DESCRIPTION

Having the time to participate in and contribute to your community is important to a sense of personal and family well-being. Community activities include being an active member of your church, volunteering your time to the PTA, a Scout troupe or a Little League team, or service on a political board or other local organization. Although the value to personal and community well-being of such participation is universally recognized, the definition of "enough time," "community activity" and "meaningful participation" is a very personal one. We have provided some general characteristics of performance on this indicator for you to consider. We have also included the definition for this indicator as defined by a Prosperity project farmer who donates fresh vegetables to a local food bank as way to provide service to community.

USE BY PROJECT FARMERS

8 out of 23 farmers use always or often

MONITORING METHODS

None recommended.

RANGE IN VALUE

None recommended.

ADDITIONAL INFORMATION

Indicator Name: Ratio of Family to Other Labor

	Performance Levels	Farmer Evaluation
High Performance	Ratio between family to other Labor is optimal. Farm fully supports family goals regarding the participation of family members and non-family members in farm operation.	
Medium Performance	Ratio between family and other labor is less than optimal. Farm somewhat supports family goals regarding the participation of family members and non-family members in farm operation.	
Low Performance	Ratio between family and other labor is much less than optimal. Farm does not support family goals regarding the participation of family members and non-family members in farm operation.	

INDICATOR: RATIO OF FAMILY TO OTHER LABOR

DESCRIPTION
There is no ideal mix of family to non-family farm labor, rather this indicator measures the ability of the farm to support family farm employment goals. The right mix of family and non-family labor will be different for every farm and will change for an individual farm over time as the family changes. The important farm characteristic measured by this indicator is that the farm is able to support the desired level of on-farm employment for family members.

USE BY PROJECT FARMERS
8 out of 23 used always or often

MONITORING METHODS
None recommended.

RANGE IN VALUE
None recommended.

ADDITIONAL INFORMATION

Indicator Name: Ratio of Family to Other Residents

	Performance Levels	Farmer Evaluation
High Performance	Ratio between full-time family and other farm residents is optimal. Farm fully supports family goals regarding the mix of family members and non-family members resident on the farm.	
Medium Performance	Ratio between full-time family and other farm residents is less than optimal. Farm somewhat supports family goals regarding the mix of family members and non-family members resident on the farm.	
Low Performance	Ratio between full-time family and other farm residents is much less than optimal. Farm does not support family goals regarding the mix of family members and non-family members resident on the farm.	

INDICATOR: RATIO OF FAMILY TO OTHER RESIDENTS

DESCRIPTION
There is no ideal mix of full-time family to non-family residents on the farm, rather this indicator measures the ability of the farm to support family farm residence goals. The right mix of family and non-family living on the farm will be different for every farm and will change for an individual farm over time as the family and the farm changes. The important farm characteristic measured by this indicator is that the farm is able to support the desired level of on-farm residence for family members.

USE BY PROJECT FARMERS
4 out of 23 used always or often

MONITORING METHODS
None recommended.

RANGE IN VALUE
None recommended.

ADDITIONAL INFORMATION

Indicator Name: Local Sales

	Performance Levels	Farmer Evaluation
High Performance	Optimum quantity of product sold through local markets to consumers and to other locally owned businesses.	
Medium Performance	Product sold through a mix of local, direct markets and other markets. Mix of local to non-local marketing options not fully optimized.	
Low Performance	All products sold through wholesale/commodity markets to distributors based outside of the local community. Local marketing has not been considered.	

INDICATOR: LOCAL SALES

DESCRIPTION

Sustainable agriculture involves the participation of the farmer in the local community as part of a regional food system. Regional food systems build health, wealth, capacity and connection for local residents. Local sales connect farmers to not only to their own history and place, but to individuals and families through collaboration, communication, and commerce. The network of interrelationships and commerce leads to food and farm business growth and development. Participating in a regional food system often requires the farmer to use direct marketing techniques. Direct marketing can give the farmer a larger share of the food dollar and possibly a higher return on each unit sold. For some farmers, adding value or marketing some minimally processed farm products directly to the consumer is a way of enhancing financial viability. However, finding the right niche and marketing directly to the public is a hard and labor-intensive job requiring time and effort, creativity, ingenuity, sales expertise, and the ability to deal with people in a pleasant and positive manner.

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USE BY PROJECT FARMERS

14 of 23 use always or often

MONITORING METHODS

No recommended methods. Suggested indicator: determine proportion of total sales made locally.

RANGE IN VALUE

No recommended range in value.

ADDITIONAL INFORMATION

Marketing Local Food. Minn Inst. Sustain. Agriculture.
http://www.misa.umn.edu/vd/publications/marketing_local_food.pdf

Direct Marketing. ATTRA. http://attra.ncat.org/attra-pub/directmkt.html

Direct Marketing Tools for NC Farm Businesses on the Web. CEFS Small Farm Unit
http://www.cefs.ncsu.edu/PDFs/Direct%20marketing%20tools%20for%20farm%20businesses%20on%20the%20web%20NC.pdf

Indicator Name: Farm Income vs. Regional Income

	Performance Levels	Farmer Evaluation
High Performance	Farm income is above the median regional household income.	
Medium Performance	Farm income equals the regional median household income. 2007 Median Household Income by county: Buncombe 43,405 Henderson 46,872 Transylvania 42, 212 Madison 37,691	
Low Performance	Farm income is below the regional median household income.	

INDICATOR: FARM INCOME VS. REGIONAL INCOME

DESCRIPTION

Comparison of farm family income with regional income provides an evaluation of the financial prosperity of the farm household relative to other households in the region. The Median Household Income statistics by county for the state of North Carolina is reported annually by the Economic Research Service and can be viewed at link reported below.

USE BY PROJECT FARMERS

1 out of 23 farmers use always or often. Although our farmers did not use this indicator, many expressed an interest in using it in the future.

MONITORING METHODS

This indicator can be monitored simply by keeping records of net farm income and comparing to regional income statistics. You could also use the LSP Farm Financial indicator to monitor net income.

RANGE IN VALUE

No recommended range in value.

ADDITIONAL INFORMATION

Median Household Income statistics for North Carolina and by county. ERS.
http://www.ers.usda.gov/Data/Unemployment/RDList2.asp?ST=NC

Indicator Name: On-Farm Jobs

	Performance Levels	Farmer Evaluation
High Performance	Optimum number of permanent, off-farm local residents working on the farm. Farm is well-respected as a place of employment by local community. Low turnover of local, off-farm employees.	
Medium Performance	Number of permanent, off-farm local residents working on the farm is not optimized. Farm is recognized as a place of employment by local community. Moderate turnover of local, off-farm employees.	
Low Performance	Local, off-farm residents are not considered for farm employment. Farm is not recognized as a place of employment by local community.	

INDICATOR: ON-FARM JOBS

DESCRIPTION
Small farms are multi-functional, which means that they not only produce quality food, but that they also contribute to a community's overall economic and social development. As a locally-based business, your farm can help to generate wealth in your community by participating in the local economy in a number of ways. One important contribution your farm can make is to provide permanent jobs for local residents living off the farm. These residents could be your family members or other living in your community.

USE BY PROJECT FARMERS
6 of 23 used always or often

MONITORING METHODS
This indicator can be monitored by including employee status and job type (ie, local resident or seasonal resident, permanent or temporary) in your financial records. The LSP Farm Financial Data assessment includes this indicator.

RANGE IN VALUE
No recommendation.

ADDITIONAL INFORMATION

Indicator Name: Local Purchases

	Performance Levels	Farmer Evaluation
High Performance	Optimum quantity of purchases sourced from locally owned businesses. Non-local purchases sourced when possible from regionally based businesses, or national cooperatives.	
Medium Performance	Purchases sourced through mix of locally-owned and other businesses. Mix of local to non-local sourcing is not fully optimized.	
Low Performance	All purchases sourced from non-local businesses. Local sourcing has not been considered.	

INDICATOR: LOCAL PURCHASES

DESCRIPTION
Farmers purchase inputs and services from other local businesses. They provide raw product for food processing firms. Local farms often produce a large "economic multiplier effect" by re-circulating dollars in local economy. In addition to these direct economic impacts, local farms have many benefits that indirectly enhance the local economy. Sustainable farms can make a significant contribution to the local economy purchasing locally when economically feasible.

USE BY PROJECT FARMERS
13 out of 23 farmers use always or often

MONITORING METHODS
This indicator can be monitored by including business type (ie, locally-owned or not) in your purchasing records. You can also adapt the LSP Farm Financial indicator to include proportion of local purchases.

RANGE IN VALUE
No recommended range in value.

ADDITIONAL INFORMATION

Farm Sustainability w/Financial Data – The Monitoring Toolbox. Land Stewardship Project. http://www.landstewardshipproject.org/mtb/lsp_toolbox.html

Benefit of farms to local economy – local multiplier effects. *Small Farms: The Optimum Sustainable Agriculture Model* http://www.oxfamamerica.org/whatwedo/where_we_work/united_states/news_publications/food_farm/art2570.html

Indicator Name: Cooperation with Other Farmers

	Performance Levels	Farmer Evaluation
High Performance	Well-respected in farming community for cooperative behavior, viewed as valuable collaborator, leader in building collaborative relationships in farming community.	
Medium Performance	Viewed as valuable member of farming community. Collaborates with other farmers when asked.	
Low Performance	Viewed as an outsider by the farming community. Does not collaborate with other members of the farming community, except in unusual or very challenging circumstances.	

INDICATOR: COOPERATION WITH OTHER FARMERS

DESCRIPTION

Although hard to place a value on, mutual support and cooperation among farm families is a common and valuable benefit of being part of a successful farming community. Farmers cooperate with their farming neighbors to offer solutions to management problems, to share materials, tools, labor, and equipment, and to cooperatively market their products, for example. Being able to benefit from and be a benefit to your farming neighbors during challenging times is critical to the well-being of your farm. Sustainable farms make an effort to create mutually beneficial relationships with other farmers in their community.

USE BY PROJECT FARMERS

10 out of 23 use always or often

MONITORING METHODS

No recommended monitoring methods. A Prosperity Project farmer measures this indicator by monitoring the success participation in farmer to farmer mentoring/education activities on the farm.

RANGE IN VALUE

No recommended ranges in value

ADDITIONAL INFORMATION

Indicator Name: Cooperation with Non-Farming Neighbors

	Performance Levels	Farmer Evaluation
High Performance	Non-farming neighbors comment regularly on the aesthetic value that your farm brings to the community, offer regular compliments about much they enjoy the sights, sounds and smells of your farm. There are no complaints from non-farming neighbors about farm sights, sounds or smells.	
Medium Performance	Non-farming neighbors offer some compliments about the sights, sounds and smells of your farm. There are some complaints from non-farming neighbors about farm sights, sounds or smells.	
Low Performance	Non-farming neighbors complain regularly about sights, sounds and/or smells of your farm. Non-farming neighbors threaten/bring civil action against your farm because of disruptive sights, sounds and/or smells.	

INDICATOR: COOPERATION WITH NON-FARMING NEIGHBORS

DESCRIPTION:
A neighboring farm can be both a blessing and a curse to your non-farming neighbors. A sustainable family farm in the neighborhood generally increases property values and improves the quality of life for the community as a whole. But many farming activities can be viewed as disruptive by non-farming neighbors: the sights, smells and sounds of livestock production, field work and other farming operations, the early morning and late hours of field work and the increased traffic during on-farm sales or events for example. Sustainable farms make an effort to maintain good relationships with their non-farming neighbors by managing the farm to reduce disruptions and being sensitive to community concerns – in short, by being a good neighbor!

USE BY PROJECT FARMERS
9 of 23 use always or often

MONITORING METHODS
No recommended monitoring methods. A Prosperity Project farmer defined performance for this indicator.

RANGE IN VALUE
No recommended ranges in value.

ADDITIONAL INFORMATION

Farms, Communities and Collaboration: A Guide to Resolving Conflicts. Cornell University. http://www.cdtoolbox.net/agriculture_economic_development/fcandc.pdf

Indicator Name: Community On Farm

	Performance Levels	Farmer Evaluation
High Performance	Community welcomed to farm for personal recreation – through active management of public access. Farm hosts regular public events. Participates in direct on-farm sales advertised to the public.	
Medium Performance	Farm hosts regular events for invited groups. Direct markets some portion of product through on-farm sales. Farm is listed in local food guide, has a website or in some other way has a public presence in the local community.	
Low Performance	Farm does not host any events for customers or community members, does not direct market on-farm. Farm does not have any public presence in local community.	

INDICATOR: COMMUNITY ON FARM

DESCRIPTION
Inviting the local community to enjoy your farm is a personal decision that must be decided by each farm family. Community members on your farm offers both risks and benefits. There are many different ways manage community access to your farm – from providing recreational access to or through your farm, by making sales from the farm and/or by hosting events that welcome the local community to your farm.

There is one farmer defined performance levels for this indicator.

USE BY PROJECT FARMERS
9 of 23 used always or often

MONITORING METHODS
There are no recommended methods for monitoring this indicator.

RANGE IN VALUE
There are no recommended ranges in value for this indicator.

ADDITIONAL INFORMATION

Indicator Name: Local Identity

	Performance Levels	Farmer Evaluation
High Performance	Recognized as local expert in farm and community history, including food and farming traditions. Historical aspects of farm preserved and communicated to public. Optimum use of local identity in products and marketing.	
Medium Performance	Knowledgeable about history of farm and role in community including food and farming traditions. Some use of local identity in products and marketing.	
Low Performance	No knowledge of farm history and role in community. No use of local identity in products and marketing.	

INDICATOR: LOCAL IDENTITY

DESCRIPTION
Local farms provide to the community through the expression and preservation of local identity, history, cuisine and traditional land use. This value can be used to benefit the farm as well, when used as a marketing tool to distinguish your farm products from others produced outside of your community.

USE BY PROJECT FARMERS
13 out of 23 farmers use always or often

MONITORING METHODS
None recommended.

RANGE IN VALUE
None recommended.

ADDITIONAL INFORMATION

Indicator Name: Farm Attractiveness

	Performance Levels	Farmer Evaluation
High Performance	Farm is a pleasing addition to the community landscape. Adds sensual quality to the community through management that results in appropriate well-maintained infrastructure and healthy land and livestock. Farm is well-respected by the community for the quality of life benefit contributed by the presence of the farm in the community.	
Medium Performance	Farm provides basic benefits of open space and otherwise does not detract from the community quality of life. Few conflicts with non-farming community and when conflicts do arise, they are resolved swiftly through mutual agreement.	
Low Performance	Farm provides basic benefits of open space, but creates significant disruption in community well-being through poor management resulting in disturbing sights, sounds and/or smells. Regular conflicts with non-farming community that are not resolved to the satisfaction of all parties.	

INDICATOR: FARM ATTRACTIVENESS (VISUAL, SMELL AND NOISE APPEAL)

DESCRIPTION

Farms add value to the communities in which they reside. An attractive, well-managed farm contributes to community quality of life. Small farms preserve open space and beautify the landscape, maintain rural character and make communities more attractive to tourists and to employers. They benefit the environment by protecting watersheds, enhancing wildlife habitat and bio-diversity.

USE BY PROJECT FARMERS

15 of 23 use visual appeal, 5 of 23 use small appeal, and 2 of 23 use noise appeal always or often

MONITORING METHODS

None recommended. One project farmer takes note when community members complement the farm in social situations. Another project farmer suggested that no complaints is a good indicator that the farm attractiveness is sufficient.

RANGE IN VALUE

None recommended.

ADDITIONAL INFORMATION

Farms, Communities and Collaboration: A Guide to Resolving Conflicts. Cornell University. http://www.cdtoolbox.net/agriculture_economic_development/fcandc.pdf

Indicator Name: Development Pressure

	Performance Levels	Farmer Evaluation
High Performance	Entire farm is permanently protected by conservation easements, market value reflects agricultural use, the value of development is zero. Community values farmland over nonagricultural land uses, prefers preservation to development.	
Medium Performance	Farm is protected partially or temporarily by mechanisms such as a voluntary agricultural district (VAD), conservation development, intergenerational assistance programs and limited term restrictions. There is interest in permanent farmland protection among farm owners. Community values farmland over nonagricultural land uses. .	
Low Performance	Farm is not protected from development and there is no interest in or conflict over farmland protection among farm owners. Development potential exceeds the value of the farm enterprise. Community prefers non-agricultural land use over farmland.	

INDICATOR: DEVELOPMENT PRESSURE (Sophia Levin-Hatz)

DESCRIPTION:
Development pressure is significant factor in the loss of farmland in the U.S. Farm income cannot compete with the income potential of farmland development. Farmland development typically causes a reduction in quality of life in a community through the loss of open-space and environmental quality, increase in population and increased costs for community services that are not met by the increase in tax value of the developed land. Farmland protection is a complex and often difficult issue to work through in the farm family and even when families agree, the options for farmland conservation are often limited by lack of private or public funds; however, conservation of your farmland is the most effective method of protecting it from development in the future.

This indicator, developed by Modeling Team research assistant Sophia Levin-Hatz, defines development pressure in terms of farm family and community-based values for farmland relative to other land use values.

USE BY PROJECT FARMERS
This indicator was not included in the survey of Prosperity Project farmers.

MONITORING METHODS
No recommended monitoring methods.

RANGE IN VALUE
No recommended ranges in value.

ADDITIONAL INFORMATION

Keeping the Farm in the Family: Farmland Protection Tools for North Carolina Farm Owners. NCSU http://www.cals.ncsu.edu/specialty_crops//pdf/fpOptions_brochure.pdf

Indicator Name: Presence of Earthworms

	Performance Levels	Farmer Evaluation
High Performance	10+ worms in shovelful of top foot of soil. Lots of casts and holes in tilled clods. Birds behind tillage.	
Medium Performance	2 – 10 worms in shovelful of top foot of soil. Few casts or holes.	
Low Performance	0-1 worms in shovelful of top foot of soil. No casts or holes.	

INDICATOR: PRESENCE OF EARTHWORMS

DESCRIPTION
Earthworms are an indicator of soil quality because they are sensitive to soil organic matter levels and are not present in degraded soils. The presence of earthworms as an indicator of soil health is in common use by many soil quality assessment tools in the U.S.

USE BY PROJECT FARMERS
8 out of 23 use always or often

MONITORING METHODS
Simple methods involve removing soil sample and counting the number of earthworms present.

RANGE IN VALUE:
NC State has published a soil quality guide for organic farmers that includes the following guidelines for assessing earthworm numbers:

Indicator	Poor	Medium	Good
Earthworms	0-1 worms in shovelful of top foot of soil. No casts or holes.	2-10 in shovelful. Few casts, holes, or worms.	10+ in top foot of soil. Lots of casts and holes in tilled clods. Birds behind tillage.

http://www.cefs.ncsu.edu/PDFs/Organic%20Production%20-%20Soil%20Quality.pdf

Although these values are for organic farms, the recommended ranges in earthworm numbers are consistent with soil quality recommendations for conventional farmers made by many U.S. organizations.

ADDITIONAL INFORMATION

Soil Quality Considerations for Organic Farmers by Keith Baldwin. 2006. Published by the North Carolina Cooperative Extension Service, Publication Number AG-659W-04. Available for free download at http://www.cefs.ncsu.edu/PDFs/Organic%20Production%20-%20Soil%20Quality.pdf
This publication provides a detailed discussion of soil quality considerations on organic farms in North Carolina and provides a simple on-farm soil quality assessment tool.

Soil Quality Website by the Natural Resources Conservation Service provides a wealth of information and resources for understanding, managing and assessing soil quality on farms. http://soils.usda.gov/sqi/

Georgia Soil Quality Scorecard was developed by farmers as a simple tool for assessment of soil quality. The scorecard can be downloaded for free from http://soils.usda.gov/sqi/assessment/files/GA_card.pdf

Indicator Name: Balanced Nutrient Budget

	Performance Levels	Farmer Evaluation
High Performance	Farm nutrient balance maintained with regular monitoring of soil nutrient content, nutrient inputs to farm and losses of nutrients through natural processes and sales of farm products.	
Medium Performance	Regular use of best management practices for nitrogen, phosphorus and potassium through regular soil testing as recommended by N.C. State Cooperative Extension Service.	
Low Performance	No use of best management practices. Crop nutrient needs based on expected nutrient uptake at maximum yield.	

INDICATOR: BALANCED NUTRIENT BUDGETS

DESCRIPTION

Monitoring the status of soil nutrient balance is a well accepted practice in sustainable farm management and maintaining the proper balance of nutrients is recommended by the North Carolina Cooperative Extension as a best management practice. Excess nutrients in the soil can contribute to the pollution of groundwater and surface waters running through your farm. Failure to replace the nutrients leaving the farm as farm products can negatively impact farm production and profitability. Typically nitrogen, phosphorus and potassium are the focus of nutrient budgets.

USE BY PROJECT FARMERS

15 out of 23 use always or often

MONITORING METHODS

Simple methods involve accounting for the nutrients leaving the farm in farm products and the N, P and K brought onto the farm as fertilizer amendments or by cover cropping. The North Carolina Department of Agriculture has extensive information and provides testing services to support nutrient management on NC farms.

RANGE IN VALUE: No Recommendation

NC Cooperative Extension recommends the use of Best Management Practices (BMPs) for this indicator but does not offer guidelines for on-farm evaluation. The nutrient management BMP's are designed to support optimum plant growth while minimizing adverse environmental effects from the use of nitrogen and phosphorus on farms.

ADDITIONAL INFORMATION

Soil Facts: NC Best Management Practices for Nutrients published by the North Carolina Cooperative Extension Service. Publication Number AG-439-20. This publication can be downloaded from the web at no charge from http://www.soil.ncsu.edu/publications/Soilfacts/AG-439-20/

Soil Facts: Nutrient Content of Fertilizer and Organic Materials published by the North Carolina Cooperative Extension Service. Publication Number AG-439-18. This publication can be downloaded from the web at no charge from http://www.soil.ncsu.edu/publications/Soilfacts/AG-439-18/

Indicator Name: Balanced Carbon Budget

	Performance Levels	Farmer Evaluation
High Performance	Topsoil clearly defined, darker than subsoil. Noticeable roots and residue. Dark brown or black color. Crumbly, mellow, loamy and easily worked. Soil organic matter content in top ½ inch greater than 2%.	
Medium Performance	Topsoil color closer to subsoil color. Some residue, few roots. Dark grey or light brown color. Some visible crumbly structure. Soil organic matter content in top ½ inch between 1 and 2%	
Low Performance	Topsoil color similar to subsoil color. No visible roots or residue. White, light gray or red color. Cloddy, hard, crusty, difficult to work. Soil organic matter content in top ½ inch is less than 1%.	

INDICATOR: BALANCED CARBON BUDGET

DESCRIPTION

Managing the carbon budget of your farm is typically done by monitoring soil organic matter content. It is soil organic matter that gives the dark color to topsoil. Nearly all of the carbon in soils is found in the organic matter, so monitoring soil organic matter is a good way to manage the carbon budget of your farm.

USE BY PROJECT FARMERS

15 out of 23 use always or often

MONITORING METHODS

Simple methods involve comparing topsoil characteristics to the underlying soil. Soil organic matter content is also a routine test conducted by many soil testing laboratories.

RANGE IN VALUE

NC State has published a soil quality guide for organic farmers that includes the following guidelines for assessing soil organic matter content:

Organic matter (OM) color	Topsoil color similar to subsoil color.	Surface color closer to subsoil color	Topsoil clearly defined, darker than subsoil
Roots/residue/(OM)	No visible residue or roots.	Some residue, few roots.	Noticeable roots and residue

http://www.cefs.ncsu.edu/PDFs/Organic%20Production%20-%20Soil%20Quality.pdf

The Georgia Soil Quality Scorecard provides these guidelines for assessing soil organic matter content on any farm:

5. Surface Soil Color	White, light gray, or red	Dark gray or light brown	Dark brown or black
6. Soil Tilth/Structure	Cloddy; hard; crusty; Difficult to work	Some visible crumbly structure	Crumbly; mellow or loamy and easily worked
12. Soil Organic Matter [2]	<1% in the top 1/2 inch soil	1-2% in the top 1/2 inch of soil	>2% in the top 1/2 inch

http://soils.usda.gov/sqi/assessment/files/GA_card.pdf

ADDITIONAL INFORMATION

Soil Quality Considerations for Organic Farmers by Keith Baldwin. 2006. Published by the North Carolina Cooperative Extension Service, Publication Number AG-659W-04. Available for free download at http://www.cefs.ncsu.edu/PDFs/Organic%20Production%20-%20Soil%20Quality.pdf
This publication provides a detailed discussion of soil quality considerations on organic farms in North Carolina and provides a simple on-farm soil quality assessment tool.

Georgia Soil Quality Scorecard was developed by farmers as a simple tool for assessment of soil quality. Available as free download from http://soils.usda.gov/sqi/assessment/files/GA_card.pdf

Sustainable Soil Management by Preston Sullivan. 2004. Published by NCAT, ATTRA publication # IP027/133. Available as free download from http://attra.ncat.org/attra-pub/PDF/soilmgmt.pdf
This publication covers basic soil properties and management steps (including soil testing and monitoring) toward building and maintaining healthy soils and concludes with a large resource section of other available information.

Soil Quality Website by the Natural Resources Conservation Service provides a wealth of information and resources for understanding, managing and assessing soil quality on farms. http://soils.usda.gov/sqi/

Indicator Name: Energy Efficiency

	Performance Levels	Farmer Evaluation
High Performance	No information available.	
Medium Performance	No information available.	
Low Performance	No information available.	

INDICATOR: ENERGY EFFICIENCY

DESCRIPTION
How much non-renewable energy does your farm use per acre of crop/livestock harvested?

USE BY PROJECT FARMERS
11 out of 23 farmers use always or often

MONITORING METHODS
Farm energy calculators are planning tools designed to help producers save electrical energy, fuel or fossil-fuel-based fertilizers. The National Sustainable Agriculture Information Service (ATTRA) has created a Farm Energy website with a variety of resources to help farmers manage the energy use on their farms. The ATTRA Farm Energy Publications can be found at http://attra.ncat.org/attra-pub/farm_energy/index.php.

RANGE IN VALUE
There is no technical advice for a range in energy use on farms. There is a new program being offered to North Carolina farmers by the North Carolina Farm Bureau – The Farm Energy Efficiency Project (FEEP). FEEP will serve to promote agricultural energy efficiency. The goals of the project include educating farmers about agricultural energy use and efficiency programs, providing low-cost energy assessments for farmers, and assisting in the implementation of on-farm energy efficiency and renewable energy projects. You can find out more about the Farm Energy Efficiency Project by going to http://www.ncfarmenergy.org/index.cfm.

ADDITIONAL INFORMATION

Conserving Fuel on the Farm ATTRA http://attra.ncat.org/attra-pub/PDF/consfuelfarm.pdf

Clean Energy Farming: Cutting Costs, Improving Efficiencies, Harvesting Renewables. SARE Bulletin. 2008. http://www.sare.org/publications/energy/energy.pdf

Indicator Name: Water Efficiency

	Performance Levels	Farmer Evaluation
High Performance	Use of best management practices including monitoring water use, promoting healthy water cycle, use of drip irrigation, waste water reuse, use of drought tolerant species, etc.	
Medium Performance	Some use of best management practices. Monitor water use.	
Low Performance	No use of best management practices.	

INDICATOR: WATER EFFICIENCY

DESCRIPTION

Improving water use efficiency means getting more benefit from each unit of water. Agricultural and horticultural water users can benefit from improved efficiency by reducing their costs of pumping and applying water and in some cases by reducing the need to treat wastewater. Using water efficiently also benefits the environment. By reducing water withdrawals, the stress on rivers, streams, and aquifers is reduced and the amount of wastewater that must be assimilated by our streams also may be reduced. Consequently, water quality and aquatic habitat are improved. In some cases, the environmental benefits of improved water use efficiency are very significant, particularly in cases where reduced withdrawals would reduce overdraft of aquifers or the undesirable dewatering of streams and rivers.

USE BY PROJECT FARMERS

15 out of 23 use always or often

MONITORING METHODS

There are no recommended monitoring methods. Keeping records of water use/unit production, or cost of irrigation/unit production allows comparison overtime of more efficient water use.

RANGE IN VALUE

No generally recommended ranges. Water use varies significantly by enterprise. Use best management practices and monitor over time to evaluate changes in management.

ADDITIONAL INFORMATION

Drought Advisory for Vegetable Production http://www.ces.ncsu.edu/disaster/drought/old/dro-13.html provides a good general discussion of best management practices for water use in vegetable production.

NC Small Farm Irrigation Links Many links to information about irrigation use in agriculture http://www.ces.ncsu.edu/chatham/ag/SustAg/irrigatelinks.html

Smart Water Use on Your Farm. 2006. SARE Bulletin. http://www.sare.org/publications/water/resource.htm

Water Quality, Conservation, Drought and Irrigation. ATTRA The publications and other resources in this area address water use, soil moisture management, water quality, and water conservation. http://attra.ncat.org/water_quality.html

The **NC Agriculture Cost Share Program** and the **USDA Environmental Quality Incentives Program (EQIP)** offer financial assistance for water conservation and for water saving technology. These programs offer over forty approved best management practices for producers that contribute to water use reduction and efficiency. Find out more about these programs at your County Cooperative Extension office.

Indicator Name: Biodiversity

	Performance Levels	Farmer Evaluation
High Performance	Planned diversity in crops and livestock, active management of field edges and non-cropped areas on farm such as wetlands, forests and riparian areas to maximize on-farm biodiversity. Use of farmscaping practices. Regular monitoring.	
Medium Performance	Planned diversity in crops and/or livestock, passive management of field edges and non-cropped areas. Some monitoring.	
Low Performance	Reliance on monoculture of crops and livestock, intensively managed production utilizes all farm acreage. No monitoring.	

INDICATOR: BIODIVERSITY

DESCRIPTION
Biodiversity in agriculture refers to all plant and animal life found in and around farms. Crops, weeds, livestock, pollinators, natural enemies, soil fauna and a wealth of other organisms, large and small, contribute to biodiversity. Diversity, in the soil, in field boundaries, in the crops you grow and how you manage them, can reduce pest problems, decrease the risks of market and weather fluctuations, and eliminate labor bottlenecks.

Biodiversity on the farm offers the farmer the benefit of numerous ecosystem services supporting profitable production. These well-recognized services include: nutrient cycling and storage, pest prevention, clean water, and many others. Farmers in this study were aware of the value of biodiversity to the health of their farm, and used the indicator in a general way by including planned biodiversity through the use of cover crops and crop rotation and the by maintaining field edges and non-cropped areas (wetlands, riparian areas, forests) on their farms.

USE BY PROJECT FARMERS
15 out of 23 use always or often

MONITORING METHODS
There are no recommended methods for monitoring farm biodiversity. Under the additional information section, there is a link to a biodiversity worksheet developed by Ben and Jerry's Icecream for use by their milk suppliers.

RANGE IN VALUE
There is no information regarding typical range in value for North Carolina farms.

ADDITIONAL INFORMATION

Biodiversity Assessment on Dairy Farms. ttp://www.benandjerrys.com/our_company/about_us/environment/sustainable_agriculture/02Biodiversity06.pdf

Manage Insects on your Farm: A Guide to Ecological Strategies SARE Bulletin. http://www.sare.org/publications/insect/index.htm#top

Farmscaping to Enhance Biological Control. ATTRA http://attra.ncat.org/attra-pub/PDF/farmscaping.pdf

Indicator Name: Pest Pressure

	Performance Levels	Farmer Evaluation
High Performance	No pests exceed the economic injury level on the farm. Consistent use of practices to encourage natural pest suppression on the farm. Active management of habitats for beneficial organisms. Regular monitoring of pests and beneficial organisms.	
Medium Performance	Few pests exceed the economic injury level on the farm. Those that do are managed with practices to encourage natural pest suppression on the farm. Chemical control is used only as a last resort. Regular monitoring of pests.	
Low Performance	Pests are managed by scheduled chemical application regardless of pest level. Chemical control is the pest management strategy of choice on the farm. No monitoring of pests.	

INDICATOR: PEST PRESSURE

DESCRIPTION
Pest pressure, or the number of pest organisms and the size of each pest's population observed on the farm, provides information about the ability of your farm to suppress pest organisms through natural ecosystem processes. An evaluation of pest pressure requires the use of the integrated pest management practice known as scouting and the ability to identify common crop and livestock pests.

USE BY PROJECT FARMERS
13 out of 23 use always or often

MONITORING METHODS
Crop and livestock specific scouting recommendations provided by the NC Cooperative Extension IPM program can be found at the North Carolina Integrated Pest Management website.

RANGE IN VALUE
There are no general whole farm pest pressure levels recommended by NC State Cooperative Extension.

ADDITIONAL INFORMATION

Biointensive Integrated Pest Management ATTRA http://attra.ncat.org/attra-pub/ipm.html

Farmscaping to Enhance Biological Control http://attra.ncat.org/attra-pub/PDF/farmscaping.pdf

Naturalize Your Farming System: A Whole Farm Approach to Managing Pests. SARE Bulletin. http://www.sare.org/publications/farmpest.htm

Pest Management Resources. ATTRA http://attra.ncat.org/pest.html
Pest management sometimes seems especially challenging for farmers dedicated to sustainable, low-input practices. If you're looking to meet the challenge, this series of publications can help. These resources offer a wide array of techniques and controls to effectively reduce or eliminate damage from insects, diseases and weeds without sacrificing the good of the soil, water, or beneficial organisms. Groups of publications available here address successful management practices for diseases, weeds, insects and other pest management challenges.

Appendix C: Decision Trees

High Value Crops
Farmland Protection

To date, these resources have not been completed.

Appendix D: Using Indicators in Farm Planning: A WNC Example

Clinton and Linda learned about the Sustainable Decision Tool at a Farm Prosperity Workshop. Both of them thought that it might help them think through the decisions facing their farm. Clinton agreed to take the lead on trying out the process. He wasn't interested in jumping into Whole Farm Planning just yet, so he moved straight to selecting indicators for the farm.

STEP ONE: Select Full Set of Farm Indicators

You can find Clinton's completed worksheet 1 on the following pages. As for most farmers, Clinton's full indicator set included a mix of suggested indicators and indicators that he uses that were not included on the lists. You will also see that Clinton made sure to include in the full set indicators from all three aspects of farm sustainability – family, community and environmental well-being. Before continuing on, Clinton had Linda review the full indicator set as a way to double-check that he had a complete record of the indicators they normally used on the farm.

STEP TWO: Rank Indicators and Select Final Set

After Linda's agreement that the full indicator set did a good job of describing the way they measured the performance of their farm, Clinton moved on to the second step of the process – he ranked the indicators using the easy rank method and the pairwise methods. Take a look at the Example Worksheet 2 to see how Clinton's indicators looked after ranking. It was clear from the ranking by both methods, that Clinton had 7 indicators that were most useful to the management decisions on the farm. After filling out the final set indicator list, Clinton spent some time thinking about these 7 indicators and came to the conclusion that they did a pretty good job of measuring the most important aspects of the farm. He was also pleased to see that there was at least one indicator from each aspect of sustainability included in the final set of indicators. After checking to make sure that Linda was satisfied with the final set, Clinton moved on to the next step.

STEP THREE: Personalize Indicator Performance to Your Farm

You can find the completed Indicator Report Cards for Clinton's 7 indicators on page __.
You can see that Clinton used the signal method to personalize performance to their farm and then noted the farm's current performance on each indicator. Clinton had Linda review the farm evaluation sheets and after some discussion and a few adjustments, Clinton was ready to create a sustainability profile for their farm.

STEP FOUR: Create Your Farm Sustainability Profile

You will find the farm sustainability profile for the Green's farm on page _____. It is clear from the profile that the Green's are doing pretty well, with farm performance rated moderate to high for all indicators. If the Green's didn't have to think about college for their children, they could just use this profile to monitor their farm performance over time. But Clinton and Linda have two concerns about the farm: 1) How can the farm support two children in college, and 2) How can they encourage at least one of their children to eventually take over the farm business?

WNC Example: Worksheet 1 – Selecting Indicators for Your Farm

Clinton completed the checksheets as show on the following pages. As is true of most farmers, Clinton found that he used more than 5 indicators in each category always or often.

Following the directions on the worksheet, Clinton worked to reduce the number of indicators in each category. He had listed 9 indicators in the Family category. Clinton first looked for strongly related indicators and found 3 instances among the indicators: family cooperation and satisfaction from farming, time for family activities and ability to take vacation, and education, ability to take vacation and total family income. Clinton decided to drop family cooperation and include family cooperation as part of his overall measure of satisfaction from farming. He dropped ability to take a vacation and planned to include ability to take a vacation partly in time for family activities and partly in family income, reasoning that vacations cost money and require that the family take time away from the farm together. Finally, Clinton dropped education and included the costs for education in total family income. As a result of identifying related indicators and dropping one of each pair, Clinton reduced the Family indicator set from 9 to 6 indicators. Looking through the indicators one more time, Clinton realized that complementary enterprises could also be included in satisfaction from farming, because in order to be satisfied, the farm enterprises had to fit fairly well with Linda's job and the kids school schedule. So Clinton dropped complementary enterprises and now had the maximum of 5 indicators for the Family indicator set.

Moving on to the Community Indicator set, Clinton first looked for related indicators and found 2 pair – coop. w/neighbors and community disruption by on-farm sales, and community on farm and customer respect. He decided to drop the disruption indicator in favor of coop. w/neighbors. Thinking about community on farm, Clinton realized that the only time the community was on his farm was during the U-Pick season, so he decided to drop the community on farm and use the customer respect indicator. Clinton now had the maximum of 5 indicators for the Community indicator set.

Finally, Clinton reviewed the Environment indicator set and noticed a strongly related pair of indicators right way – wildlife diversity and managed biodiversity. Clinton reasoned that if he observed low pest pressure and diverse wildlife on the farm, that was a pretty good indication that he was getting the managed biodiversity right. So Clinton decided to drop managed biodiversity and now had the maximum 5 indicators for the Environment indicator set.

Clinton was now ready to move on to Worksheet #2 and prioritize the 15 sustainability indicators that he had selected for his farm.

Full Indicator Set

Indicators you use always or often

Family	Community	Environment
1. total family income	1. local sales	1. nutrient budget
2. total farm income	2. coop. w/neighbors	2. carbon budget
3. ~~ability to take vacation~~	3. ~~community on farm~~	3. pest pressure
4. ~~complementary enterprises~~	4. development pressure	4. ~~managed biodiversity~~
5. ~~family cooperation~~	5. visual appeal	5. wildlife diversity
6. satisfaction from farming	6. ~~disruption by on-farm sales~~	6. soil erosion
7. farm succession	7. customer respect	7.
8. ~~education~~	8.	8.
9. time for family activities	9.	9.
10.	10.	10.

Indicators you might use in the future

Family	Community	Environment

A. Indicators of Farm Family Well-Being: ensuring YOU and YOUR family are happy, healthy, and financially secure.
How often do you consider these indicators when you make decisions on your farm – always, often, sometimes, rarely or never? If you never use an indicator, would you consider using it in the future? Complete this worksheet by checking the boxes to answer the question for each indicator listed below.

Indicator	always	often	sometimes	rarely	never	future
Total Family income *combined income from all sources*	✓					
Total Farm income *total income from all farm-based enterprises*	✓					
Time for Family Activities *time to participate in activities as a family*		✓				
Family Health *maintain good family health*			✓			
Satisfaction from farming *farm work brings family a feeling of satisfaction*		✓				
Farm Succession *ability for future operation by family members*		✓				
Family Education *ability to gain desired education of family members*		✓				
Community Activities *ability to participate in religious/community activities*			✓			
Balance of Family/Other Farm Labor *proportion of family members employed on the farm*					✓	
Balance of Family/Other Farm Residents *proportion of family members living on the farm*					✓	

Other Indicators *Are there any other ways that you keep track of your family's well-being that are not included above? How often do you use these indicators? Record this information in the space below.*

Ability to take a family vacation every year (always)
Level of family cooperation (often)
Complementary enterprises (always)

B: Indicators of Community Well-Being and Connection to Community: ensuring that your farm is part of a healthy community.

How often do you consider these indicators when you make decisions on your farm – always, often, sometimes, rarely or never? If you never use an indicator, would you consider using it in the future? Complete this worksheet by checking the boxes to answer the question for each indicator listed below.

Indicator	always	often	sometimes	rarely	never	future
***Local Sales** *proportion of your total farm income from local markets*	✓					
Farm Income Compared to Average Income *total farm income relative to average regional income*						✓
On-Farm Jobs *number of jobs filled by local residents*				✓		
***Local Purchases** *proportion of total farm purchases from local suppliers*			✓			
Cooperation w/Other Farmers *active member of a local farm org., farmer's coop. or other informal group of local farmers*			✓			
Cooperation w/Neighbors *good relationships with non-farming neighbors*		✓				
Community on Farm *community visit farm*		✓				
Development Pressure *ability to prevent conversion of farmland to other uses*		✓				
Local Identity *consider farm history and it's relationship to local region*				✓		
Visual Appeal *consider visual appeal of farm to community*		✓				
Smell Appeal *consider smell 'appeal' of farm to community*					✓	
Sound Appeal *consider sound 'appeal' of the farm to community*					✓	

***Local is defined as within 100 miles of your farm. Community is the population in close physical proximity to the farm as well as the community serving as the primary market for the farm.**

Other Indicators *Are there any other ways that you think about and keep track of the role your farm plays in your community's well-being that are not included above? How often do you use these indicators? Record this information in the space below.*

Immediate neighbors visit U-Pick (sometimes)
Disruption caused by on-farm sales (often)
Customer respect for farm by minimizing waste/eating while picking (often)

: Indicators of Environmental Well-Being: ensuring good quality water, soil, and air on the farm
How often do you consider these indicators when you make decisions on your farm – always, often, sometimes, rarely or never? If you never use an indicator, would you consider using it in the future? Complete this worksheet by checking the boxes to answer the question for each indicator listed below.

Indicator	always	often	sometimes	rarely	never	future
Presence of Earthworms *monitor earthworm populations on farm*				✓		
Balanced Nutrient Budgets *monitor nutrient status of N, P, K on farm*	✓					
Balanced Carbon Budget *monitor soil organic matter content*	✓					
Energy Efficiency *ratio non-renewable energy use per amount of crop/livestock harvested*			✓			
Water Efficiency *ratio water use per amount of crop/livestock harvested*			✓			
Managed Biodiversity *variety of different habitats/ecosystems on farm*		✓				
Pest Pressure *pest pressure on farm when no pesticides (organic or conventional) used?*	✓					

Other Indicators *Are there any other ways that you think about and keep track of the environmental well-being of your farm that we have not included here? How often do you use these indicators? Record this information in the space below.*

Forest Health (sometimes)
Wildlife diversity (often)
Soil erosion - Look for muddy water running from fields (often)

WNC Example

Worksheet 2: Ranking Indicators: Finding the Most Useful Indicators

In this step Clinton is working to reduce the number of indicators that he will use for his farm sustainability profile. For ease of decision-making, he is aiming for a maximum of 8 indicators. Clinton found it pretty easy to do the Easy Rank order exercise. The pairwise was a little more difficult, but he got through it. You can see the results of Clinton's work ranking the indicators in Table 1 on the next page.

Clinton thought the two groups of top ten indicators (shaded areas in both lists) looked pretty consistent. He was confident about the indicators that appeared in the top ten indicators of both groups and listed those 8 indicators in the Final Indicator Set table.

Clinton then reviewed the 8 indicators to be sure that each category of sustainability was represented. He was pleased to see that the 8 indicators were pretty balanced, although family well-being was a little over-represented, with 5 of the 8 indicators. Clinton was satisfied with the two environmental indicators in the top group and he thought that the addition of nutrient budget or soil erosion would not add that much additional information about environmental well-being on his farm. He was concerned that only one community well-being indicator made it to the top group and decided to add one more community well-being indicator. Of the two community well-being indicators that made it to a top ranked group, he chose local sales over customer respect, figuring that success with local sales would provide some information about the way that customers viewed his products. Clinton added local sales to his Final Indicator List and was ready to move on to the next step of the process: Personalizing the Indicators to his farm.

While doing the ranking exercise, Clinton got to thinking about development pressure and farm succession and he realized that these two concerns were strongly interconnected. He and Linda view the farm as the one really valuable legacy they have. They hope that one of their children will want to come back and take over the farm, but Clinton realized as he worked through the indicators that no matter who would have the farm in the future, he wanted it to remain a working farm. He shared this realization with Linda and they had a long talk about it. They agreed that they would take a serious look at preservation options for the farm and then talk to the boys about their desire to have their land remain a farm, even if no one from the family wanted to it take over. As Linda looked over the indicator list that Clinton had made, she noticed that education wasn't included. Since college for the boys was looming, she asked Clinton why education was missing. Clinton explained that he dropped education in favor of total family income – reasoning that they try to increase their income in order to help the boys pay for college. It occurred to Linda that they might be able to achieve two goals with one choice: Was it possible to preserve the farm and make the income needed to send the boys to college? She had heard about selling development rights, but wasn't sure what that meant. Clinton agreed it was worth checking into and Linda offered to learn more about their land preservation options.

Indicator Ranking Results

Easy Rank Order (1 to 15	Pairwise Rank Order (1 to 15)
total income	total income
farm income	farm income
family activities	development
satisfaction	satisfaction
carbon budget	farm succession
development	carbon budget
pest pressure	pest pressure
farm succession	nutrient budget
customer respect	family activities
local sales	soil erosion
soil erosion	customer respect
nutrient budget	wildlife diversity
wildlife diversity	local sales
coop/neighbors	coop/neighbors
visual appeal	visual appeal

Final Indicator Set (Top Ranked)
total family income
total farm income
time for family activities
satisfaction from farming
balanced carbon budget
development pressure
pest pressure w/o chemicals
farm succession plan
local sales

PAIR WISE COMPARISON

In this exercise, you will rank the indicators from most to least useful to you by comparing every possible pair of indicators. The pair wise comparison process is different from the easy rank process because every possible pair of indicators is compared. It sometimes results in a different indicator order than the easy ranking, because the pair wise process is a more objective way of making comparisons among indicators. As you consider each pair of indicators, choose the indicator this is the most useful to you when thinking about managing your farm. Sometimes the comparisons are very difficult to make, or the comparison seems like comparing apples to oranges, so just do your best. Again, don't spend too much time worrying over each comparison. Trust yourself to make the right choice fairly quickly.

To rank the indicators using the pair wise process, first fill in the column labeled Indicator Name in the table on the back of this page with the indicators that you listed in Worksheet 1 (indicators that you use always or often). As you fill in the column, note the letter by each indicator. To complete the pair wise process, you will fill in the table row by row, by comparing each indicator with each of the other indicators (denoted by their letter in the columns across the top of the table). For example, in the first row you will compare indicator A with indicator B, then C and so on, through the last indicator pair.

This pair wise process helps you compare each indicator with all the other indicators and choose which one of each pair is more useful to you. To keep track of which indicator is most useful in each pair, follow this rule: if the ROW indicator is MORE USEFUL than the column indicator enter a 1 in the BOTTOM HALF of the box under each column, however, if the COLUMN indicator is MORE USEFUL than the row indicator enter a 1 in the TOP HALF of the box under each column. You can skip any box marked with an X as those boxes are just a repeat of pairs that you have already tested. Once you have finished all the comparisons, add up the BOTTOM half of the boxes in each ROW and fill in the Row Total Column at the left side of the table. Add up the TOP half of each Column and fill in the Column Total Row at the bottom of the table.

Now you can rank the indicators using the sum of the row total and column total for each indicator. Add up the row and column total for each indicator and complete column labeled Indicator Rank. The indicator with the highest row + column total is most useful, so it gets a rank of 1. The indicator that has the next highest row + column total is second most useful, so gets a rank of 2 and so on. Now you can fill in the Pair wise comparison ranking in _____.

	Indicator Name	Indicator Total (row + column)	Indicator Rank	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Row Total
1	total income	14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14
2	farm income	13 + 0 = 13	2	X	1	1	1	1	1	1	1	1	1	1	1	1	1	13
3	satisfaction	10 + 0 = 10	4	X	X	1	1	1	1	1	1	1	1	1	1	1	1	10
4	farm succession	10 + 0 = 10	5	X	X	X	1	1	1	1	1	1	1	1	1	1	1	10
5	family activities	5 + 1 = 6	9	X	X	X	X	1	1	1	1	1	1	1	1	1	1	5
6	local sales	2 + 0 = 2	13	X	X	X	X	X	1	1	1	1	1	1	1	1	1	2
7	coop/neighbors	1 + 0 = 1	14	X	X	X	X	X	X	1	1	1	1	1	1	1	1	1
8	development	7 + 4 = 11	3	X	X	X	X	X	X	X	1	1	1	1	1	1	1	7
9	visual appeal	0 + 0 = 0	15	X	X	X	X	X	X	X	X	1	1	1	1	1	1	0
10	customer respect	1 + 4 = 5	11	X	X	X	X	X	X	X	X	X	1	1	1	1	1	1
11	nutrient budget	2 + 5 = 7	8	X	X	X	X	X	X	X	X	X	X	1	1	1	1	2
12	carbon budget	3 + 6 = 9	6	X	X	X	X	X	X	X	X	X	X	X	1	1	1	3
13	pest pressure	2 + 6 = 8	7	X	X	X	X	X	X	X	X	X	X	X	X	1	1	2
14	wildlife diversity	1 + 2 = 3	12	X	X	X	X	X	X	X	X	X	X	X	X	X	1	1
15	soil erosion	1 + 5 = 6	10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Column Total			0	0	0	1	0	0	4	0	4	5	6	6	2	5	

WNC Example: Indicator Report Cards

With this step, Clinton worked to personalize the indicators in his final indicator set to his style of farm management and his farm. The signal scale made the most sense to Clinton, so he followed the directions and completed signal scales for each of his 9 indicators and then rated the current performance of his farm on each indicator. He was surprised at how easy it was to make the signal scales for each indicator and to rate his farm's performance.

Working on the Indicator Report Cards raised several questions about his soil and pest management practices. Clinton talked with his farm management advisor about what it would take to do more to encourage beneficial insects on his farm and what low cost options were available to start building soil organic matter in his intensively managed vegetable crops.

Working with the income indicators helped Clinton think through just what kind of income increase would be needed to help the boys with college. With a specific income goal in mind, Clinton could start exploring alternative enterprises that could be expected to increase farm income.

Clinton was pleased to see that the farm was doing pretty well in terms of supporting a good quality of life for himself and his family. He knew things were going pretty well before completing the farm performance sheets, but thinking specifically about aspects of his family's well-being other than total income, such as spending time together and the level of satisfaction with farming clarified for Clinton some of the benefits other than income that his farming offers his family. Having specific aspects of well-being identified and defined by the indicators also made it easy to think about the tradeoffs involved in making changes to the farm. Clinton wondered if changing to a new, more profitable enterprise or adding an additional enterprise to increase farm income would reduce time with his family. And how would a new enterprise change his satisfaction with farming?

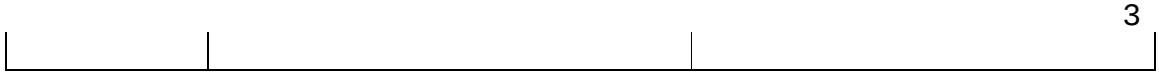
After completing all the Indicator Report Cards, Clinton summarized his farm's current performance in the Table 1 below, and moved on to the last step of the process – creating his farm sustainability profile. You can find Clinton's completed Indicator Report Cards on the following pages.

Indicator	Current Performance Level
total family income	OK
time for family activities	BETTER
satisfaction from farming	OK
balanced carbon budget	BAD
development pressure	WORST
pest pressure w/o chemicals	BETTER
farm succession plan	WORST
local sales	OK

Indicator Name: Total Family Income

	Performance Levels	Farmer Evaluation
High Performance	**Farm Sustains Family and Future Generations** Total farm revenue covers all opportunity costs, direct costs, and retains earnings. Off farm income is not needed to support family.	BEST
	Farm Supports Family Total farm revenue covers all opportunity costs and direct costs. Off farm income is not needed to support family, but earnings are not retained.	BETTER
	Farm Contributes Total farm revenue covers direct costs and contributes to opportunity costs. Family income from off-farm sources used to subsidize some opportunity costs of farm.	OK **X Current Performance**
Medium Performance	**Farm is Self-Supporting** Total farm revenue covers direct costs but does not contribute to opportunity costs. Family income from off-farm sources used to subsidize opportunity costs of farm.	BAD WORST
Low Performance	**Farm is not Self-Supporting** Total farm revenue covers variable costs and contributes to fixed costs. Family income from off-farm sources used to subsidize some fixed costs of farm.	
	Farm Losses Total revenue covers variable costs but can't contribute to fixed costs. Family income from off-farm sources used to subsidize fixed costs of farm.	
	Farm Debt Total farm revenue is less than total variable costs. Family income from off-farm sources used to subsidize variable and fixed costs of farm.	

The Green family depends on the farm income to help them meet living expenses and contribute to family savings. Linda's job provides the family health benefits and some additional income, but the farm enterprise must be profitable in most years. They are comfortable now, but Clinton and Linda realize that in the next few years, they must find some way to bring in more income to help cover college expenses for the boys. They discussed some possible options for increasing family income such as increasing Linda's off-farm income, increasing farm profitability or some combination of both.



Indicator Name: Time for Family Activities

	Performance Levels	Farmer Evaluation
High Performance	Abundant time available for enjoyable activities with full family participation and family subgroups. Participate in activities as a family regularly on a daily and weekly basis. Participate regularly as a family in special events and social occasions such as holiday celebrations and family vacations.	BEST BETTER **X Current Performance**
Medium Performance	Some time available for enjoyable activities with full family participation and family subgroups. Participation in activities as a family regularly on a weekly basis. Participate regularly as a family in special events and social occasions such as holiday celebrations and vacations.	OK BAD WORST
Low Performance	Little time available for enjoyable activities with full family participation and family subgroups. Some participation in activities as a family on a regular basis. Some participation as a family in special events and social occasions such as holiday celebrations and vacations.	

The Green family puts a high value on time together as a family, and Clinton was not surprised about how well the farm performed on this indicator. Looking at the range in value of this indicator, Clinton realized that he would be comfortable with a little less time spent together as a family in return for a significant increase in farm income over the next few years. Talking in terms of indicators, Clinton was able to clearly describe to Linda the trade-off that he was willing to make between family time and increased income to put towards the boys college expenses.

Indicator Name: Farm Succession Plan

	Performance Levels	Farmer Evaluation
High Performance	Written plan for farm succession has full support of all family members and is legally protected to the fullest possible extent.	BEST BETTER
Medium Performance	Farm succession plans have been discussed and are generally supported by family members. Some legal protections to assure farm succession plan are in place or under discussion.	OK BAD
Low Performance	Farm succession has not been discussed or has been considered and dismissed by family. Little or no interest in planning for farm succession by family members.	**X Current Performance** WORST

Clinton rated farm performance at worst for this indicator because he and Linda had just never taken the time to talk about a farm succession plan. Working on this indicator made it obvious to Clinton that he and Linda needed to start some serious work on a farm succession plan. Although it make sense when he thought about it, Clinton had no idea that it often took a minimum of 5 years and sometimes as much 15 years to complete a plan.

Indicator Name: Satisfaction from Farming

	Performance Levels	Farmer Evaluation
High Performance	Consistent feelings of satisfaction from all aspects of farm work – planning, production, processing, and marketing. Customers express appreciation, are loyal and refer new customers. Farm and farm family have high resilience to bad weather/markets or other factors that threaten to reduce farm profitability	BEST BETTER **X Current Performance**
Medium Performance	Consistent feelings of satisfaction from many aspects of farm work – planning, production, processing, and marketing. Some customers express appreciation, are loyal and refer new customers. Farm and farm family have some resilience to bad weather/markets or other factors that threaten to reduce farm profitability.	OK BAD
Low Performance	Consistent dissatisfaction with most aspects of farm work planning, production, processing, and marketing. Few customers express appreciation, are loyal and refer new customers. Farm and farm family lack resilience to bad weather/markets or other factors that threaten to reduce farm profitability.	WORST

The Green family really enjoy the farming life and put a lot of effort into making it work well for everyone. Even after 15 years of farming, Clinton was still mostly happy to wake up to another day full of the joys and challenges of owning and operating the farm. Working on this indicator helped Clinton understand that feeling satisfied with the farm was pretty important to his family's happiness. Clinton decided he was going to do his best to find a way to increase the family income without reducing his family's satisfaction from farming. This was not an indicator he was willing to do much trading on.

Indicator Name: Development Pressure

	Performance Levels	Farmer Evaluation
High Performance	Entire farm is permanently protected by conservation easements, market value reflects agricultural use, the value of development is zero. Community values farmland over nonagricultural land uses, prefers preservation to development.	BEST BETTER
Medium Performance	Farm is protected partially or temporarily by mechanisms such as a voluntary agricultural district (VAD), conservation development, intergenerational assistance programs and limited term restrictions. There is interest in permanent farmland protection among farm owners. Community values farmland over nonagricultural land uses.	OK BAD
Low Performance	Farm is not protected from development and there is no interest in or conflict over farmland protection among farm owners. Development potential exceeds the value of the farm enterprise. Community prefers non-agricultural land use over farmland.	**X Current Performance** WORST

The low farm performance on this indicator was no surprise. Although protecting the farm from development was something that mattered to both Clinton and Linda, they just never seemed to find the time to learn more about how they might protect their land. Looking over the performance levels, Clinton was pleased to see that at least he and Linda had the advantage of living in a community that values farmland and is willing to protect it and that they both agreed that some kind of protection for the farm would be a good thing.

Indicator Name: Local Sales

	Performance Levels	Farmer Evaluation
High Performance	Optimum quantity of product sold through local markets to consumers and to other locally owned businesses.	BEST
		BETTER
Medium Performance	Product sold through a mix of local, direct markets and other markets. Mix of local to non-local marketing options not fully optimized.	**X Current Performance**
		OK
		BAD
Low Performance	All products sold through wholesale/commodity markets to distributors based outside of the local community. Local marketing has not been considered.	WORST

Clinton understood the value of local marketing and paid attention to opportunities to sell to local markets in his region, but he was too busy with farm work to take the time to promote his products locally. He was satisfied with his current mix of markets. Working on this indicator did get him thinking about the potential to increase farm income with an increase in direct local sales or perhaps a shift to some value-added products. He wondered how much of an increase in income might be possible and how much extra time he would spend developing the new markets and/or products.

Indicator Name: Balanced Carbon Budget

	Performance Levels	Farmer Evaluation
High Performance	Topsoil clearly defined, darker than subsoil. Noticeable roots and residue. Dark brown or black color. Crumbly, mellow, loamy and easily worked. Soil organic matter content in top ½ inch greater than 2%.	BEST BETTER OK
Medium Performance	Topsoil color closer to subsoil color. Some residue, few roots. Dark grey or light brown color. Some visible crumbly structure. Soil organic matter content in top ½ inch between 1 and 2%	BAD **X Current Performance**
Low Performance	Topsoil color similar to subsoil color. No visible roots or residue. White, light gray or red color. Cloddy, hard, crusty, difficult to work. Soil organic matter content in top ½ inch is less than 1%.	WORST

Clinton paid attention to soil quality on his farm, but after working with this indicator, he realized he could do a lot better. He had never tested the organic carbon content of his soils, so he was surprised to learn they tested right at 1%. After reading about the many benefits of keeping soil organic carbon in the 2 to 4% range, Clinton decided to learn more about the steps he could take to start doing a better job managing the carbon budget on his farm to start building soil carbon levels.

Indicator Name: Pest Pressure

	Performance Levels	Farmer Evaluation
High Performance	No pests exceed the economic injury level on the farm. Consistent use of practices to encourage natural pest suppression on the farm. Active management of habitats for beneficial organisms. Regular monitoring of pests and beneficial organisms.	BEST
Medium Performance	Few pests exceed the economic injury level on the farm. Those that do are managed with practices to encourage natural pest suppression on the farm. Chemical control is used only as a last resort. Regular monitoring of pests.	BETTER **X Current Performance** OK
Low Performance	Pests are managed by scheduled chemical application regardless of pest level. Chemical control is the pest management strategy of choice on the farm. No monitoring of pests.	BAD WORST

Clinton was a little surprised by the range of performance levels for pest pressure on the farm. He was a believer in IPM and practiced regular pest monitoring, but he had never considered monitoring beneficials or creating habitat to promote beneficial organisms on his farm. He was satisfied with current farm performance as best for his farm, but did make a note to try and learn more about new pest management methods like promoting beneficials to see if they might work on his farm.

WNC Example: Farm Sustainability Profile Worksheet

Clinton completed the final step of the process by plotting the current performance of the farm for the nine indicators in his final indicator set. For ease of interpretation, he grouped the indicators around the graph according to the three categories of sustainability: Family Well-Being, Community Well-Being and Environmental Well-Being. Each spoke of the wheel is one indicator and the performance level of the indicator ranges from BAD at the center of the wheel to BEST at the outside edge.

As Clinton and Linda discussed the sustainability profile of their farm, they were not surprised to see the poor performance on the development pressure and farm succession plan. After all, one of the main reasons they decided to take a careful look at their farm and their options was their concern about farm succession. Their other major concern was how to pay for their sons' college education. That shows up in the indicators in Clinton's rating of just OK for their total income.

The one surprising result was the farm's poor performance on the carbon budget indicator. Clinton has always paid attention to soil management on his farm, but he had never tried to evaluate how well his practices were working. Now that he had an indicator to work with, he was interested in learning more about why his soil quality was low and what options he had to improve it. The balanced carbon budget indicator sheet gave Clinton some resources to help him learn more about managing for high quality soils.

At this point, Clinton and Linda had some choices to make. They could simply use the sustainability profile to **monitor farm performance** from year to year. This would be their most likely choice with indicators that the farm performance is satisfactory.

Where farm performance is unsatisfactory or family needs require a different level of performance, Clinton and Linda can use the **indicators to monitor progress toward short and long term goals** for their farm. For example, Clinton could use the carbon budget indicator to monitor the effect of new soil management practices on soil quality.

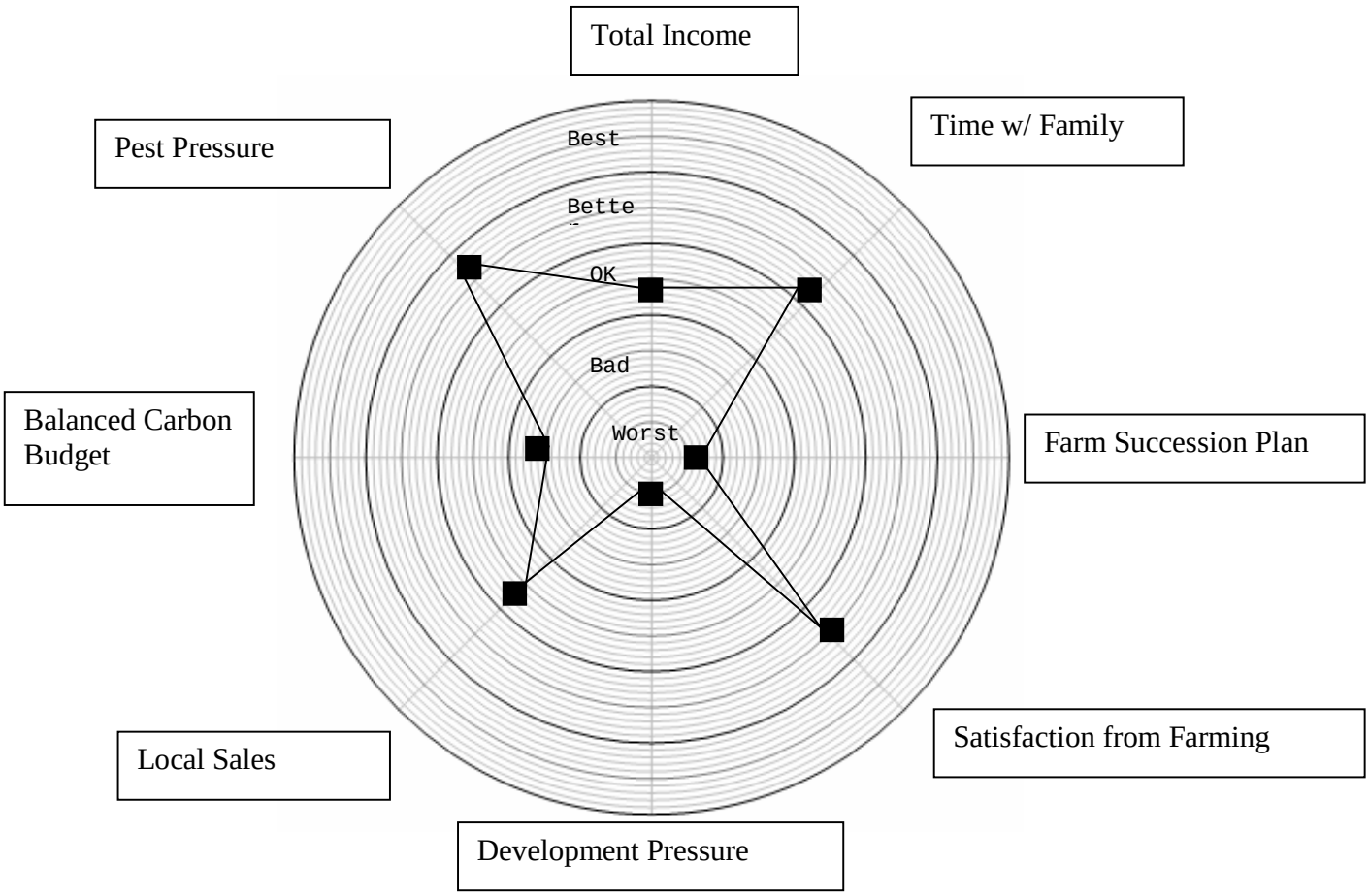
The Greens could set a short term goal of having a plan for farm succession that includes land protection and monitor their progress toward those goals with the appropriate indicators. Finally, they could set short and mid-term goals to increase family savings in a college fund for the boys and use the family income indicator to monitor progress toward that goal.

The Greens could also use the farm sustainability profile as **an aid in making decisions about "best fit" options** for increasing savings and protecting the farm from development. Using the sustainability profile in this way involves comparing alternative scenarios with existing farm conditions to determine how the alternatives change farm performance on each indicator.

The Greens decided that they would like to try using the sustainability profile as a decision aid. Clinton agreed to work on considering ways to increase savings by increasing farm income. Linda took the lead on developing a farm succession plan.

Clinton used the Alternative Enterprise Decision Tree to get started thinking about alternatives to existing farm enterprises. Linda worked through the Farm Protection Decision Tree to learn more about land protection.

Sustainability Profile For ___Current Farm _____



WNC Example: Using the Farm Sustainability Profile

Clinton and Linda discussed the sustainability profile of their farm. The profile clearly showed their dissatisfaction with farm succession plans and their concern about the development pressure on their land. They also knew they needed to increase family savings in order to put more money into a college fund for the boys.

Clinton used the Alternative Enterprise Decision Tree to explore the potential to increase farm income with a more profitable product mix. Linda used the Land Protection Tree to get started on a farm succession plan. Both Clinton and Linda worked through the decision trees with the help of local advisors.

Decision Trees: Finding Your Best Options

The Modelling team envisioned this section presenting an example of Clinton working through the High Value Crops Decision Tree and Linda working through the Farmland Preservation Decision Tree to find "best fit" options for their farm that combined land preservation and more profitable enterprises. We continue with the WNC example with the assumption that using standard resource assessment tools like the documents cited below and information about farmland preservation options provided by the Prosperity Project and local land conservation non-profits, Clinton and Linda were able to develop four options that met their need for additional income and desire to preserve their land as a working farm.

Resource Assessment Guides

Whole Farm Resource Inventory, Plan and Manage the Whole Farm, NC Cooperative Extension Service.
http://transylvania.ces.ncsu.edu/content/wholefarminventory&source=transylvania

Evaluating A Rural Enterprise. 2002. P.Sullivan and L. Greer
http://attra.ncat.org/attra-pub/PDF/evalrural.pdf

A Primer for Selecting New Enterprises for Your Farm. 2000. T. Woods and S. Isaacs. Agricultural Economics Extension No. 00-13 University of KY.
http://www.uky.edu/Ag/AgEcon/pubs/ext_aec/ext2000-13.pdf

Farmland Protection Options

Keeping the Farm in the Family: Farmland Protection Tools for North Carolina Landowners. n.d. A Publication of the Farm Prosperity project.
http://www.cals.ncsu.edu/specialty_crops/pdf/fpOptions_brochure.pdf

Farmland Protection. American Farmland Trust Website.
http://www.farmland.org/programs/protection/default.asp

Landowner Resources. Carolina Mountain Land Conservancy.
http://carolinamountain.org/?do=resources

Evaluating Options: Developing Alternative Sustainability Profiles

Alternative Enterprise Options

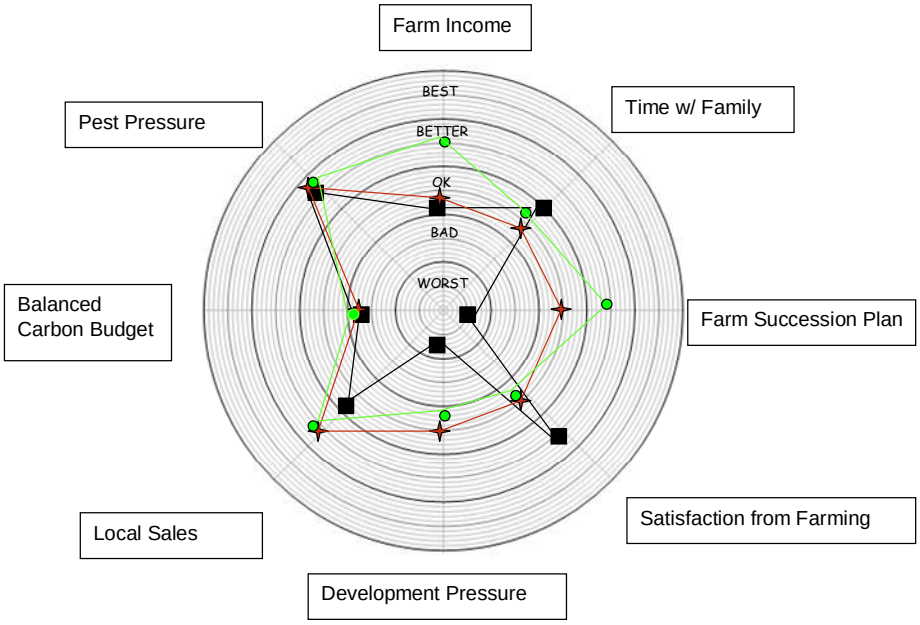
Working with their local farm advisor, Clinton and Linda were able to make a pretty good estimate of farm performance under the two alternative enterprises and two different land preservation options that seemed to fit their situation the best. The farm performance scorecards with the performance values for the new options plotted along side the current performance can be found at the end of this section. The new performance values for the different combinations of options are listed in Table 1 below, along with current farm performance values.

Indicator	Current Performance	Option 1	Option 2	Option 3	Option 4
total family income	OK	OK	BETTER	BETTER	BETTER
time for family activities	GOOD	OK	OK	OK	OK
farm succession plan	WORST	OK	BETTER	OK	BETTER
satisfaction from farming	BETTER	OK	OK	OK	OK
development pressure	WORST	OK	OK	BEST	BEST
local sales	OK	BETTER	BETTER	OK	OK
balanced carbon budget	BAD	BAD	BAD	BAD	BAD
pest pressure w/o chemicals	BETTER	BETTER	BETTER	BETTER	BETTER

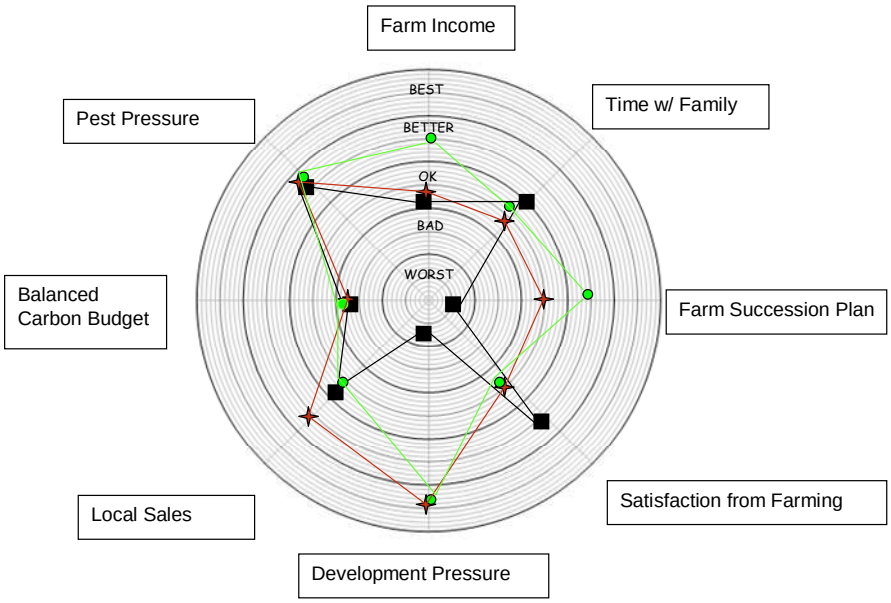
Option 1: Enterprise 1 + Land 1
Option 2: Enterprise 1 + Land 2
Option 3: Enterprise 2 + Land 1
Option 4: Enterprise 2 + Land 2

It is easier to compare the differences between the four options when the farm performance values for each option are plotted against current farm performance in a sustainability profile web graph as shown on the following pages.

WNC Example: Options 1 and 2



WNC Example: Options 3 and 4



Finding the Best Fit with Sustainability Profiles

The Even Swap: Making Tradeoffs Among Options

Now that Clinton and Linda have identified their indicators and options they are ready to evaluate the options to determine which one is the best fit for their farm. The goal of this step is to clarify the differences in farm performance among the four options by focusing on differences between indicators among the options. When farm performance on an indicator is the same under all options, the indicator can be dropped from consideration - reducing the number of indicators to consider and so simplifying the choice process . To complete this step of decision tool, Clinton and Linda followed the steps set out Worksheets 5 and 6.

Step 1: The first step is to determine if Clinton and Linda have any *critical indicators* and to be sure these indicators are at an acceptable value for all options under consideration. Clinton and Linda identified both family income and family activities as their critical indicators. The critical value they require is a level of OK for each. All four options provide at least this level or higher for these indicators and therefore all options remain in the option set for consideration.

Step 2: Simplify the impact table by removing any *irrelevant* indicators – those that have the same value for all options. Four indicators are irrelevant to the decision and include: Time for family activities, satisfaction from farming, balanced carbon budget, and pest pressure. Although these indicators are removed for the decision regarding the options discussed, there remains important information for Clint and Linda, that is that the carbon budget indicator has a level of BAD for all options. Also, both Satisfaction from Farming and the Time for Family indicators are declining with the new options. Clint and Linda have both already decided that in order to achieve their current goals of addressing their concern for family income, succession plans and development pressure, they will need to accept lower levels of farm performance on these indicators.

Step 3: Next we want to identify and delete any *non- dominant* options. These are the options that have lower values on one or more criteria and have the same values for all other criteria than all the other options. When we consider the four options we find that none are non-dominant compared to the others, although option 1 may be partially non-dominant since it is only at the OK level for three of the four remaining indicators. Clint and Linda could remove this option if they considered the local sales level of better insufficient to make up for the low level on all other indicators. For illustrative purposes we will continue to include this option in our example.
We now consider the simplified impact table below.

Indicator	Option 1	Option 2	Option 3	Option 4
total family income	OK	BETTER	BETTER	BETTER
farm succession plan	OK	BETTER	OK	BETTER
development pressure	OK	OK	BEST	BEST

local sales	BETTER	BETTER	OK	OK

Note that the options are equal to or better than the current performance for each indicator remaining. The only indicator that has a lower value than the current performance was satisfaction from farming. In this case Clinton and Linda agreed that they were willing to accept the lower value for this indicator in order to get the higher values in the others, thus this one is also left out of the table. We are now ready to consider which option is the best fit for Clinton and Linda.

Step 4: Clinton and Linda have decided to use the **'Even Swap'** method first for their evaluation.

- Recall for the 'Even Swap' approach we are looking for ways to compare different indicators values in order to find equivalencies between them. This allows us to cancel out equivalent values and narrow the decision to one or two remaining indicators. We do this by finding the swap or trade we are willing to make that gives equivalent indicator values across options for that indicator. This allows us to cancel out the indicator (because performance on that indicator is the same for all options) and thereby simplifying the decision.
- Scanning the indicator values we see that the Total Family Income indicator is the same for three of the four options, so we start with this indicator.
    - Although option 1 gives only an OK value for the Total family income indicators, it does give a BETTER value for the local sales indicator. The question is, is this enough 'compensation' for the lower value in family income? To find out, Clinton and Linda must think through the trade off: Are they willing to give up some of the local sales value if they could get family income up to BETTER? Clint and Linda decide that they would be willing to give up local sales to a level of OK, if they were to increase family income up to BETTER.
    - Why did we use the local sales indicator to make the swap? Because Clinton and Linda decided that they are not willing to reduce either farm succession or development pressure lower than OK, therefore they are left with local sales as the only trade off option.
    - The table is adjusted below and Clinton and Linda can remove the family income indicator as it is the same across all options.
    - Scanning the remaining indicators and options for dominance, we find that option 1 is non-dominant. So we continue with the 3 options (2-4) and the three remaining indicators.

Indicator	Option 1	Option 2	Option 3	Option 4
total family income	OK ↑BETTER	BETTER	BETTER	BETTER
farm succession plan	OK	BETTER	OK	BETTER
development pressure	OK	OK	BEST	BEST

local sales	~~BE~~TTER (↓ OK)	BETTER	OK	OK

- Scanning the remaining indicators Clinton and Linda noticed that they could make a swap in option 2 by decreasing Local sales to OK. This allows them to cancel out Local Sales, but they wanted to trade off the loss in performance on Local Sales with a gain in performance on another indicator. Linda and Clinton agree that to accept a decrease in local sales they would want to see the development pressure indicator increase to BEST. The table is adjusted as shown below.

Indicator	Option 1	Option 2	Option 3	Option 4
~~**total family income**~~	~~OK~~	~~BETTER~~	~~BETTER~~	~~BETTER~~
farm succession plan	OK	BETTER	OK	BETTER
development pressure	OK	~~OK~~ (↑ BEST)	BEST	BEST
~~**local sales**~~	~~BETTER~~ (↓ OK)	~~BETTER~~ (↓ OK)	~~OK~~	~~OK~~

Now Clinton and Linda are left with the 3 options and 2 indicators. Again it is time to scan for dominance of any options. We find that Options 2 and 4 dominate option 3. Thus the lower performing options can now be deleted from the option set.

Indicator	Option 2	Option 4
farm succession plan	BETTER	BETTER
development pressure	~~OK~~ (↑ BEST)	BEST

When we return to our original indicator values for options 2 and 4 we see that option 4 is the dominant option and is the best fit for Clinton and Linda's farm.

Indicator	Option 2	Option 4
farm succession plan	BETTER	BETTER
development pressure	OK	BEST

With practice, the Even Swap approach becomes increasingly easy to use.

Adding Confidence to the Decision: Comparing Choice Procedures

Suppose Clinton and Linda wanted to use two different approaches to choosing the option that best fits their farm in order to ensure they have made the best choice. The even swap approach is straightforward and easy to use, but does not take into account directly the relative importance of each indicator or provide any estimate of the uncertainty of expected farm performance on each indicator. The even swap approach includes this information only implicitly through the trade-offs that Clinton and Linda decided they were willing to make.

Clinton and Linda decided to check their choice of Option 4 as the best fit for their farm by comparing the four options using a second method – the Distance Metric. This method offers the advantage of using explicit estimates of uncertainty and relative importance of each indicator to Clinton and Linda to help them compare the options.

The Distance Metric: Measuring Differences Among Options

To compare options using the Distance Metric approach, Clinton and Linda reviewed the results on steps 1 through 3 from their work comparing options with Even Swap. The Distance Metric procedure uses the simplified table created in the first three steps of the Even Swap method to compare the distance of each option from the farm performance desired by Clinton and Linda.

To begin the Distance Metric process, Clinton and Linda first had to decide the relative importance of each indicator to their decision making – in other words, they answered the question: How much weight do we want to give each indicator in our decision?

Recall the distance metric approach measures the distance of the expected performance value for each indicator for each option from that indicators maximum possible value desired. This measure is summed for each option to give it's total distance from the maximum desired value. The option closet to the desired, with the lowest distance measure, is the option recommended.

Step 4: Determine Relative Value of Indicators

Recall from above that the distance metric approach requires the decision-maker (DM) to determine the priority weights for each of their indicators. Using the simplified table reproduced below only 4 indicators remain, so the DM needs only to establish their priority weights for these indicators.

Indicator	Option 1	Option 2	Option 3	Option 4
total family income	OK	BETTER	BETTER	BETTER
farm succession plan	OK	BETTER	OK	BETTER
development pressure	OK	OK	BEST	BEST
local sales	BETTER	BETTER	OK	OK

Clinton and Linda use a dot system to figure out their weights for these indicators. Allocating 20 dots across these four indicators according to how important each one was to their choice of options, they created the weight table below.

	# of Dots out of twenty	Indicator j's weight, Wj # dots/20
Total Family income	**8**	**8**/20=0.4
Farm succession plan	5	0.25
development pressure	4	0.2
local sales	3	0.15

Step 5: Convert Farm Performance Values to Numerical Values

Next Clinton and Linda had to convert the indicator values of WORST through BEST to numerical values. They used the conversion below as directed and then created the new Distance Metric Options Table as shown below.

best	4
better	3
ok	2
bad	1
worst	0

	Option 1	Option 2	Option 3	Option 4	***Ideal Value***
Total Family income	2	3	3	3	***4***
Farm succession plan	2	3	2	3	***4***
Development pressure	2	2	4	4	***4***
Local sales	3	3	2	2	***4***

Note the ideal value for each indicator is given in the last column and is specified as the maximum satisfaction value for each indicator. It is important to understand that this does not imply that this is the highest performance value for the indicator. Remember that Clinton and Linda determined the "best' satisfaction level. BEST can (and often is) achieved at a performance level less that the highest possible.

Step 6: Calculating Option Distance

Using the Distance Metric Options Table, Clinton and Linda calculated the distance of each option from the ideal by subtracting the value of each indicator from the ideal value and placing the result in the Distance From Ideal Table as shown below.

	V1t-V1j	V2t-V2j	V3t-V3j	V4t-V4j
Total Family income	2	1	1	1
Farm succession plan	2	1	2	1
Development pressure	2	2	0	0
Local sales	1	1	2	2

Step 7: Calculating the Distance Metric

Using the weights for each indicator (See Table X above) and the formula given below, Clinton and Linda calculated the distance metric. Note we have assumed in this example that the outcomes for each option are expected to occur with probability of 1, e.g. the outcomes are certain, thus p=1.

The distance metric formula is:

$$D_{it} = [\sum_j W_j^p (V_{tj} - V_{ij})^p]^{1/p}$$

Where:

D_{it} = the distance value of the ith option to the ideal option t.
W_j = the weight for indicator j and is raised to the pth power that represents the level of risk involved with receiving the outcomes from the ith option.
V_{ij} = the standardized value for the jth indicator for the ith option.
V_{tj} = the standardized value for the jth indicator for the ideal option t

If p=1, then the formula simplifies to:

$$D_{it} = \sum_j W_j (V_{tj} - V_{ij})$$

Using this formula we get the following weighted distance values for each of Clinton and Linda's options:

	Wj	Wj(V1t-V1j)	Wj(V2t-V2j)	Wj(V3t-V3j)	Wj(V4t-V4j)
Total Family income	0.4	0.8	0.4	0.4	0.4
Farm succession plan	0.25	0.5	0.25	0.5	0.25
Development pressure	0.2	0.4	0.4	0	0
Local sales	0.15	0.15	0.15	0.3	0.3
Weighted distance		**1.85**	**1.2**	**1.2**	**0.95**

The Distance metric approach gives Option 4 as the best option for Clinton and Linda's farm. This is the same result from the even swap method above. If the outcomes from each option are not expected to occur with the same certainty, then Clinton and Linda

need to determine the level of certainty in expected farm performance for each option with the help of a technical advisor.

The uncertainty, or risk associated with each option is an important consideration when using the Distance Metric approach. For example, suppose for option 3, Clinton and Linda determine that the expected farm performance is likely to occur with the probability of .65 – in other words, the expected outcome has a little better than a 50% chance of actually happening. How does this impact the distance metric for this option? The table below illustrates this result and shows that as uncertainty increases, so does the estimated distance from the desired performance level. For option 3 the distance increases from 1.2 to 2.15. If option 4 is expected with less certainty and options 1 or 2 with more, the final choice can change. Thus if Clint and Linda do have only limited knowledge of outcomes and some expected level of certainty of the outcomes, then the distance metric can integrate that knowledge into the choice more explicitly and allows some test of the sensitivity of their choice to their perception of risk.

	Wj	V3j-V3t	Wj^.65	(V3j-V3t)^.65	Wj^.65(Vij – Vtj)^.65	(∑(Wj^.65(Vij – Vtj)^.65))^1/.65
Total Family income	0.4	1	0.55	1.00	0.55	
Farm sucession plan	0.25	2	0.41	1.57	0.64	
Development pressure	0.2	0	0.35	0.00	0.00	
Local sales	0.15	2	0.29	1.57	0.46	
Weighted distance					1.65	2.15

Summary of Choice Analysis

Clinton and Linda talked over the results of their analysis of the best fit options and felt pretty confident that Option 4 was the best choice for their farm and their family. With the help of their technical advisor, they developed a plan to make Option 4 a reality. They also planned to monitor farm performance over the next few years in order to adjust their plan as needed to realize the expected benefits of Option 4.

Indicator Name: Total Family Income

	Performance Levels	Farmer Evaluation
High Performance	**Farm Sustains Family and Future Generations** Total farm revenue covers all opportunity costs, direct costs, and retains earnings. Off farm income is not needed to support family.	BEST
	Farm Supports Family Total farm revenue covers all opportunity costs and direct costs. Off farm income is not needed to support family, but earnings are not retained.	BETTER **Option 2** **Option 3** **Option 4**
	Farm Contributes Total farm revenue covers direct costs and contributes to opportunity costs. Family income from off-farm sources used to subsidize some opportunity costs of farm.	OK **Option 1** **X** **Current Performance**
Medium Performance	**Farm is Self-Supporting** Total farm revenue covers direct costs but does not contribute to opportunity costs. Family income from off-farm sources used to subsidize opportunity costs of farm.	BAD
	Farm is not Self-Supporting Total farm revenue covers variable costs and contributes to fixed costs. Family income from off-farm sources used to subsidize some fixed costs of farm.	WORST
Low Performance	**Farm Losses** Total revenue covers variable costs but can't contribute to fixed costs. Family income from off-farm sources used to subsidize fixed costs of farm.	
	Farm Debt Total farm revenue is less than total variable costs. Family income from off-farm sources used to subsidize variable and fixed costs of farm.	

This box will discuss the estimates of farm performance on this indicator for each option.

Indicator Name: Time for Family Activities

	Performance Levels	Farmer Evaluation
High Performance	Abundant time available for enjoyable activities with full family participation and family subgroups. Participate in activities as a family regularly on a daily and weekly basis. Participate regularly as a family in special events and social occasions such as holiday celebrations and family vacations.	BEST BETTER **X Current Performance** **Option 2 Option 3** **Option 1** **Option 4**
Medium Performance	Some time available for enjoyable activities with full family participation and family subgroups. Participation in activities as a family regularly on a weekly basis. Participate regularly as a family in special events and social occasions such as holiday celebrations and vacations.	OK BAD WORST
Low Performance	Little time available for enjoyable activities with full family participation and family subgroups. Some participation in activities as a family on a regular basis. Some participation as a family in special events and social occasions such as holiday celebrations and vacations.	

This box will discuss the estimates of farm performance on this indicator for each option.

Indicator Name: Farm Succession Plan

	Performance Levels	Farmer Evaluation
High Performance	Written plan for farm succession has full support of all family members and is legally protected to the fullest possible extent.	BEST BETTER **Option 2** **Option 4**
Medium Performance	Farm succession plans have been discussed and are generally supported by family members. Some legal protections to assure farm succession plan are in place or under discussion.	OK **Option 1** **Option 3** BAD
Low Performance	Farm succession has not been discussed or has been considered and dismissed by family. Little or no interest in planning for farm succession by family members.	**X** **Current Performance** WORST

This box will discuss the estimates of farm performance on this indicator for each option.

Indicator Name: Satisfaction from Farming

	Performance Levels	Farmer Evaluation
High Performance	Consistent feelings of satisfaction from all aspects of farm work – planning, production, processing, and marketing. Customers express appreciation, are loyal and refer new customers. Farm and farm family have high resilience to bad weather/markets or other factors that threaten to reduce farm profitability	BEST BETTER **X Current Performance** **Option 1 Option 3 Option 4** **Option 2**
Medium Performance	Consistent feelings of satisfaction from many aspects of farm work – planning, production, processing, and marketing. Some customers express appreciation, are loyal and refer new customers. Farm and farm family have some resilience to bad weather/markets or other factors that threaten to reduce farm profitability.	OK BAD
Low Performance	Consistent dissatisfaction with most aspects of farm work planning, production, processing, and marketing. Few customers express appreciation, are loyal and refer new customers. Farm and farm family lack resilience to bad weather/markets or other factors that threaten to reduce farm profitability.	WORST

This box will discuss the estimates of farm performance on this indicator for each option.

Indicator Name: Development Pressure

	Performance Levels	Farmer Evaluation
High Performance	Entire farm is permanently protected by conservation easements, market value reflects agricultural use, the value of development is zero. Community values farmland over nonagricultural land uses, prefers preservation to development.	BEST **Option 4** **Option 3** BETTER
Medium Performance	Farm is protected partially or temporarily by mechanisms such as a voluntary agricultural district (VAD), conservation development, intergenerational assistance programs and limited term restrictions. There is interest in permanent farmland protection among farm owners. Community values farmland over nonagricultural land uses. .	OK **Option 1** **Option 2** BAD *This box will discuss the estimates of farm performance on this indicator for each option.* **X** **Current Performance**
Low Performance	Farm is not protected from development and there is no interest in or conflict over farmland protection among farm owners. Development potential exceeds the value of the farm enterprise. Community prefers non-agricultural land use over farmland.	WORST

Indicator Name: Local Sales

	Performance Levels	Farmer Evaluation
High Performance	Optimum quantity of product sold through local markets to consumers and to other locally owned businesses.	BEST **Option 1** **Option 2** BETTER
Medium Performance	Product sold through a mix of local, direct markets and other markets. Mix of local to non-local marketing options not fully optimized.	**X Current Performance** **Option 3** **Option 4** OK BAD
Low Performance	All products sold through wholesale/commodity markets to distributors based outside of the local community. Local marketing has not been considered.	WORST

This box will discuss the estimates of farm performance on this indicator for each option.

Indicator Name: Balanced Carbon Budget

	Performance Levels	Farmer Evaluation
High Performance	Topsoil clearly defined, darker than subsoil. Noticeable roots and residue. Dark brown or black color. Crumbly, mellow, loamy and easily worked. Soil organic matter content in top ½ inch greater than 2%.	BEST BETTER OK
Medium Performance	Topsoil color closer to subsoil color. Some residue, few roots. Dark grey or light brown color. Some visible crumbly structure. Soil organic matter content in top ½ inch between 1 and 2%	BAD **Option 2** **Option 3** **Option 1** **Option 4** **X** **Current Performance**
Low Performance	Topsoil color similar to subsoil color. No visible roots or residue. White, light gray or red color. Cloddy, hard, crusty, difficult to work. Soil organic matter content in top ½ inch is less than 1%.	WORST

This box will discuss the estimates of farm performance on this indicator for each option.

Indicator Name: Pest Pressure

	Performance Levels	Farmer Evaluation
High Performance	No pests exceed the economic injury level on the farm. Consistent use of practices to encourage natural pest suppression on the farm. Active management of habitats for beneficial organisms. Regular monitoring of pests and beneficial organisms.	BEST
Medium Performance	Few pests exceed the economic injury level on the farm. Those that do are managed with practices to encourage natural pest suppression on the farm. Chemical control is used only as a last resort. Regular monitoring of pests.	BETTER OK
Low Performance	Pests are managed by scheduled chemical application regardless of pest level. Chemical control is the pest management strategy of choice on the farm. No monitoring of pests.	BAD WORST

This box will discuss the estimates of farm performance on this indicator for each option.

Option 1 **Option 2** **Option 4**

X **Current Performance** **Option 3**