Measuring Success

LOCAL FOOD SYSTEMS AND THE NEED FOR NEW INDICATORS

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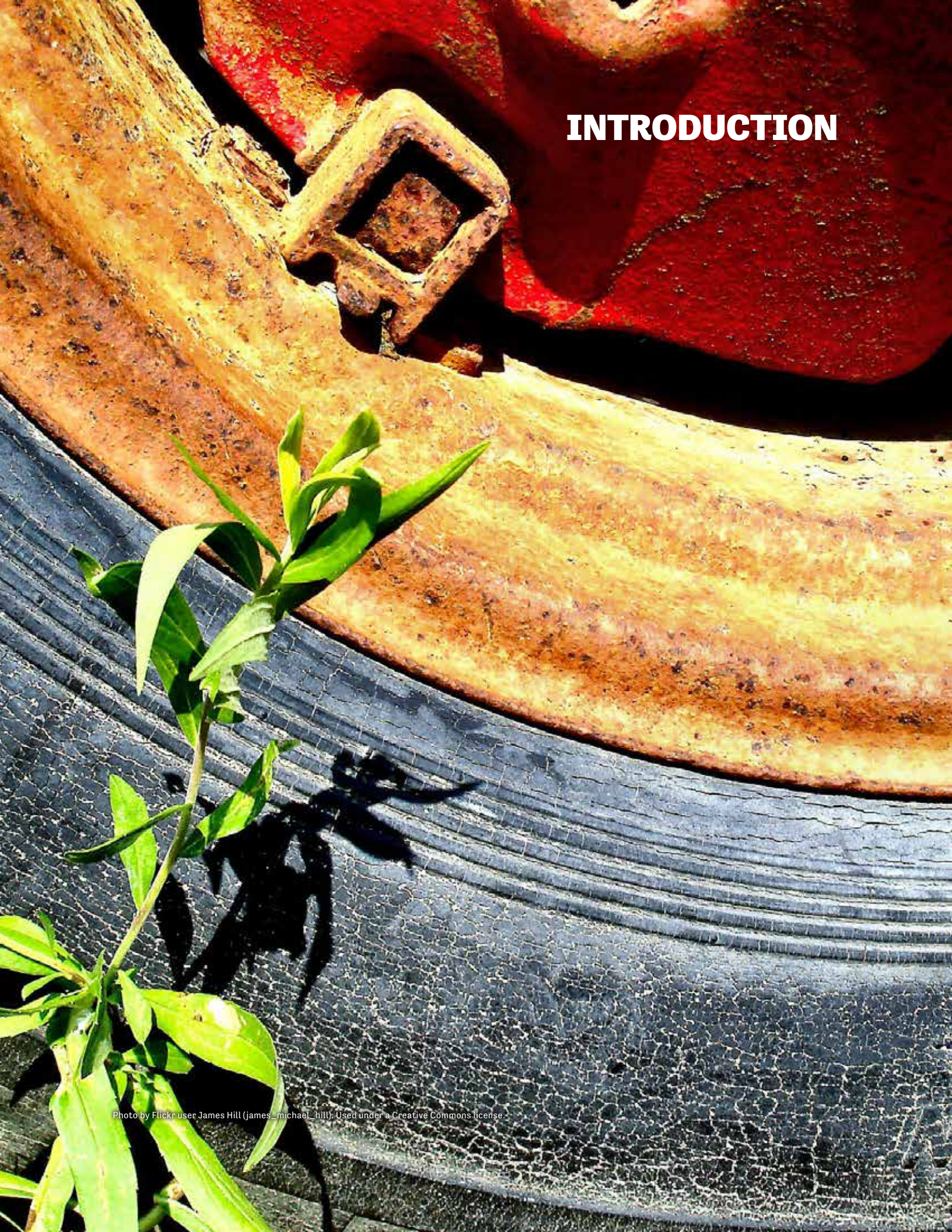
INTRODUCTION



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In agriculture, policy makers, analysts and researchers often use a set of indicators to assess whether a farming system, or new technology, is succeeding. The most common indicators focus on increasing "yield," often of a singular crop or animal unit, within large-scale production systems. The use of indicators focused almost exclusively on production helps to shape scientific research and public policy. But just as weight alone is not a good measure of human health, a single-minded focus on production is an inadequate measure of the health of a farming system. So long as yields are high, this narrow focus supports the illusion that our agricultural system is meeting the nutrition, health, environmental sustainability, rural development and other needs of the population.

Farming produces multiple products. The most obvious are food, feed, fiber and raw materials for conversion into other food and non-food products (such as energy, materials, etc.). Done right, farming also contributes to better soil health and water quality, wildlife habitat, recreational opportunities and carbon storage. Unfortunately, less desired products are often produced as well, such as pollution to ground and surface water and air, with detrimental impacts to human and animal health.

Yet, despite the clear reality of these multifunctional outcomes of agriculture and the important roles these products play in our environment, society and economy (for better or worse), we lack the means to assess them accurately. To truly measure the value and sustainability of local food and farming systems, we need indicators that are multi-dimensional and cross-disciplinary, and that fully capture the range of outcomes contributing to the success of the system.

There is growing support within the U.S. and around the world for less chemical-intensive, more ecological approaches to agriculture—including systems that produce healthy food for local markets. These systems have the potential to provide a whole host of benefits—from environmental to social to health—that are currently neither assessed nor valued under most current scientific research and public policy regimes. There is some evidence this is changing. Both the USDA's Food Atlas[1] and the state of Vermont's Farm to Table Strategic Plan for 2020[2] are using a wider range of indicators to measure the food system. But these are the exceptions, not the rule.

With all of this in mind, IATP launched a project in 2012 to begin to establish a research framework for a new set of indicators that would better represent the diverse benefits of local, agroecological food systems and that could be tracked over time. To ground our work, we partnered with the Main Street Project, which has attempted to create an innovative, replicable systems approach to raising free-range poultry, based in Northfield, Minnesota. Working with this project provided a unique opportunity to develop and test these new indicators of success within food production.[3]

WHY NEW INDICATORS ARE NEEDED

When farm policy is created or revised, lawmakers often rely on research findings to inform their priorities. Unfortunately, public resources for agricultural research is directed almost exclusively towards support of the same commodity, monocultural farming systems that have dominated the U.S. agricultural sector for decades. Private agriculture research is even more lopsided, as it is funded by the companies that benefit most from today's food system, such as Cargill, Monsanto, Coca Cola and the like.[4]

The focus of agricultural research matters. And it is likely to matter even more in the near future as it is used, for example, to identify new and expected disease and pest issues, to assess crop insurance payment levels, and to create the tools we'll need to continue farming in a changing climate and environment. That so much of today's research supports the industrial farming system puts other methods of farming at a distinct disadvantage, simply because data about how these other systems affect the environment, farm economics, public health and the community at large are not as available.

Despite the lack of policy and research support, there is a growing movement around *local, agroecological* food and farming systems, both in the U.S. and around the world. These farming systems are typically smaller scale than many "conventional" industrial operations, but size is the least important of the differences. Where industrial farming operations are dependent on outside (and often fossil fuel-based) inputs like herbicides, synthetic fertilizers, antibiotics and genetically modified crops, local food and farming systems rely on farmer knowledge to minimize off-farm inputs by rotating crops, integrating livestock production, and following agroecological management systems.[5] These farms provide multiple "products" and serve multiple functions, including not only the raising of crops and livestock, but also providing habitat for wildlife and pollinators, improving soil and water quality, and carbon sequestration. Furthermore, based on their higher resilience, they are viewed by many as a key part of the solution to how we can meet our food and farm production needs in a changing climate, as seen most prominently in the 2008 International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) report, "Agriculture at a Crossroads," which was endorsed by more than 50 countries.[6]

The absence of quantitative data that allows for comparisons among a broad range of farming systems creates two problems. The first is that, when agriculture policy is created or revised, experts and lawmakers often rely on research findings to inform their decisions. Without adequate research data to support them, small, diversified systems stand little chance of being promoted through policy.

The second problem is that the U.S. Department of Agriculture (USDA), state-level water and soil conservation agencies, and public health agencies are increasingly turning to performance-based indicators to determine how to allocate funding for conservation and public health programs.[7] Performance data, however, will not be collected on the individual farms participating in these programs; rather, it will be based on larger data sets that at this point are weighted heavily in favor of large-scale, monoculture systems. This shift toward performance-based incentives is promising—after all, it is the outcomes, not the "prescribed practices" that matter most—but without adequate data to support small-scale, diversified farming systems, those systems are at a distinct disadvantage.

The movement toward indicator-based support programs at the USDA and in the states should be a positive shift in policy, especially given how well we know local food and farming systems can perform. However, virtually all of the indicators commonly in use today are driven by the data that are currently available, and these data are, by and large, narrow and reductionist. In turn, the agricultural research that is proposed and funded depends largely on the indicators that are already developed, leading to

a reinforcing feedback loop in which conventional and industrial systems of crop and livestock production are favored. The indicators selected by the USDA, in other words, are likely to not be appropriate for all farms, putting local food and farming systems at a disadvantage once again.

If agroecological farming systems are to have a place at the policy table in coming years, what is urgently needed is a broad set of such indicators that can accurately track the economic, health and sustainability benefits of the food system, and be applied from the national level all the way back to the farm level. As important is the involvement of farmers and farm workers in helping to develop these indicators. Far too often, those most involved and impacted by production are left out of research and policy design—but are left to deal with the outcomes of both.

Indicators that would better capture the full range of benefits of local food and farming systems are those that would reflect the connection to the farmers' health, to economic well-being, to the ecological health of waterways, to use of antibiotics, to use of fossil fuels and other synthetic inputs, to soil sequestration of carbon, to wildlife habitat, and perhaps even to the nutrient density of the agricultural products produced. This is the ambitious task that IATP and its partners at Main Street Project and in the community decided to take on in this project.

PROCESS

The Main Street Project's sustainable farming system in Northfield, Minnesota aims to build wealth—especially among Latino farm workers (current and former)—by providing training and technical and marketing assistance to support them in becoming direct owner/operators of sustainable farming operations. The system that Main Street is developing and implementing is low-input and highly diversified in design (it includes vegetables, grains and livestock), with an initial focus on market opportunities around poultry production.

Because the Main Street project is grounded in agroecology, targeting local markets and ownership, it offered a set of unique research opportunities, including a chance to set baselines for indicators to track throughout the project.

RESEARCH TEAM

To begin, we convened a trans-disciplinary research team, bringing together experts in rural enterprise, soil science, public health, and environmental studies. See inset. The research team included Jim Kleinschmit (IATP), Dr. David Wallinga, M.D. (IATP), former Leopold Center Director Dr. Dennis Keeney, PhD (an IATP senior advisor), Kris Johnson, PhD (Univ. of Minn. Institute on the Environment), Reginaldo Marroquin (Main Street Project), Mary Huebert, and Robin Major (research interns), as well as researchers/professors from the Environmental Studies Program of St. Olaf College. Julia Olmstead (IATP) was the initial team coordinator.

The team started by researching existing indicators for environmental sustainability and the food system, digging deep into existing and under-development indicators, both nationally and here in Minnesota, to ensure our indicator work was not duplicative, but value-added (See Appendix A). From there, the team produced an analysis of what areas may be of highest value to assess, based on Main Street's participants, proposed production system and ecology, and a list of national and state resources for indicators (See Appendix B).

The environmental sustainability and food system indicators identified in our research served as an initial starting point. The next step was to decide which existing indicators would be

most relevant for the Main Street project participants—and which new indicators might need to be identified and developed.

The team began consultations with farmers and other relevant stakeholders to learn what types of information they felt was both needed and not currently available regarding local farming systems. Following those consultations, our research team attempted to identify and match indicators that are measurable within the Main Street system. Key considerations included what data exists, what is practically measurable, and what people (including farmers, consumers and policymakers) care about.

Initially, our multidisciplinary research team expected and intended to focus on the identification and development of specific sustainability "performance" indicators: farm-scale tools that help assess the environmental, health, climate and community contributions of the Main Street production system. However, it soon became clear that the indicators we were talking about were not of primary interest to the farmers themselves. In order to ensure that these tools would be valuable not only to researchers, but also to the farmers, the team switched at that point to a Community Engaged Research (CER) approach.

COMMUNITY ENGAGED RESEARCH MODEL

Once project leaders in IATP and Main Street recognized that community engaged research (CER) would be the best approach, the team faced a new obstacle. Many of the participating researchers (and those focused on sustainable agriculture and indicator science in particular) were not familiar with CER methodology, and in turn, the group's community members and other researchers were not familiar with sustainable farming or indicator science. A "learning team" was formed to create a shared base of understanding about CER and sustainable farming. The Learning Team consisted of researchers focused in these different areas, Main Street participants, and other key community stakeholders.

Learning Team Participants

- Reginaldo Haslett Marroquin, Main Street Project
- Niel Ritchie, Main Street Project
- Dr. David Wallinga, IATP
- Dr. Tlahtoki Xochimeh, University of Minnesota
- Dr. Amy Damon, Macalester College
- Dr. John Schade, St. Olaf College
- Dr. Ramona Robionson-O'Brien, College of St. Benedicts
- Dr. Ann Finan, St. Cloud State University

Community Engaged Research is a model in which communities themselves identify issues of concern, and work together with researchers to initiate research and then take action. Because the goal of this project and Main Street is to promote food and farming systems that benefit rural communities economically, environmentally and socially, we concluded that CER is the best methodology for this project.

The CER process was essential not only to building the right indicators, but also to collecting data. Through the CER process, we built trust and connections among a core group of Northfield community members, consisting primarily of farmers from Main Street, but also key representatives from other parts of that food system. Those community leaders worked with academic research partners involved in the learning team to identify the issues of greatest concern to the community, create a plan for data collection that is led by community members, and, based on the data collected, determine the next steps for research and the dissemination of the results. The development of this protocol was led by Dr. Tlahtoki Xochimeh, an expert in CER at the University of Minnesota and a member of our learning team.

Meetings of the Learning Team provided context and information on the three key aspects of this project: sustainable agricultural systems broadly and the Main Street system much more specifically; CER methodology; and the science and role of indicators in measuring multiple aspects of sustainability.

The participating farmers and IATP staff met several times at the Main Street Project office in Northfield, Minnesota. Six farmers participated in all or most of the meetings, and two additional farmers have participated in one meeting. Feedback was also solicited and received from farmers in the Main Street effort outside of the scheduled meetings. For the meetings, the Learning Team group also included a member of the Main Street staff and our interpreter. The farmers varied in their agricultural backgrounds, some having grown up farming in their home countries while other are new to food production, but all are or have been engaged with Main Street's Sustainable Food and Agriculture training program.

During each of the meetings, we engaged in various discussions to identify indicators important for the farmers and the community. Many of the farmers have a great passion for growing more healthful, sustainably produced food for the benefit of their families and the community. Several of the farmers identified differences they see between the fresh food they had available in their home countries and how much unhealthy processed food they and their families are now eating here in the United States, and are concerned about how this may impact their and their children's health. They view producing their own food as a way to have better health, as well as economic independence.

Based on input from the meetings, IATP staff created a draft survey to collect initial data in the community. The survey is organized by categories covering health, finances, family life and diet. IATP collaborated with economics professor Amy Damon from Macalester College on how best to present the questions. Both a written survey and focus groups were suggested as a way to collect both quantitative and qualitative data. At a subsequent meeting in Northfield, the group reviewed the survey questions and made several suggestions for additional questions that should be included in order to make sure we get at important details that give a more accurate picture of the community and the impacts of this particular style of farming.

Based on the feedback from the group, the survey questions were further refined in order to collect the most useful socio-economic data. The Learning Team then oversaw the creation of a survey tool to share with the participating farmers. See Appendix C (an English version of the survey); the questions are intended to help establish a baseline and measure over time the socio-economic, health and other quality-of-life aspects of the Main Street farming system for participants and community members. The questions were translated into Spanish, and then, with assistance from IATP and Main Street Project staff, the survey was administered by community members in late spring and early summer 2013.

FARMERS TELL THEIR STORIES

To provide further insight into why Main Street participants are part of this project, we include three stories that capture the challenges, worries and hopes for the future.

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Realizing a dream

Our first farmer is a middle-aged woman, married, with two children, a 14-year-old boy and a 17-year-old girl. She left her village in Mexico when she was fifteen, alone. She has lived in Northfield for 18 or 19 years.

Before her children entered school, she stayed home while her husband worked two jobs. "The kids would never see him," she says. For the last seven years, she has worked in manufacturing. They both do factory work.

How long have you been involved in this project? Who else in your family is involved?

I have spent two months on the project. I started this project because my brother did it before. He took the course on chickens and owns a chicken farm. He also has vegetables, though not much. He will do more.

Now, I have a cousin [beginning] in the program. She will start when we finish the course. I think we will start in March, after the winter.

How has your family made its living in the United States? What challenges have you faced economically?

We have always had work...We work in a factory. I have worked in manufacturing for a lot of the time. I have worked there seven years. When my children were young, my husband worked, so I did not have to.

What do your family's meals look like? When you cook, who cooks?

We have lunch and dinner apart, because we are out. We are never together, because I work mornings and my husband works evenings. But we spend Saturday and Sunday together. I cook.

In your country, did you eat together?

Yes, when I was young I would eat with my family, in our house in my village. But I left to study and work at 15; I was not with my family.

Are there health issues in your family? Obesity? Diabetes?

My family is not obese—my children or my husband do not [have problems with obesity]. But all the family of my husband is diabetic.

I have had a problem for two or three years where I could not walk because everything was moving [she was dizzy]. It is a common problem in United States [the farmer states that her family does have health care accessible to them].

How important is food to your conception of being well?

It is super important. All the days I cook in my house, we do not eat fast food, hamburgers. On Sunday is the only day we may go out.

What are your dreams for your children?

I want them to study and be successful. I want them to choose what to do. It is what is important. A technical career would be nice, but I want them to be happy.

What motivated you to participate in the first place to be part of this program?

I had the idea to become a part of this group because I want to start an individual project, have my own business. To have better work.

I had a brother in the program. He learned a lot, and I was interested. There is not much opportunity, so I decided to do this.

What does this project mean to you and your family?

For me, it is about realizing my dream. I never imagined I could learn about business. It has been good to learn, and I have been able to.

A beautiful place

The second farmer interviewed is a man who was born in Mexico, married with five children. His grandparents in Mexico did subsistence agriculture. He later worked in the fields in Cuernavaca, and for a rancher who raised pigs and other animals.

He says, "I have spent three years in Northfield, Minnesota. It is a beautiful place; I like it. I like to help the community; I am close to the Hispanic community." Most of that time, he has worked in construction. Due to the worsening economy, he went to work in a meat-packing plant. His wife has worked in restaurants.

How has your family made its living in the United States? Have you had trouble finding work?

We work. I have worked the entire time. But economic conditions are hard as a Latino. I have had help finding work. It is complicated; I need to work two or three jobs.

How long have you been involved in this project?

For eight weeks. My wife is interested in joining, if she can, in a little while. We will see how it unfolds.

With you starting to work with chickens now, do you work all three [jobs] during a month?

Yes.

With respect to your family, what does a typical lunch or dinner look like? Do you eat together? Do you go out?

[Typically], we eat separately. We have contrary (different) work schedules. Sometimes my kids eat with me, and sometimes they eat with her. We both cook—she cooks when she can, and I cook when I can. We eat together when we have a break.

What health issues are there in your family?

My son has various syndromes, including hydrocephalus. My mother and father and other members of my family are diabetic. I can't remember all my family members that have diabetes.

Is health care affordable?

For my children, yes—because they were born here. For my spouse and me, no.

In your opinion, how important is food for your well-being?

For Hispanic people, food has a lot of importance. Food is an important part of health.

What are your dreams for your children?

That they would graduate from high school and go to university. That they will have careers and find their independence.

What motivated you to participate in this project the first place?

The opportunity to come out ahead, the opportunity to make extra money. The opportunity to work independently. To eventually have my own business and to not have to rely on the types of jobs I have now.

Has this project helped you?

Yes, it will have an impact, but not yet. We have not yet started [farming], but my family is interested in helping with the farm.

Seeking independence

Our third farmer grew up in Mexico without a father, living and working for 17 years on his mother's farm, growing oranges. It was different being a kid then. Then, they had to work to live; they didn't go to school much.

Growing up on farms was really difficult, but they always had enough to eat. They never accepted government help, and all of the children worked to make sure that their family did not have to subsist on the government.

Now, their family farm in Mexico cannot compete with farms that have huge machinery and fertilizers to help them grow larger oranges more easily. Nobody buys small oranges. In the U.S., he has agricultural experience including work in Texas, and in Napa Valley picking lettuce and on a cotton farm.

After leaving his family farm, but before moving to the United States, he worked in construction in Mexico for 10 years, just under the level of supervisor. The company would not let him become a supervisor because, for that job, he would have needed two to three years of college.

He moved to the United States because the construction company opened a new plant here. They moved him here to help train the new employees. His family does not have health insurance because it is so expensive. It is something that he is working hard to acquire for his family.

How long have you been involved in this project?

I started working on the project in July 2012, so it has been two months.

How has your family made its living in the United States? What challenges have you faced economically?

I like my job [working construction]; it pays well, more or less. Working is my responsibility, so maybe I don't love it, but it is work.

The biggest economic problem I had when moving to the US is that there are so many obstacles in overcoming credit. When I first opened a credit card account, the bank required another person to sign off so as to help my credit score. Unfortunately, this person had bad credit, and so it has since negatively affected my credit score. I wanted to be independent, and this credit problem has made it really difficult.

What do your family meals look like? When you cook, who cooks?

All four members of my family eat together at the same table. I am insistent that we are not going to eat in front of the TV. Both my wife and I cook for the whole family.

Are there health issues in your family? Obesity? Diabetes?

My family does not have health problems. The hardest thing we have had to deal with is my mother needing to have a kidney transplant in Mexico. That was the worst thing. My family here in the U.S. is healthy. None are diabetic; no one has ever needed antibiotics.

In your opinion, how important is food for your well-being?

Food is an important factor in health. I like to mix a lot of fish, seafood and vegetables in the dinners I make for my family.

What are your dreams for your children?

I always try to explain to my children what life is and what I have done in my life. I tell them they have to study because school is very important. Work and school. Life is not easy; sometimes it's hard, but sometimes you have to do it if you want to be something in life.

What motivated you to participate in this project the first place?

I decided to participate in the program because I wanted to learn how to run a business, how to administrate. I wanted to have my own independent ideas, to be independent. It would have been difficult otherwise to learn these skills.

For instance, when I lived in Texas, I did all of the things that we are doing now in the agriculture program, but they wouldn't pay me to do them until I had gained more experience. In Texas, they would not pay me more than $7.50 or $8 an hour without the proper business experience. Here in Minnesota, they know how to value people.

Has this project helped you?

I like this project, firstly because it allows me to gain valuable work experience. It will give me the experience to get somewhere, both for me and for my children. It will definitely have an impact, because I am emotionally motivated to participate. I do not want to lose. It will give my family a future, because they are already involved in learning how to run this business, and they see how it is. It is experience for them, too. They learn to work with all the chickens and everything. And they will learn about whether or not they like it.

FINDINGS

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FINDINGS FROM DEVELOPING THE INDICATORS

1. New indicators

One of the strengths of the CER process is the learning that comes from the process itself. Many of the issues Main Street participants were most interested in did not show up in the previous reviews of indicators of environmental sustainability or food system indicators. More specifically, participants were interested in:

- Contributions to their community;
- The ability to work independently and be empowered to make decisions about their operation;
- The ability to manage their own infrastructure and systems;
- Producing healthier food and that people understand the difference between their products and conventional products;
- Land ownership;
- The ability to produce not only for the market but also for themselves;
- Having a sufficient rate of return;
- Resources for their children and greater time with their family;
- Adaptability to climate change.

From these issues and areas of concern, the Learning Team developed a survey of questions to help track progress over time. The survey broadly covered issues related to: family, employment, health, diet, land, and their economic situation (See Appendix C).

2. New research

Going forward, connections have been made with the broader research community in Minnesota to continue work with Main Street Project. We were very fortunate to be able to help assemble an ecological research team with colleagues and students from nearby colleges. Researchers at St. Olaf College and Carleton College (both located in Northfield) are continuing their work with Main Street Project staff to collect and assess an array of ecological data from the project sites. Students working with Professors Diane Angell, John Schade and Kathy Shea at St. Olaf have collected data on soil biogeochemistry, structure and tilth; microbial diversity; and insect diversity. The students collate, analyze and present the data, as well as begin design longer-term research experiments. While timing did not allow us to incorporate this research work in our indicators development process, the goal of engaging researchers and influencing Environmental Studies and other departments to conduct research on soil, water and other environmental aspects of this type of farming system has been a clear success. This will not only elevate and formalize the data collection needed to better understand the multifunctional values of more sustainable farming systems over time, but will also help to train the next generation of leaders in food systems thinking.

In addition, researchers at the University of Minnesota, led by Prof. Jason Hill, have pursued research on a lifecycle analysis of energy use throughout the Main Street system. The researchers are collecting data on energy inputs and outputs, beginning with the production of the feed and continuing through the production of the chicken, all the way to slaughter and distribution. A substantial body of scientific literature on energy use in other chicken production models exists, which will allow energy efficiency comparisons to be made between this and other systems, including conventional as well as other models of sustainable production.

3. A participatory model

Our project revealed that the *development* of indicators is as important as the indicators themselves. A participatory model is essential to creating useable tools for farmers involved in agroecological, local food systems. What researchers think is important is not always what is most important to farmers or the long-term viability of the system. The indicators that were developed may, when translated appropriately to other contexts, be very useful throughout the local food movement. But the more directly transferable "product" is likely the participatory research approach itself, which can be adapted to different contexts and should serve as a basis for not only future research of agriculture systems, but also for establishing policy goals for the future.

GOING FORWARD

While we do believe that the indicators emerging from this project may be useful for other similar-scale sustainable farming systems, the more critical and transferrable piece is the community-engaged research model for engaging stakeholders in the development and monitoring of appropriate sustainable indicators. Further use of this model in other sustainable farming systems could: 1) help to begin moving local, small-scale, diversified farming systems onto a more even playing field in the increasingly performance-driven policy and market environments; 2) provide a solid base of data that can be used to identify and promote the multiple benefits of sustainable agriculture systems; and 3) contribute to the creation of food and farming production and research systems that better serve the needs of the communities most intimately affected by them, and at the same time contribute to a broader base of support for a policy agenda.

Aside from tracking the indicators themselves, we believe there is additional value to this work. In fact, the indicator development work may actually be of higher value "internally"—in other words, to the farmers and project leaders themselves—than we originally suspected. One of the key challenges with the local food movement is the actual economic viability of enterprises and success of farmers. Due to a number of constraints, including pricing, costs, etc., most of these enterprises are not highly profitable, nor do they expect to produce high profit levels. As a result, many of these projects succeed or fail on the strength of the producers' dedication or unique abilities, as opposed to the economic or environmental sustainability of the operation.

At the same time, there are few ways currently to assess the long-term potential success of a local food producer, so new producers (and those leading the farming system development) are forced to take a leap of faith and hope that their particular situation will have the lucky combination of factors that allow them to succeed. A better understanding of what motivates a producer to participate in such a farming system, and what they see as the most important outcomes, can help reduce this risk. Our hope is that this survey and monitoring tool will be allow farmers and project leaders to improve their ability to assess their own potential for success at the early stages in these efforts.

The community-engaged research approach provides us with an opportunity to not only convey some of the sustainability values of this type of local food production system to policymakers and other outside observers, but also to clearly identify a much more refined picture of what motivates farmers and farm workers to shift jobs and move into agricultural production. In turn, this information gives us a better chance of structuring local food production systems to succeed.

The Main Street Project's Sustainable Food and Agriculture program is still in its early stages and has not yet produced a fully mature local food and farming system or long-term participants. Once this is in place, the developed indicators will help Main Street and its participants better assess which aspects of the system and characteristics of the participants point to long-term success.

FINAL THOUGHTS

The CER process, which was grounded and led by participants and based on their existing context and needs, shifted the focus of the initial indicator development away from a purely environmental/health assessment toward one which included economic indicators, and toward helping participating farmers track the goals, costs and benefits associated with producing chickens (the current farm production) in the Main Street system, both at entry and at regular intervals during the training and ongoing farm development. This outcome, which was not expected, resulted in a more appropriate and timely tool for the farmers and project coordinators, and one that should help identify sources of participant motivation for project involvement and chances of success in the local food farming system. While specific to Main Street and its context, we expect that this tool may also be of use to other sustainable and local food initiatives as well.

Overall, the project reinforced the need to better measure outcomes of more local, agroecological farming systems. The task by its very nature is challenging—because they are in fact local, adapting to local conditions, whether ecological, social or economic. And because they are local, including local stakeholders in the design of the indicators is essential.

APPENDIX A

BACKGROUND ON SUSTAINABLE AGRICULTURE INDICATORS

Research concerning environmentally sustainable indicators for agricultural systems can take many forms, depending on an organization's definition of sustainability, the system being analyzed and the degree to which the organization focuses on environmental rather than social or economic sustainability. Most academic environmental indicator research and policy is done in Europe (Italy, Greece, the Netherlands, the U.K. and Germany).[8] United States environmental sustainability practices related to indicator work focus on large-scale producer chains, such as Global Bioenergy Partnership and the Leonard Academy.[9] Despite many sustainable agricultural studies, especially in Europe, there remains an acute absence of an American-initiated project that attempts to define sustainable indicators to be applied at regional and national political scales.

Designing agro-ecosystems that exhibit attributes of sustainability (see Table 1) has become a leading objective of scientific research and policy agendas, while their performance assessment remains a complex issue.[10] A major task is to identify sustainable indicators that accurately gauge the performance, indicate specific management problems, and identify undesirable environmental changes and what action to take. Ideally, an indicator will sway a farm or research team to improve the system or avert ecological damage.[11] Social, economic and environmental indicators are inherently overlapping, and separating them out is next to impossible. Still, it is our goal to look at the environmental indicators first, as these are the most quantifiable and predictable.

What follows is an overview of necessary factors to consider when working with agricultural environmental indicators, as well as a brief assessment of three environmental indicator studies, one audit assessment and one literature review. Four are located in Europe and one is located in Latin America. Many of these concepts apply to future research with the Rural Enterprise Center, specifically pertaining to 1) appropriate indicators to measure, and 2) evaluation techniques.

BASIC ATTRIBUTES OF SUSTAINABLE AGRICULTURAL SYSTEMS

There are many visions of a biodiverse, resilient, productive and resource-efficient agriculture system. They may be conservation (no-till systems) agriculture, sustainable intensification (a viewpoint espoused by the World Bank), organic agriculture and agroecological systems. But agreeing on the basic attributes of a sustainable agricultural system is essential. The following attributes are adapted from a series of basic factors for sustainable agricultural systems compiled by Koohafkan *et al.*[12] (Table 1)

1. Use of local and improved crop varieties and livestock breeds to enhance genetic diversity and adaptation to changing environmental conditions
2. Avoiding the use of agrochemical and other technologies that adversely impact the environment and human health
3. Efficient use of resources, reduced use of non-renewable energy and reduced farmer dependence on external inputs
4. Measurement of agroecological processes, such as nutrient cycling, biological nitrogen fixation, allelopathy and biological control
5. The productive use of human capital in the form of traditional and modern scientific knowledge and skills to innovate and use social capital through recognition of cultural identity, participatory methods and farmer networks to enhance solidarity
6. Minimization of the ecological footprint of crop and animal production, distribution and consumption practices, thereby minimizing GHG emissions and soil and water pollution
7. Promotion of practices that enhance clean water availability, carbon sequestration, conservation of biodiversity, soil and water conservation, etc.
8. Strengthening of adaptive capacity and resilience of the farming system by maintaining agro-ecosystems diversity
9. Conservation of agricultural heritage to allow social cohesion and sense of pride

Table 1 (right). Basic attributes of sustainable agricultural systems. Adapted from Koohafkan *et al.*[13]

INDICATOR METHODS

Indicators of environmental impact may be based on farmer production practices (means-based) or on the effects these practices have (effect-based) on the farming system and/or the surrounding environment. While Van der Werf *et al.*[14] criticizes the use of means-based methods, as "it is logically impossible to evaluate contribution of a practice to environmental impact" and as they "will not contribute to recognizing errors and improving practices," Rigby *et al.*[15] argues that it is easily attainable information that can be collected on a large scale with little funds. The most accurate indicator strategy, however, may lie somewhere in between. Using a combination of effect-based and means-based indicators, a farm system could be analyzed with real-life numbers that infer to specific farmer production practices.

The following are examples of means-based, effect-based and mixed (means- and effect-based) studies and literature reviews. It should be noted that indicator definitions differ between studies. For example, Rigby et al.[16] assign the farm one sustainability indicator number based on a means-based scale system, whereas Van der Werf et al.[17] identify multiple means- and effect-based indicators based on environmental objectives. Table 2 is a compilation of the indicator factors taken into account from all studies.

1. Means-based: One farm-level indicator

Rigby *et al.*[18] sampled 80 organic and 157 conventional producers in the U.K. The study is based on patterns of input use and assigns weights to these practices in order to produce one indicator number for the whole farm. The paper emphasizes the applicability of the study at a political level, as it incorporates a wide and easily accessible database. While the use of means-based indicators can never produce a real-life, applicable number, Rigby *et al.*[19] address strategic attributes of a sustainable agricultural system (see Table 1: attributes 1, 2, 3, 5). This could serve as a strong model for a survey-based study, as well as a comprehensive study for the short-term research goals for the Main Street Project.

2. Mixed-based: A farm audit

The International Federation of Organic Farming Movements (IFOAM) established a farm audit based on sustainable indicators to establish a comprehensive assessment of many farms.[20] The farm audit is mixed-based (means- and effect-based), and while the study is in its beginning stages, it is a well-rounded, system-based assessment. The farm audit would serve as a strong, simple model for beginning research with the Main Street Project.

3. Effect-based

Girardin *et al.*[21] analyze data from 17 farms in France and Germany, assessing nine agroecological indicators: nitrogen fertilizations, phosphorus fertilization, pesticides, irrigation, crop succession, cropping pattern, crop cover, organic matter and ecological structures. They analyze their data in a classic interaction matrix, or "control panel," form for each farm in order to clearly reflect the impact of one production practice on all environmental components concerned. While they may not incorporate all necessary indicators, their evaluation method is a valuable model of an environmental impact assessment for the use of sorting, selecting and classifying farming practices according to their effects on the environment. This assessment method could serve as a valuable model for long-term research.

4. Mixed-based (means- and effect-based): A literature review

In a literature review comparing 12 environmental-based indicator methods, Van der Werf *et al.*[22] explore major questions that must be addressed when designing an evaluation method. These questions include: Should indicators of farm production practices or indicators of the environmental effects of these practices be used? Which environmental problems of current agroecosystems should be considered, and what type of indicators is best suited to quantify these problems? This comprehensive assessment of potential indicators emphasizes the complexity

involved in choosing indicators that accurately evaluate all levels of an agroecological system. Van der Werf *et al.*[23] recommend defining regional science-based threshold levels for effect-based indicators.

5. Mixed-based (effect- and means-based): A socio-environmental approach

The MESMIS approach, developed by a multi-institutional team in Mexico, is an interdisciplinary framework for 20 case studies in Mexico and Latin America. Its MESMIS structure is a six-step cycle devoted to the selection of specific indicators for the environmental, social and economic dimensions of sustainability. Through the last steps of the cycle, the indicators are integrated with a multi-criteria analysis, so as to evaluate the farming systems and provide insights for improving practices. Sustainability is not measured individually, but is measured through comparison of other factors. Using an AMOEBA-type diagram, they show, in qualitative terms, how far an objective has been reached for each indicator by giving the percentage of the actual value with respect to the ideal value. This enables a simple and comprehensive comparison of the system being evaluated. The MESMIS study could act as a valuable model for long-term research with the Main Street Project. Figure 1 is an example of the MESMIS AMOEBA model.

Input related (Means-based)	**Emission Related** (Effect-based)	**System state related**
Use of nonrenewable energy	Emission of greenhouse gases	Landscape quality
Use of nonrenewable resources	Emission of ozone-depleting gases	Natural biodiversity
Soil erosion	Emission of acidifying gases	Agricultural biodiversity
Land use	Emission of nitrifying substances	Total system biomass
Water use	Emission of pesticides	Air quality
Nitrogen fertilizer use	Emission of substances contributing to POCP	Water quality
Pesticide use	Emissions of substances concerning terrestrial ecotoxicity	Soil quality
Seed sourcing	Emissions of substances concerning aquatic ecotoxicity	Food quality
Weed control	Emissions of substances concerning human toxicity	Animal welfare
Crop management	Waste production and utilization	

Table 2. A comprehensive list of indicators used in Rigby *et al.*[24], Van der Werf *et al.*[25], Girardin *et al.*,[26] López-Ridaura *et al.*[27] and Measures[28]. Note: only environmental factors are included.

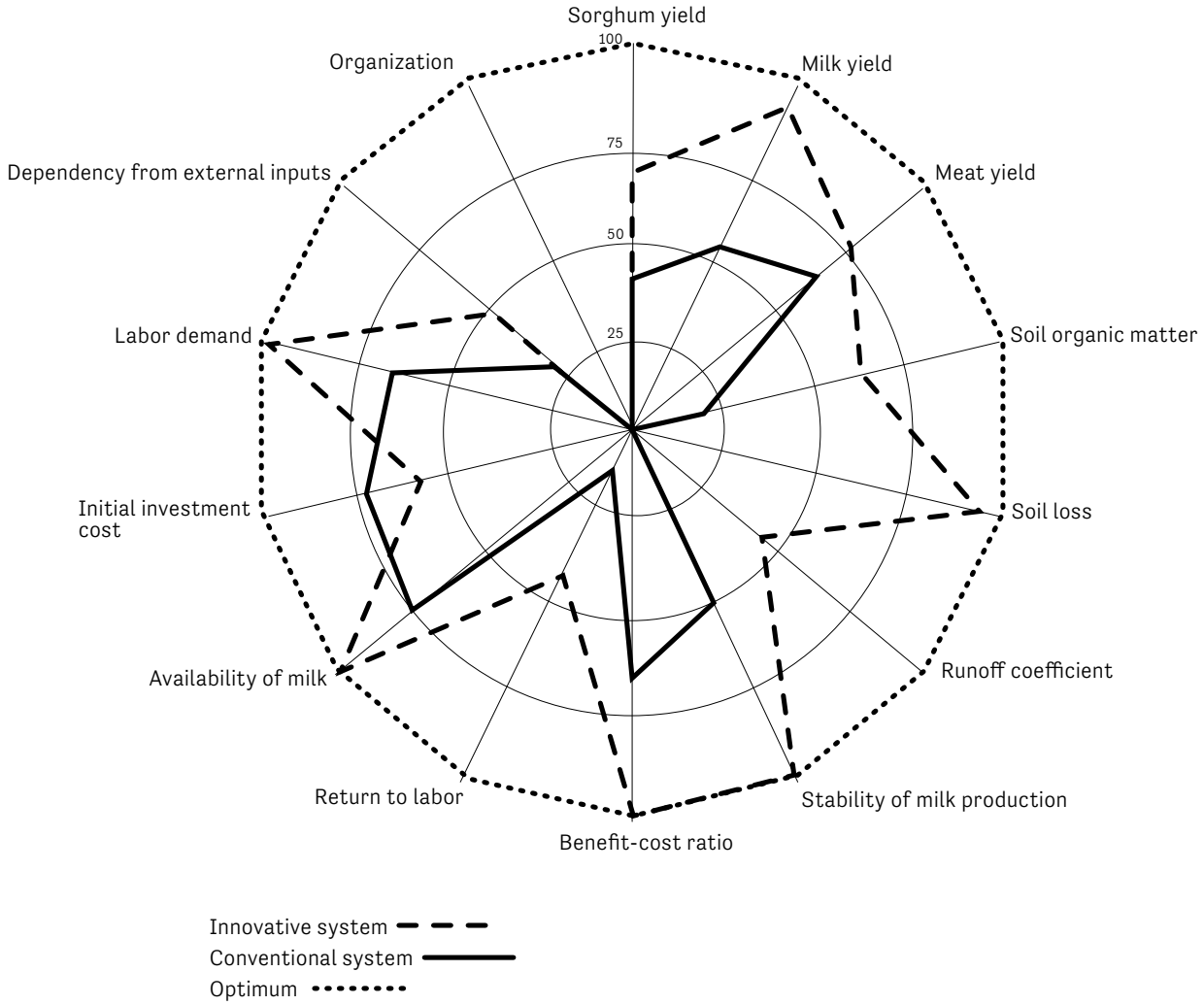

Figure 1. An example of AMOEBA-assessment for the MESMIS Latin America study.

DEVELOPING FOOD SYSTEM INDICATORS: A MINNESOTA INITIATIVE

As a prelude to our indicator work, which helped inform this project's design and focus, IATP worked with the University of Minnesota's Healthy Foods, Healthy Lives Institute to develop a set of state-level food system indicators and compile data on them for all 50 states for the period 1997—2007.[29]

From more than 200 indicators, the research team selected 63 unique indicators that measure structural, economic, environmental, health and social changes in the food system. Data for each of the 63 indicators were compiled primarily from government sources such as the U.S. Census Bureau, the U.S. Department of Agriculture (USDA), the Bureau of Economic Analysis, the Bureau of Labor Statistics and the Centers for Disease Control. The two largest sources of data employed in the study are the US Census Bureau's Economic Census and the USDA's Census of Agriculture.

Two indicator summary tools—national maps and state fact sheets—were developed to communicate indicator data and to highlight differences across states and changes over time. Approximately 300 maps and 153 state and national fact sheets were generated to encourage community goal-setting and monitoring.

The project team included Robert King and Gigi DiGiacomo from the Department of Applied Economics at the University of Minnesota; Molly Anderson from College of the Atlantic; David Mulla from the Department of Soil, Water & Climate at the University of Minnesota; and David Wallinga from the Institute for Agriculture and Trade Policy.[30]

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APPENDIX B

Resources and initial scan of potential indicator areas for health, economic well-being and quality of life

SECTION 1

The resources in section 1 include many of the key documents or websites that provide further detail on the existing and potential indicators identified in the Section 2 of this appendix.

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ADDITIONAL INDICATOR RESOURCES BY GEOGRAPHIC LEVEL

State-level

Minnesota Department of Health
www.health.state.mn.us/cdrr
Resources: Fact sheets and data, general information. Additional resources, in particular: Nutrition such as vitamin and mineral uptake, fruit and vegetable consumption

http://www.health.state.mn.us/divs/idepc/diseases/ecoli/index.html
Resources: Cases of *E. coli* in 2009 and general information

http://www.health.state.mn.us/divs/idepc/diseases/salmonellosis/index.html
Resources: Cases of Salmonellosis in 2009 and general information

http://www.health.state.mn.us/divs/idepc/diseases/staph/basics.html
Resources: Cases of Staphylococcus aureus in 2009 and general information

http://www.health.state.mn.us/divs/idepc/diseases/campylobacteriosis/index.html
Resources: Cases of Campylobacteriosis in 2009 and general information

Minnesota County Level Health Data
http://www.health.state.mn.us/divs/chs/countytables/index.htm

State Health Facts
statehealthfacts.org
Resources: Abundance of health data (Stats on births, infants, children, obesity, mental health, oral health, vaccines, death rates, life expectancy, Alzheimer's, cancer, diabetes, heart disease, smoking, asthma, nutrition, physical activity, violence, disability) and *how Minnesota compares to other states*.

National level

Food Environment Atlas
http://www.ers.usda.gov/foodatlas/

USDA—Know Your Farmer, Know Your Food
http://www.usda.gov/wps/portal/usda/knowyourfarmer?navid=KNOWYOURFARMER

Wallace Center
http://www.wallacecenter.org/resourcelibrary/?category=Charting+Growth

Kids Count
http://datacenter.kidscount.org/data#USA/2/27/28,29,30,31,32,33,34
Resources: Indicates children's overall health in each state and the state's ranking in comparison to other states in the U.S.

Centers for Disease Control and Prevention - Division of Nutrition, Physical Activity and Obesity
http://www.cdc.gov/nccdphp/dnpao/

Agriculture and Public Health Gateway
http://phaig.jhsph.edu/index.cfm
Resources: Effect of public policy and agricultural techniques on human health

Agriculture Sustainability Institute
http://asi.ucdavis.edu/resources/publications/sandiegoreport.pdf
Assessing the San Diego County Food System: Indicators for a more food-secure future.

Organization of Economic Cooperation and Development
http://stats.oecd.org/viewhtml.aspx?QueryName=516&QueryType=View

SECTION 2

POTENTIAL LOCAL FOOD SYSTEMS INDICATORS (BASED ON RESOURCES IDENTIFIED IN SECTION 1)

FARMER DEMOGRAPHICS

- **Baseline info:** Gender, age, etc.
- **Education**
- **Income**

FARMER HEALTH

- **Background information**
- **Appearance of obesity and overweightness:** Both Dakota and Dodge County have seen increasing levels of obesity since 2004. It could be useful to compare this data to the data from the farmers in the Agripreneur program and the consumers of their products.
- **Appearance of type 2 diabetes:** Type 2 diabetes is correlated with being inactive and overweight and has also increased in Rice and Dakota counties since 2004.
- **Chronic diseases in farm workers:** Chronic diseases such as asthma, bronchitis and decreased respiratory function are not uncommon among farmer workers. Contributors to these illnesses include gases formed by the decomposition of manure (hydrogen sulfide) and dust composed of harmful components such as dander, dried manure, insects and bacteria.
- **Number of farmers with health insurance:** A lack of health insurance can result in the inability to seek medical attention and receive professional care. In individuals with serious illnesses, the results could be devastating.
- **Access to healthcare:** Availability of healthcare, as well as health insurance, greatly correlates with an individual's quality of life by means of their health and emotional well-being.
- **Number of sick days taken per year:** Number of sick days per year can indicate trends in specific workers relating to age, social factors, health of the individual and trends in the health of the farm community.

FOOD SECURITY/ACCESS

- **Workers on SNAP benefits: Bei**ng eligible for SNAP benefits indicates a financial deficiency and thus a potential inability to buy healthy foods. Participants using SNAP have been shown to have more healthful and higher-quality foods in their homes than individuals of similar income who do not have SNAP benefits. Nutritional deficiency, obesity and high stress (contributing to inferior health) are also lower while using SNAP. Thus, the use of SNAP benefits could be an indicator of farm workers' health if there is a financial deficiency.
- **Worker families on WIC program:** WIC is a program that provides certain foods to alleviate the malnutrition of women, infants and children who are at a level of economic disparity. This displays nutrition levels of farmer's families, as well as their financial situation, in their ability to access healthful foods.

- **Workers' utilization of food shelves:** Use of food shelves shows an immediate need for food access that cannot be purchased due to financial deficiency. Food is provided for free or prices below commercial value.
- **Skipped or missed meals** (per week/month)
- **Type of diet farmer is able to access:** A farmer's financial situation, legal status, access to social services and proximity to a grocery store all affect the diet they are able to obtain for themselves and their family. Areas with limited access to healthful food choices can be especially devastating for workers without reliable access to transportation.
- **Dollars (or percent of income) spent on groceries per month:** The amount of money a farmer spends on groceries every month can be an indication of the nutrition in their diet. Also, consider include how many groceries a farmer is able to obtain from the farm at which they work.

ECONOMIC FACTORS

- **Percent of income workers are sending to families elsewhere:** Some farmers, particularly those with families in other countries, may be spending a significant amount of their income on those residing elsewhere (remittances). As such, their income may not accurately represent what they are actually able to spend on themselves, giving a false representation of their financial ability to provide for themselves and those with whom they live.
- **Economic contribution to community:** This indicator displays the economic benefit of having a farm or farms in the community. This includes that community's access to local foods, base resources and tax contributions.
- **Labor productivity/labor hours:** This ratio can measure how much farmers work in comparison to their productivity level, displaying the amount of work a farmer has to do to reach their goals. Can also be an indicator of free time.
- **Entrepreneurial capacity:** This depends on a farmer's ability to obtain financial and planning assistance, training/education and English ability, as well as presence of business development systems, incubators and forces outside of their control.

HOUSING AND LAND

- **Property values in nearby communities:** Property values in areas next to a farm can impact quality of life of the farmers and their neighbors.
- **Access to land/land ownership:** Farmers with little to no financial capital or credit history have an extremely difficult time obtaining loans with which to purchase land. Another issue with the purchase and ownership of land is the extreme price volatility in the market. Other options include renting land or sharecropping.
- **Quality of housing for farm workers:** There are three factors that display a housing disparity. They include:
  - Percent of crowded housing (more than 1 person per room)
  - Inadequate housing (with moderate to severe physical problems)
  - Housing that costs more than 30% of income

FINANCIAL ACCESS

- **Availability of off-farm employment opportunities:** A large number of farm workers do not make enough money from farming and need other jobs to support their income. The availability of these other positions influence their quality of life and economic stability.
- **Ability to access credit**
  - Many types: bank, family, community
  - Knowledge about credit
  - Can be influenced by legal status
  - Farmers looking to obtain credit for their business may encounter difficulty if faced with financial problems at some point previously in their lives. Farmers with bad credit or no credit are significantly less likely to receive credit necessary to finance their farm. In comparison to loans, credit interest rates are significantly higher. However, loans are very difficult to obtain as opposed to a credit card that is easily accessed, regardless of status.
- **Ability to access insurance**
  - Home, farm/crop, business
  - Insurance of any kind is necessary to maintain a business and to have a better quality of life. In the event of a "disaster," a farmer who possesses insurance would not be as vulnerable to complete financial devastation and would likely be able to continue their endeavors as before. Financial insufficiencies could deter farmers from obtaining insurance due to high rates and deductibles.
  - Some farmers may rely on informal support, such as community, as insurance.
- **Capital assets:** A farmer's tangible wealth, as opposed to liquid wealth, is a demonstration of a farmer's ability to generate revenue. This private capital is fixed; thus, it is not easily converted into monetary value and is driven by market forces, e.g., owning a car, TV, computer
- **Level of community support for farmers:** Community involvement in a farm, such as a CSA, gives greater assurance that a farm can face difficulties and maintain stability.

TIME USAGE

- **Social interaction:** This indicator may depend on the individual, but in general, social interaction can increase quality of life. Social interaction may take place largely at the individual's work, such as the farm.
- **Access to family and friends:** Ability to access family and friends can impact many other areas of life. Physical proximity is especially important for individuals without reliable transportation.
- **Time spent with family:** The amount of time an individual spends with their family has indicated a higher quality of life for most individuals.
- **Job satisfaction**

BASELINE SPECIFIC TO MAIN STREET PROJECT

- **Total costs/capital needs:** This indicates the economic capacity needed by the farmer. How much a sustainable farmer spends is significant, because it takes into consideration money savers such as lower feed costs, use of family labor and higher sale prices.
- **Price of product that consumer is willing to pay:** This price indicates the amount of work the farmer must do to raise an equivalent number of conventionally raised chickens. It is especially important when compared to the cost of production.
- **Cost of slaughtering:** Cost of slaughtering chickens is related to size of farm, whether they require inspection, location of slaughtering and rental of mobile poultry-processing units. Chickens may be slaughtered either on or off the farm.
- **Level of English ability:** A farmer's level of English can affect their entrepreneurial capacity and their ability to buy and sell products, as well as their level of independence.

TO RESEARCH AFTER AGRIPRENEURSHIP

- **Gap between potential and actual yields:** These numbers are important when noting how accurate estimations were, how much clout can be placed into such predictions, and whether or not the project was successful in its first year or if more time is needed to make such assessments.
- **Value of crop production:** This indicates the overall production, dependent on market forces, quality of crop, subsidies given and the presence of demand curves dependent on crop types. This can be looked at in many ways, based on how "value" is determined, profits, revenue or total value grown.
- **Cost of transportation to slaughter/market**

INDICATORS FOR NUTRITIONAL QUALITY AND SAFETY OF CHICKENS PRODUCED

BIRDS

- **Quality of feed:** The quality of the feed given to chickens can directly affect the quality of the meat and the eggs that they produce. The program at the Rural Enterprise Center is working to use sprouted grains for feed and allowing chickens to scratch at seeds and eat sprouted grains, which could yield more nutritional eggs or meat.
- **Fatty acid content in pasture-raised chickens):** Omega-3 Fatty Acids, such as alpha-linolenic acid (ALA), eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) have been shown to reduce the risk of heart disease, reduce triglycerides in type II diabetes patients, and increase immune function. Because the body cannot synthesize these compounds, they must be acquired from food. Higher levels of fatty acids also reflect the quality of the pasture where the meat and eggs were grown, and are especially common in outdoor-raised chickens consuming seeds, insects and small animals.
- **Total fat content/water content:** Many chickens are being injected with saltwater to easily increase the weight of the meat. Fat-to-water ratio could indicate the nutritional value of the meat, as well as the economic value pound per pound. Even some chickens labeled as natural undergo this process).
- **Detectable levels of antibiotics:** The antibiotics used in poultry overlap with those used in humans by 25 percent (Mellon, Benbrook, and Benbrook 2001). In fact, 50 to 80 percent of antimicrobials in the U.S. are used in animal feed in subtherapeutic doses—doses that are most likely to cause antibiotic resistance—and can easily end up in the water supply. (See also: The National Antibiotic Resistance Monitoring Survey—2009)
- **Detectable level of arsenic in chickens:** Arsenic in feed creates many problems, such as arsenic buildup in soil from manure, arsenic in ground water and damage to plants from high levels, which can lead to secondary problems aside from arsenic tolerance in chickens. Because 10-15% of arsenic remains in the meat, humans consuming many servings of poultry a day can intake a large portion of their daily tolerable arsenic of 2µg/kg/day.
- **Resistance to cephalosporins and fluoroquinolones**
  - Cephalosporins are antimicrobial drugs that are used in humans to treat various types of infections, from pneumonia to foot infections. They are also given to chickens at doses that can create antibiotic resistance in humans who come in contact with the meat.
  - Fluoroquinolones are drugs used to treat the *campylobacter* infection in humans. It has also been given to poultry, causing chickens as well as humans to develop fluoroquinolone-resistant *campylobacter*.
- **Presence of *E. coli*/level of resistance:** *E. coli* O157:H7 is a bacterium that causes an infection in human and animal intestines. It is commonly derived from farm products, mainly cattle, but can be found on anything that has been contaminated with animal waste. *E. coli* can be resistant to both quinolones and cephalosporins.
- **Presence of *Campylobacter*/level of resistance:** *Campylobacter* causes bacterial gastroenteritis and is derived mainly from handling animal products, especially poultry. The level at which *campylobacter* is resistant to fluoroquinolones provides insight into the health of the meat for human consumption as a transmitter of resistance.

- **Presence** *of Salmonella***/level of resistance:** *Salmonella* is an infection that affects the intestines and is associated with eating undercooked, contaminated food, including poultry products. Salmonella can be resistant to both cephalosporins and fluoroquinolones.
- **Presence of** *Enterococcus***/level of resistance:** Certain types of *Eneterococcus* can cause infections in the intestines. These bacteria can be resistant to both cephalosporins and fluoriquinolones.
- **Presence of** *Staphylococcus aureus***/Level of resistance:** *Staphylococcus aureus* is an infection of skin and soft tissues. A small amount of *S. aureus* infections are related to handling of poultry.
- **Presence of multi-drug resistance:** Multi-drug resistance is classified as meat resistant to three or more drugs. Poultry can be contaminated with resistant strains of all of the bacteria previously listed.

FARMS

- **Spread of manure over field:** The amount of manure present on a farm, which correlates with the number of animals and methods of disposal, can have significant health effects on the environment, farmers and farm workers, and community members. Spreading manure can cause nitrates, antibiotics, bacteria and parasites, such as *Salmonella* and *Cryptosporidium*, and elements, such as phosphorus, nitrogen and potassium, to enter the ground water, contributing to illness and eutrophication of waterways. Manure also decreases air quality by emitting hydrogen sulfide, dust particles and ammonium into the air, contributing to respiratory infections of farm workers.
- **Ammonia levels in chicken houses:** Ammonia gas is connected to respiratory illnesses, as well as the eutrophication of waterways when volatized. In chicken coops, the safety standards are regularly exceeded, affecting farmers and community members.

APPENDIX C

Indicators survey text (English version)

BASIC

1. What is your status with Main Street Project's training program?
   - ▫ Current student
   - ▫ Past student
   - ▫ Potential/Future Student
   - ▫ Not Applicable

2. Gender
   - ▫ Male
   - ▫ Female

3. Age

4. What is your marital status?
   - ▫ Single
   - ▫ Married
   - ▫ Widowed
   - ▫ Divorced
   - ▫ Separated

5. What is the highest degree or level of school you have completed?
   - ▫ No schooling completed
   - ▫ Elementary school to 8th grade
   - ▫ Some high school, no diploma
   - ▫ High school graduate, diploma or the equivalent (for example: GED)
   - ▫ Some college credit, no degree
   - ▫ Trade/technical/vocational training
   - ▫ Associate degree
   - ▫ Bachelor's degree
   - ▫ Advanced degree (master's, doctorate, etc.)

6. Please provide information for all members of your household (include all people living in your house, regardless of family relation).

	GENDER	AGE	RELATED TO YOU?
1.	M/F		Yes/No
2.	M/F		Yes/No
3.	M/F		Yes/No
4.	M/F		Yes/No
5.	M/F		Yes/No
6.	M/F		Yes/No
7.	M/F		Yes/No

FAMILY

1. How many children do you have? *If no children, skip to FAMILY QUESTION 4.*
   - ▫ 0
   - ▫ 1
   - ▫ 2
   - ▫ 3
   - ▫ 4
   - ▫ 5 or more

2. Do you have any children not living at home?
   - ▫ Yes
   - ▫ No

3. Select the highest level of education completed by your child:

- ▫ No schooling
- ▫ Elementary school to 8th grade
- ▫ High school
- ▫ College
- ▫ Trade/Technical/Vocational training
- ▫ Advanced degree (master's, doctorate, etc.)

3 (a). If your children have attended college, have they completed a degree?

- ▫ Yes
- ▫ No

4. How many hours per week do your children spend outside?

- ▫ 0-5
- ▫ 6-10
- ▫ 11-20
- ▫ 21 or more

5. Approximately how many hours per week do you spend with your family in a non-work setting?

- ▫ 0-5
- ▫ 6-10
- ▫ 11-20
- ▫ 21 or more

6. Does your family participate in community activities?

- ▫ Yes
- ▫ No

6 (a). If yes, please explain.

EMPLOYMENT

1. How many jobs do you currently have? *If none, skip to EMPLOYMENT QUESTION 5.*

- ▫ 0
- ▫ 1
- ▫ 2
- ▫ 3 or more

1 (a). What is your occupation?

2. How many total hours do you work per week?

- ▫ 1-20
- ▫ 21-40
- ▫ 41-60
- ▫ 61 or more

3. How far do you commute to work each week (total miles)?

- ▫ 1-50
- ▫ 51-100
- ▫ 101-150
- ▫ 151 or more

4. Is your current job(s) related to food?

- ▫ Yes
- ▫ No

4 (a). If yes, which industry? Select all that apply.

- ▫ Production/Farming
- ▫ Processing
- ▫ Transportation
- ▫ Preparation/Cooking
- ▫ Service

5. Have you previously held jobs related to food?

- ▫ Yes
- ▫ No

6. What is your total household income per year?

- ▫ Under $10,000
- ▫ $10,000-15,000
- ▫ $15,000-20,000
- ▫ $20,000-25,000
- ▫ $25,000-30,000
- ▫ $30,000-40,000
- ▫ $40,000 or more

7. Family work status

7 (a). If you are married, does your spouse work?

- ▫ Yes
- ▫ No

7 (b). If you have children, do your children work?

- ▫ Yes
- ▫ No

7 (c). If you have other family living with you, do any of your extended family work?

- ▫ Yes
- ▫ No

HEALTH

1. If you have health insurance, who is insured on your plan?

- ▫ Self only
- ▫ Self, plus spouse
- ▫ Self, plus one or more children
- ▫ Self, plus spouse AND one or more children
- ▫ Not Applicable, do not have health insurance (skip to HEALTH question 2)

1 (a). How much are you paying for insurance?

- ▫ $0-50/month
- ▫ $51-100/month
- ▫ $101-150/month
- ▫ $150-200/month
- ▫ $200 or more/month

1 (b). What kind of insurance plan do you have?

- ▫ Traditional “co-pay” plan
- ▫ High deductible plan
- ▫ Other

2. How many times have you or any members of your family been to the doctor in the last year?

Self	0	1-3	4-6	7-9	10 or more
Spouse	0	1-3	4-6	7-9	10 or more
Children	0	1-3	4-6	7-9	10 or more

3. How many of those times did you or any members of your family go to the urgent care clinic or emergency room?

Self	0	1-3	4-6	7-9	10 or more
Spouse	0	1-3	4-6	7-9	10 or more
Children	0	1-3	4-6	7-9	10 or more

4. Have you or any members of your family had to take antibiotics in the last year?

Self	Yes	No
Spouse	Yes	No
Children	Yes	No

5. In the last year, how many days of work did you miss due to illness?

- ▫ 0
- ▫ 1-3
- ▫ 4-6
- ▫ 7-9
- ▫ 10 or more

6. How many days of work did you miss due to children being sick?

- ▫ 0
- ▫ 1-3
- ▫ 4-6
- ▫ 7-9
- ▫ 10 or more

7. Do your or anyone in your family have diabetes?

- ▫ Yes
- ▫ No

8. Do you ever use traditional methods (such as herbs) to treat illness?

- ▫ Yes
- ▫ No

8 (a). Are you able to get the ingredients you need here in the US?

- ▫ Yes
- ▫ No

DIET

1. How much money do you spend on food per month?

- ▫ Under $100
- ▫ $101-200
- ▫ $201-300
- ▫ $301-400
- ▫ $401-500
- ▫ $501 or more

2. How many meals per week do you or other members of your family prepare at home?

- ▫ 0
- ▫ 1-3
- ▫ 4-6
- ▫ 7-9
- ▫ 10 or more

2 (a). How many of those meals do you make from scratch (using fresh vegetables and meats or raw grains)?

- ▫ 0
- ▫ 1-3
- ▫ 4-6
- ▫ 7-9
- ▫ 10 or more

b. How many of those meals do you make using pre-prepared foods (such as frozen or boxed foods)?

- ▫ 0
- ▫ 1-3
- ▫ 4-6
- ▫ 7-9
- ▫ 10 or more

3. Do you currently produce any food for consumption by you or your family?

- ▫ Yes
- ▫ No

4. When in season, do you purchase any food directly from other farmers (including farmers markets) for consumption by you or your family?

- ▫ Yes
- ▫ No

4 (a). If yes, what is the approximate dollar value of this food per year?

- ▫ Under $25
- ▫ $26-50
- ▫ $51-75
- ▫ $76-100
- ▫ $101 or more

5. Do you currently receive any food support, including SNAP, WIC or food shelf assistance?
- ▫ Yes
- ▫ No

6. Do you talk to your family about healthy eating?
- ▫ Yes
- ▫ No

7. Do you support local restaurants that use locally produced food?
- ▫ Yes
- ▫ No
- ▫ Unsure

8. If you have the option to purchase local or more sustainable foods, are you willing to pay more for this food if it is more expensive?
- ▫ Yes
- ▫ No
- ▫ Unsure

LAND

1. Do you own or rent your home?
- ▫ Rent/lease
- ▫ Own

2. If you are currently farming, do you own or rent farmland?
- ▫ Rent/lease
- ▫ Own

3. If you currently rent or lease farmland, would you eventually like to own your own farmland? **Yes/No/Not Applicable**

a. If yes, what is your goal for when you would like to own the land?
- ▫ 1 year from now
- ▫ 2-5 years from now
- ▫ 5-10 years from now
- ▫ More than 10 years from now

b. How important is it to you to own your own land?
- ▫ Unimportant
- ▫ Somewhat important
- ▫ Important
- ▫ Very Important

4. Is it important to you to live on or very near the land you farm?
- ▫ Unimportant
- ▫ Somewhat important
- ▫ Important
- ▫ Very Important

5. Is the location of the land important in terms of where market or other things in the community (church) are?
- ▫ Yes
- ▫ No

FINANCIAL

1. Do you have a family budget?
- ▫ Yes
- ▫ No

2. Do you have a savings account?
- ▫ Yes
- ▫ No

3. Do you have a checking account?
- ▫ Yes
- ▫ No

4. Do you have a credit card?
- ▫ Yes
- ▫ No

5. Do you have any debt?

- ▫ Yes
- ▫ No

5 (a). If yes, what kind of debt?

- ▫ Bank (loan, mortgage, etc.)
- ▫ Credit card
- ▫ Informal (borrowed from family or another community member)
- ▫ Other

6. If you are a producer, do you have a business plan, including a budget, for your farming operation?

- ▫ Yes
- ▫ No
- ▫ Not applicable

6 (a). If yes, where did you find information to plan a budget?

- ▫ Main Street Project
- ▫ Family
- ▫ Community members/neighbors
- ▫ Bank/financial advisor
- ▫ Other

6 (b). Does your budget include planning for taxes?

- ▫ Yes
- ▫ No

6 (c). Do you receive any outside financial support for your farming operation?

- ▫ Yes
- ▫ No

7. What are your household assets? And how many of each?

ASSET	OWN	QUANTITY
House	Yes/No	
Vehicle (car/truck)	Yes/No	
Computer	Yes/No	
Cell phone	Yes/No	
Farming equipment (tractor, trailer)	Yes/No	
Other:		
Other:		
Other:		
Other:		

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30. Mary Story from the Division of Epidemiology in the School of Public Health at the University of Minnesota participated in the early phases of the project; Joel Nelson from the Department of Soil, Water & Climate at the University of Minnesota provided leadership and expertise in the design of the indicator maps; Ben Scharadin from the Department of Applied Economics at the University of Minnesota conducted the principal components analysis of the indicator data as part of his M.S. program.

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