ECONOMIC FEASIBILITY OF COMMERCIAL MAPLE SYRUP PRODUCTION IN ILLINOIS

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ABSTRACT.—For Illinois farmers, the maple resource is poised to be tapped given that 1.8 of the total 4.3 million acres of Illinois woodlands exists on farms. Industry standards suggest that a properly managed maple tree resource producing an average sap sugar concentration of 2 percent and an average volume per tap per season of 10 gallons of sap is necessary for a commercial maple syrup venture to succeed. IMPLAN results show that a 20-acre sugarbush, supporting 1,000 taps, will add an additional $7,146 to the returns of an existing farm producing 50 acres of mulch corn and 50 acres of mulch soybeans. Such an operation would impact the local economy by requiring $1,792 of locally purchased inputs and creating a total farm commodity value impact of $12,564. Graphical results using ESRI's ArcView 3.3 illustrate that commercial maple syrup production has potential throughout several counties in Illinois, especially within the southern portions of the state. These results indicate that maple syrup production maybe an economically viable alternative agricultural enterprise for Illinois farmers and landowners to incorporate into their whole farm plan.

Introduction

Maple syrup, once referred to as "white gold", is one of our oldest agricultural crops native to North America (Koelling et. al. 1996). As subsistence was a way of life for many of the early settlers, colonists, and farming families of the early 20th century, their life revolved around an agricultural operation whose primary role was to provide for the immediate needs of the family but also to produce an ample amount of surplus products to be bartered or sold for products that weren't produced on the farm. On farms where a maple resource was present, maple sap was collected and processed into syrup and sugar. It wasn't long until maple sugaring caught on to become an integral part of the spring farm experience, occurring at a time of year when other farm activities of necessity slowed down or ceased.

Historically, Illinois forests have been dominated by oak-hickory forests. Due to a lack of disturbances, such as the fires present prior to European settlement, fire tolerant tree species such as oaks and hickories are being replaced by fire intolerant species such as the sugar maple, also referred to as "maple takeover" (Fabry and Patterson 2000). Both silver and sugar maple (*Acer saccharinum* and *Acer saccharum*, respectively) can be used to produce syrup. Both are present within a wide natural range on upland and bottomland sites in eastern North America and are increasingly becoming more common in Illinois. Currently, maple syrup production is an alternative, value-added agricultural enterprise underdeveloped in the state of Illinois. Therefore, a potential exists for many Illinois farmers to incorporate maple syrup production into their whole farm plan, helping them to diversify their farm-income and establish a "safety-net" in years of crop-struggle.

Even though Illinois is not considered as a commercial maple syrup producing state, two commercial producers do exist within the state. Industry standards suggest that a properly managed maple tree resource producing an average sap sugar concentration of 2 percent and an average volume per tap per season of 10 gallons of sap is necessary for a commercial maple syrup venture to succeed (Vogt 1994, Heiligmann 2002). Funk's Grove Pure Maple Syrup (Shirley, Illinois) is the largest commercial syrup producer in the state while the Forest Glen Preserve (Part of the Vermillion County Conservation District) is the second largest commercial producer of maple syrup in the state. Currently, Funk's Grove puts approximately 6500 taps

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out and produces an average of 1600-1800 gallons of syrup per year (2000+ gallons on exceptional years). Forest Glen Preserve's production peaks at approximately one hundred gallons of maple syrup in a season. Consequently, Illinois has to import most of its syrup and candies since the local market demand is outpacing the local market supply.

This study uses IMPLAN (IMpact Analysis for PLANning, Social Accounting and Impact Analysis Software, Minnesota IMPLAN Group, Inc., Stillwater, MN) to demonstrate the economic impacts that a hypothetical maple syrup industry would have on Illinois, both statewide and locally. Additionally, a geographic information system (GIS) is used in conjunction with the Forest Service Forest Inventory and Analysis database (FIA) to investigate the availability and production potential of the maple resource in the state.

Methods

Economic Impact Analysis

An adapted version of IMPLAN (Impact Analysis for PLANning, Social Accounting and Impact Analysis Software, Minnesota IMPLAN Group, Inc., Stillwater, MN) was used to model the economic impact that an expanded maple syrup industry would have on Illinois. A preliminary phase in this study used IMPLAN to construct an input-output model representative of the state of Illinois thus establishing a foundation upon which a hypothetical maple syrup industry could be evaluated. The IMPLAN-software is capable of assessing the potential economic impact on the region's economy as well as contributions to the local community. Results of the IMPLAN model can then be used to determine the economic feasibility of establishing maple plantings with or without cost-sharing such as the Conservation Reserve Program (CRP).

In order to more accurately reflect regional conditions, southern Illinois-specific enterprise budgets were constructed on a per acre basis for commodities such as mulch corn and mulch soybeans. Farm budgets were originally created by the University of Illinois extension office (UIUC Farmlab 1999) and then modified by researchers at Southern Illinois University Agribusiness Economics department (Peterson, 2003). The modified maple syrup enterprise budget used for this analysis was established from information obtained from the North American Maple Syrup Producers Manual (NAMSPM) (Koelling et al. 1996). This budget example assumes an operation consisting of 1,000 taps within a 20-acre sugarbush. Koelling et al. (1996) made several additional assumptions when they created the enterprise budget. For instance, a separate sugarhouse building is assumed to be located on the farm property, sap is collected using a vacuum tubing system, the evaporator is wood fired, and a reverse osmosis machine is used. The modified enterprise budget used for this study shares many of the same assumptions as the NAMSPM does, except that this study assumes the 20-acre sugarbush as well as the tractor and trailer are already in service, integrating a maple syrup enterprise into an already established "working" farm.

Once the enterprise budget was created, production function coefficients were calculated by taking the value of production and dividing through by total receipts (i.e., the gross revenues from retail, wholesale, and other products). This calculation created the gross absorption coefficients that are recognized by IMPLAN. In addition, value-added coefficients were established for employee compensation, proprietary income, other property income, and indirect business taxes. Final steps necessary to run the IMPLAN model included entering the aforementioned coefficients and assigning an employment level to the model.

After running the IMPLAN model, specific results (e.g., taken from the industry balance sheet) were aggregated (i.e., 526 "specific" sectors grouped into 21 "generalized" sectors) and selected output data were taken from impact tables including output, employment, personal income, total value added, employee compensation, proprietors income, other property income, and indirect business taxes to create the following summary tables. These tables include: Table 1. Economic Impact in Local Community of a Farm Producing Maple Syrup, Table 2. Economic Return to Farm of a Farm Producing Maple Syrup, Table 3. Total Economic Impact in Local Community of a Farm Producing Maple Syrup, and Table 4. Multiplier Effect on the Local Community of a Farm Producing Maple Syrup. These individual tables were then linked to another spreadsheet capable of demonstrating the economic impacts a 20-acre maple syrup enterprise would have on an established 100-acre Illinois farm already producing mulch corn and mulch soybeans. For ease of comparison, summary information from these four tables was compiled in Table 5.

Table 1.—Economic Impact in Local Community of a Farm Producing Maple Syrup

	Farm Level Commodity Production (dollars)	Gross Inputs (dollars)	Inputs Purchased Locally (dollars) (State)
1—20 acre sugarbush	9500.00	2,354	1,792

Table 2.—Economic Return to Farm of a Farm Producing Maple Syrup

	Farm Level Commodity Production (dollars)	Return to Farm* (dollars)	Percent of Commodity Production that is Return to Farm
1—20 acre sugarbush	9500.00	7,146	75%

*Return to Farm includes Employee Compensation, Proprietary Income, Other Property Income, and Taxes

Table 3.—Total Economic Impact* in Local Community of a Farm Producing Maple Syrup

	Total Farm Commodity Impact* (dollars)	Total Farm Commodity Employment Impact*	Total Farm Commodity Value Added Impact* (dollars)
1—20 acre sugarbush	18,475	0.42	12,564

*Total Economic Impact = Direct (Farm Level) Impact+ Indirect Impact + Induced Impact

Table 4.—Multiplier Effect on the Local Community of a Farm Producing Maple Syrup

	Total Farm Commodity Multiplier*	Total Farm Commodity Employment Multiplier*	Total Farm Commodity Value Added Multiplier*
1—20 acre sugarbush	1.94	1.32	1.76

*Multiplier = (Direct (Farm Level) Impact+ Indirect Impact + Induced Impact)/Direct Impact

Table 5.—Economic Impacts of Maple Syrup on Representative 100 Acre Farm

Economic Impacts	Without Maple	With Maple
Farm Level Commodity Production (dollars)	31,495	40,995
Gross Inputs (dollars)	16,093	18,447
Inputs Purchased Locally (dollars) (State)	7,920	9,712
Return to Farm[1] (dollars)	15,402	22,548
Marginal Return to Farm (dollars)		7,146 (46%)
Percent of Commodity Production Returned to Farm	49%	55%
Total Farm Commodity Impact[2] (dollars)	57,563	76,038

[1]Return to Farm includes Employee Compensation, Proprietary Income, Other Property Income, and Taxes
[2]Total Economic Impact = Direct (Farm Level) Impact+ Indirect Impact + Induced Impact

Mapping Industry Potential

County level data for Illinois, obtained from the U.S. Forest Service Forest Inventory and Analysis (FIA) database, was used to map potential syrup production by county. FIA is a continuing endeavor mandated by Congress in the Forest and Rangeland Renewable Resources Planning Act of 1974 and the McSweeney-McNary Forest Research Act of 1928. The FIA database provided this study with extensive data on forest area attributes (e.g., size class and frequency) and on the status of live and standing dead hard and soft maple trees by county in Illinois. While the FIA database is not an inventory of every tree, a continuous sampling of multiple plots is used. For the purposes of this analysis, data obtained for the multiple plots was statistically aggregated up to the county level. While a majority of the counties in Illinois used 1998 (cycle 4) data, Edgar County used 2001 (cycle 5) data and the counties of Massac, Cass, Bureau, Scott, and Kendall, used 1985 data (cycle 3). The counties of Boone, Carroll, Champaign, Cook, De Witt, Douglas, Du Page, Ford, Kane, Kankakee, Lake, Mc Donough, McLean, Menard, Morgan, Piatt, Stephenson, and Will couldn't be included in the analysis because no data was available. The DBH tapping criterion outlined in the NAMSPM was used to estimate the number of taps each tree could support. For example, a DBH of 11-14.9 inches is capable of supporting one tap, 15-18.9 inches is capable of supporting two taps, and 21-inches and greater capable of supporting 3 taps. Assuming that each tap produces 1 quart of syrup per year, the total number of taps was divided by 4 to calculate the total gallons. This calculation represents the number of gallons of syrup that each county in Illinois could potentially produce, assuming that every tree was tapped and every tap had a potential of producing an average of 10 gallons of sap per tap per year at 2 percent sugar. This table was then inserted into ESRI's ArcView 3.3 and a map was generated to predict the potential gallons of syrup per county that could be collected in Illinois.

Results

Economic Impact Analysis

The results in Table 5 compare the economic impacts of a farm producing 50 acres of mulch corn and 50 acres of mulch soybeans with and without 20-acres of sugarbush. A farm producing 50 acres of mulch soybeans and 50 acres of mulch corn (without a maple syrup enterprise) returns $15,402 to the farm. In other words, 49 percent of the money generated from producing these commodities is returned to the farm. Money returned to the farm includes employee compensation, proprietary income, other property income, as well as indirect business taxes. Incorporating a 20-acre sugarbush adds an additional $7,146 to the returns to farm bringing the total to $22,548, an increase of 46 percent. In addition, maple syrup increases the percent of the commodity production that is returned to farm to 55 percent, an overall increase of 6 percent. The maple syrup also added an additional $18,475 to the total farm commodity impact bringing the total to $76,038. The total farm commodity impact includes a direct (farm level) effect, an indirect effect, and an induced effect. These results demonstrate the positive economic potential of incorporating a maple syrup enterprise into a whole farm plan. Future research will assess the economic contributions that a maple syrup enterprise will have on different farm diversification scenarios.

Mapping Industry Potential

Figure 1 illustrates the potential unconstrained maple syrup production per county, assuming that every tree is tapped. The darkest areas in the figure represent counties with the greatest number of maple trees. Mapping data from the FIA database demonstrates that the resource potential for commercial maple syrup production is predominately concentrated in southern and western Illinois but is also concentrated in the central portions of the state. Potential syrup production under the unconstrained scenario could reach as high as 344,400 gallons in some counties.

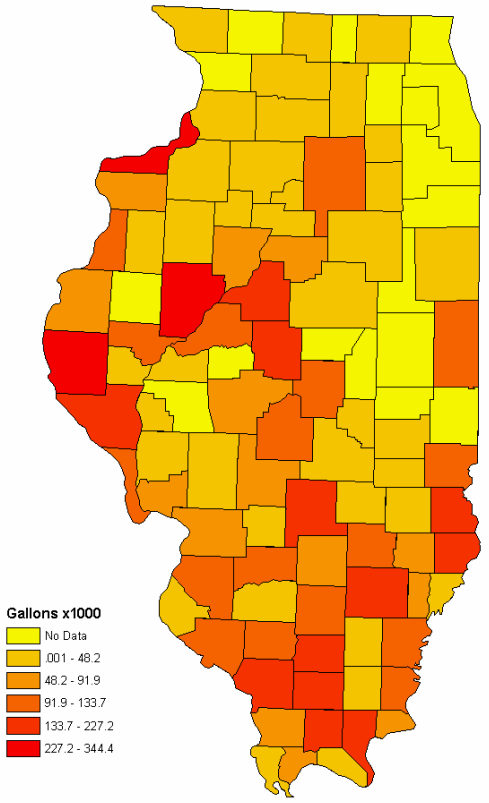

Figure 1.—Unconstrained Maple Syrup Production Potential

Discussion And Conclusions

Economic Impact Analysis

Because small to medium sized farms are more predominant in the southern part of Illinois, this analysis used a representative farm size of 100 acres. A 20-acre maple grove was incorporated into a representative farm already producing 50 acres of mulch corn and 50 acres of mulch soybeans for a total of 120 acres, assuming the farm had a maple resource poised to be tapped. While there are integrated and diversified maple syrup operations that exist with the potential to provide enough income to support a family solely from receipts obtained from maple products alone, most maple syrup produced on farms provides a supplemental source of income to the other commodities being produced. The appeal of producing maple syrup is that it is part of the seasonal farm experience, occurring at a time of year when other farm activities of necessity have slowed down or ceased. Additionally, farmers who want to enter the maple syrup industry are often advised to consider the maple syrup-product business as an addition to other agricultural enterprises by allowing for expanded use of some of the available resources (e.g., buildings, tractor, trailer, labor).

With regard to large capital expenditures common in new or expanding commercial operations, several planning options need to be considered. When planning a new sugarhouse, for example, the degree of public access plays a major role in the determination of a specific location. If the intent is to use the sugarhouse as a marketing location, it should be accessible by a hard surface road with adequate parking, and should have electrical services, sanitary facilities with a potable water supply, adequate product display areas, and sufficient room for visitors. The building and location should also be prominent, professional, and attractive to the greatest extent possible. In Illinois, compliance with local governmental regulations (i.e., Illinois Department of Public Health—IDPH) relating to land use and public accommodations may be necessary. If on-site dining facilities are in the future design, it is imperative to be in compliance with local and state regulations regarding food service areas.

Producing maple syrup is an alternative agricultural enterprise that utilizes a farm's natural resource base (both existing and potential) and employs best management practices (BMPs) to help improve the quality of farm life, diversify farm income, and promote rural sustainability. What distinguishes maple syrup production from other crops is the relative permanence of the trees that yield the crop. In other words, instead of harvesting maple trees for wood products and generating an income right away, maple syrup allows income to be generated over the life of the tree. Although maple syrup enterprises tend not to be the main source of income for many producing households, they are still economically important to the producers. With maple syrup production integrated into the full array of farming activities, many producers emphasize how the enterprise helps manage risks by diversifying farm income in an uncertain economy and exercising the seasonality of rural resource use and employment. For some in rural communities, resource-based self-employment complements available non-farm employment options.

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