

Results of a National Survey of Biobased Product Companies

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Summary

Iowa State University conducted a convenience survey of biobased product companies in 2008 to better understand some of the basic characteristics of companies that produce end-use biobased products and intermediate materials. The companies included in the survey were selected from a database of nearly 2,000 companies populated by Iowa State as part of their support of the BioPreferred program. This program is part of an effort by USDA to satisfy portions of the Farm Security and Rural Investment Act of 2002 and the Food, Conservation, and Energy Act of 2008. Companies in the database produce and distribute more than 100 types of products including bath products, candles and wax melts, facial care products, intermediate feedstocks, multipurpose cleaners, gasoline fuel additives, graffiti and grease removers, laundry products, disposable tableware, hydraulic fluids, sorbents, and animal repellants.

Companies responding to the survey were very diverse, ranging from large multinational corporations to small start-ups. About one-third of the respondents had five or fewer employees. Nearly half had been in business for less than ten years and nearly two-thirds had been selling biobased products for less than ten years. Nearly 80% of the companies were located in a metropolitan area, with about 40% in cities with a population less than 20,000.

The majority of the products the survey respondents sold were categorized in the chemical sector, with the greatest sub-group in the soap, cleaning compound, and toilet preparation category. Roughly half of all respondents only sold biobased products; the other half sold both biobased and non-biobased products. About two-thirds of the companies stated that biobased sales comprised 80% or more of sales. Some of the products cost less than alternative non-biobased products, but about 50% of the respondents stated their products cost 10% or more.

Introduction

The Food, Conservation, and Energy Act of 2008 (FCEA) reauthorized and expanded provisions related to the federal biobased procurement and labeling statute originally established by Section 9002 of the Farm Security and Rural Investment Act of 2002 (FSRIA) [1,2]. The statute includes provisions to encourage the procurement of biobased products by federal agencies and a voluntary biobased-labeling program. USDA refers to the programs collectively as BioPreferred.

As defined by FCEA, “biobased products” are products determined by the U.S. Secretary of Agriculture to be commercial or industrial goods (other than food or feed) that are composed in whole or in significant part of biological products, including renewable domestic agricultural materials and forestry materials or intermediate ingredients or feedstocks.

The goals of the BioPreferred program are to lessen U.S. dependence on foreign oil to improve security and decrease the trade deficit; promote economic development by creating new jobs in rural communities and new markets for farm commodities; and to improve the environment. These might occur from substitutions of petroleum-based products with biobased equivalents, by incorporating improvements over petroleum-based products, or by the development of entirely new products.

Federal agencies are required to give preference to BioPreferred-designated biobased products when the biobased product is reasonably available, reasonably priced, and comparable in performance. The development of a list of items (or generic groupings of biobased products) for preferred procurement is a core element of the BioPreferred program. Once an item is designated, every manufacturer/vendor producing and marketing products that fit within that designation can claim preferred procurement status for their products when marketing to federal agencies.

For the purposes of this study, the definition of a biobased product was further constrained to new-use products. Mature market products (e.g., cotton shirts) are not included in the current analysis since many do not consider these types of products as part of a new bioeconomy. Items like cotton shirts were developed in the marketplace because of basic consumer demand for the product and not as a mechanism to reduce U.S. dependency on oil, help rural economies, or improve the environment.

As defined by USDA, mature markets generally refer to items sold prior to 1972 [2]. Some companies that sold products that were available prior to 1972 are still included in the BioPreferred database and were included in the survey for two reasons. First, the database used for the survey includes companies that have not yet been analyzed in-depth by USDA to determine when the products were initially sold and whether they should receive preferred preference under the BioPreferred program. The number of companies that fall into this category is fairly small since the products that were analyzed first by USDA included those items that were sold by a significant number of companies. Second, USDA still considers some products sold prior to 1972 as acceptable for preferred procurement because information gathered indicated that these products did not constitute a significant portion of the market, and therefore would still qualify for preferred procurement.

End-use biobased products are defined as items sold directly to end-use consumers (point of purchase) or business-to-business sales. Business-to-business sales might include transactions where only minor modifications to the product are made (e.g., repackaging) or wholesale distribution of end-use products. End-use biobased products include all products that are not categorized as a biofuel or biochemical.

In this report, biochemicals refers to non-fuel chemicals made from biobased feedstocks that are predominantly considered to be new uses. As such, items like high-fructose corn syrup are not included in this definition, nor are products like biobased pharmaceuticals and others that do not use agricultural feedstocks. What remains within the definition used here are commodity chemicals or intermediates that use a biomass feedstock as opposed to a petrochemical feedstock. Some of these biochemicals could also be classified as end-use products (e.g. biobased 1,3-propanediol). The recent Farm Bill specifically refers to intermediate ingredients that “are or can be used to produce items that will be subject to the preference” targeted by the BioPreferred program. These may be commercial or industrial products [1].

Since the definition of biobased products is not easily defined nor universally understood, the following definition was developed for use in the survey conducted in this work:

“A biobased product is a commercial or industrial product other than food or feed that is made from biologically-based materials, such as plant or animal products, and that traditionally has been made from other kinds of materials. This includes products like chemicals that are plant-based rather than petroleum-based, or like clothing made from corn or hemp. Biobased products are sometimes referred to as “green” products.”

In 2008, ISU had identified over 12,400 biobased products produced or sold by nearly 2,000 manufacturers and distributors.

Survey Methodology

In 2008 Iowa State University’s Center for Survey Statistics and Methodology was contracted by CIRAS to conduct a telephone survey of manufacturers and distributors of biobased products.

A questionnaire was developed that covered a variety of topics associated with the size of the companies and constraints to growth. The survey was purposely kept short in an attempt to achieve a high response rate.

A telephone survey was conducted to maintain a consistent focus on biobased products, per the definition. Interviewers were able to clarify the definition when needed and to probe for whether the company was actually involved in the biobased products industry.

There is currently no available listing of all companies involved in the biobased products industry. As a result, the sample for this project was a convenience sample developed by ISU through support of the USDA BioPreferred program. The sample consisted of a list of 1,956 companies that identified themselves in promotional materials or on their websites as either

manufacturing or distributing biobased products. The sample consisted primarily of U.S. companies. If a company was composed of two or more establishments, only a single establishment was included. This was typically the company headquarters.

The survey included only companies in predominantly English-speaking countries because of a potential language barrier between the interviewers and the company personnel. Specifically, companies in the United States, Canada, Australia, and United Kingdom were interviewed; 1,938 of the total.

Advance letters were sent to the sampled companies prior to data collection to explain the purpose of the research and to notify them that a research interviewer would be contacting them to conduct an interview. Approximately 150 of those letters were returned as undeliverable. Additional efforts were made to locate new addresses.

Attempts were made to call all sampled companies with an available telephone number. When no contact name was available, attempts were made to locate someone in the firm who was knowledgeable about biobased product lines. Anywhere from eight to sixteen unsuccessful call attempts were made before companies were removed from the calling queue.

Of the original 1,938 businesses in the sample, 518 were classified as either not eligible for a variety of reasons, no personal contact could be made with the company, or a working telephone number was not available.

There were 297 businesses deemed ineligible. These included businesses that were verified as closed or merged with other firms, duplicate listings, exclusively involved in research and development, or planning to manufacture in the future but are currently in developmental stages. A few of the businesses manufactured biologically-based products that were excluded from the study by definition, either because all of their products are food, feed, or pharmaceuticals or because all of their products are mature products like wooden pallets, wood flooring, or standard compost. The largest portion of ineligible businesses simply stated that they do not manufacture or distribute any biobased products, based on the study definition.

There was no personal contact with 103 of these cases; only answering machines or ringing numbers. They were removed after a maximum number of calls were made.

There were 118 businesses that did not have a working telephone number available. Some of these businesses may have closed or merged with other companies, but their actual status is unknown. Some are operating businesses but no phone numbers or company employees are available to the public.

A remaining sample of 1,420 companies remained, 73% of the base 1,938 businesses.

There were an additional 441 companies where personal contact was made but a survey was not completed. Some refused to complete an interview (216); a portion of these because company policy prohibited them from completing surveys. The remaining 225 involved some personal conversation with an employee. They did not actively refuse to participate, but no

interview could be conducted within a maximum number of call attempts within the data collection period.

A total of 979 distinct interviews were completed with businesses. This is 69% of the companies where personal contact was made and the company was deemed to be a manufacturer or distributor of a biobased product as defined above.

The company interviews were held from May 14 through August 29, 2008. Standard interviewing protocols were followed. Interviews were monitored at random intervals by supervisory staff to ensure proper protocols were being followed. Interviews lasted an average of 14 minutes. Since a convenience sample was used, the data was not weighted.

Business Summary

Of the total number of companies responding to the survey, 73% primarily considered themselves a manufacturer, 25% were primarily a wholesaler or retailer, and 2% classified themselves as something different. Of all respondents, 81% stated they manufactured a biobased product. Fifty percent of the companies also manufactured or distributed a non-biobased product.

Biobased Products

The respondents' biobased products were categorized into one of three broad types – end use, intermediates, and fuels. The make-up of the respondents is displayed in Figure 1. The total in the chart adds up to more than 100% because some companies sold products that fall into more than one category.

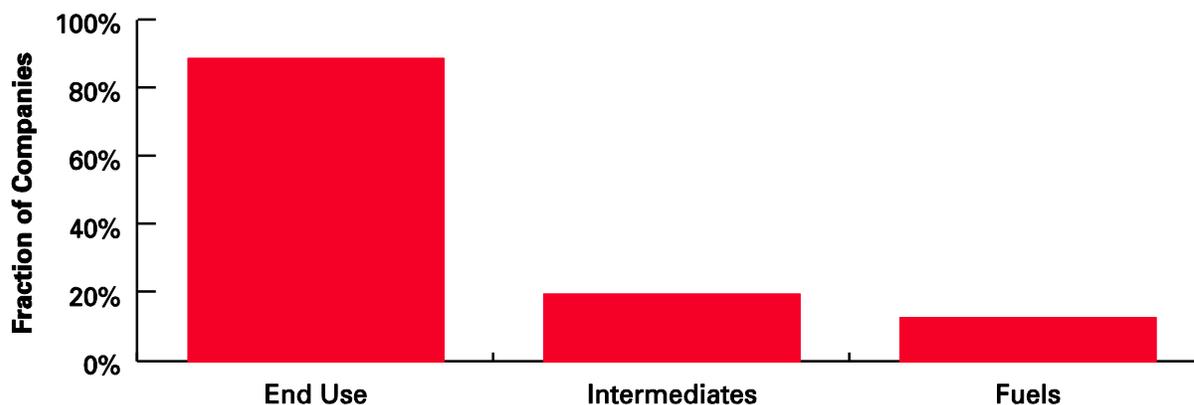


Figure 1: Products sold by biobased products companies.

The majority of the respondents sold end-use biobased products; many fewer companies sold intermediates. This is not surprising since there generally are fewer companies that produce intermediates than those that buy commodity feedstocks to produce a product. Companies

that produce intermediate chemicals tend to be larger and more established, whereas many companies that sell end-use biobased products are very small and have been in existence for a shorter period of time. In addition, ISU researchers began the search for companies that produce intermediate feedstocks after the search for end-use products began. Therefore, the survey sample likely included a lower fraction of the total number of companies that produce intermediates.

Only 13% of the respondents produced fuels, which is fewer than what might be expected given the number of ethanol and biodiesel plants in the U.S. [3]. One reason the number of respondents is low is because of how the survey list was generated. The company list did not include all of the biofuel companies since the list was generated based on the FSRIA product definition. Specifically, companies were only included if they sold fuels targeted as a fuel-additive since non-fuel products was the primary focus of the legislation. Other legislation is focused on the growth of the biofuels industry targeted to the transportation sector.

The median size of the companies that stated they produce end-use products was 10 employees. The median size of the companies that produced intermediates was 20 employees. The median size of the companies that produced fuels was 41.5 employees.

The companies were asked what primary product they sell and the corresponding three-digit NAICS category [4]. Seventy-one percent of the total were categorized as being in the chemical industry (325). See Figure 2. The top seven NAICS categories of the respondents are displayed in the figure. These top seven three-digit categories encompassed 97% of all companies that responded to the survey.

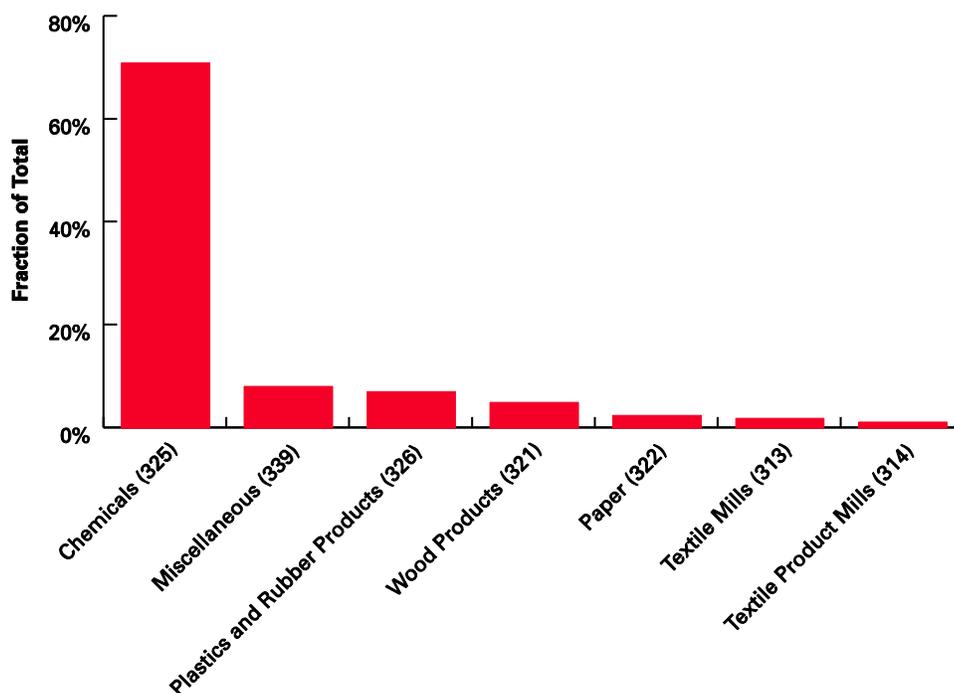


Figure 2: Top NAICS categories of survey respondents.

Information was also gathered on secondary NAICS codes. Fewer than 13% of the companies stated they sold a product with a different three-digit NAICS code than their primary product code. No significant difference in the NAICS-category distribution was observed between the primary and secondary NAICS codes. The majority of the secondary NAICS products were classified within the chemical industry.

Approximately one-third of the survey respondents provided three-digit NAICS information on their products. The remaining companies were asked additional questions in an attempt to understand their three-digit NAICS. A fraction of these provided enough additional information so that the authors were able to further classify those products to a four-digit code. The primary sub-categories of the 446 chemical companies where a four-digit code could be ascertained are displayed in Figure 3. The product descriptions associated with these four-digit NAICS are listed in Table 1.

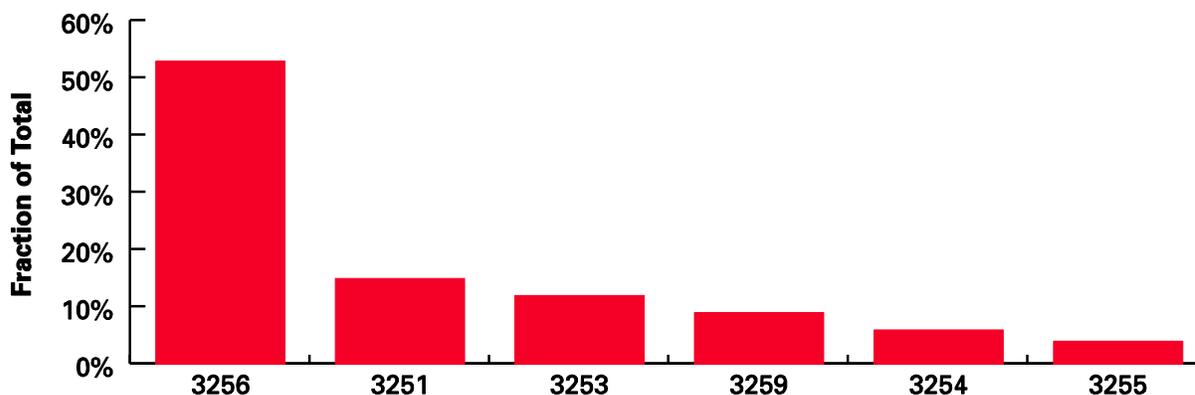


Figure 3: Products sold by chemical companies –NAICS 325.

Table 1: Four-digit NAICS code descriptions.

4-Digit NAICS	Description
3256	Soap, cleaning compound, and toilet preparation
3251	Basic chemicals
3253	Pesticide, fertilizer, and other agricultural chemicals
3259	Other chemical products and preparation
3254	Pharmaceuticals and medicines
3255	Paints, coatings, and adhesives

Company Location

Of the 979 distinct companies responding to the survey, 94% were located in the U.S., 4% in Canada, and the remaining in Australia and the U.K.

The locations of the 925 U.S. respondents to the survey are displayed in Figure 4. The region definitions are the same as the four census regions used by the Bureau of Census. For companies with multiple establishments, only the establishment that completed the survey is included in these results.

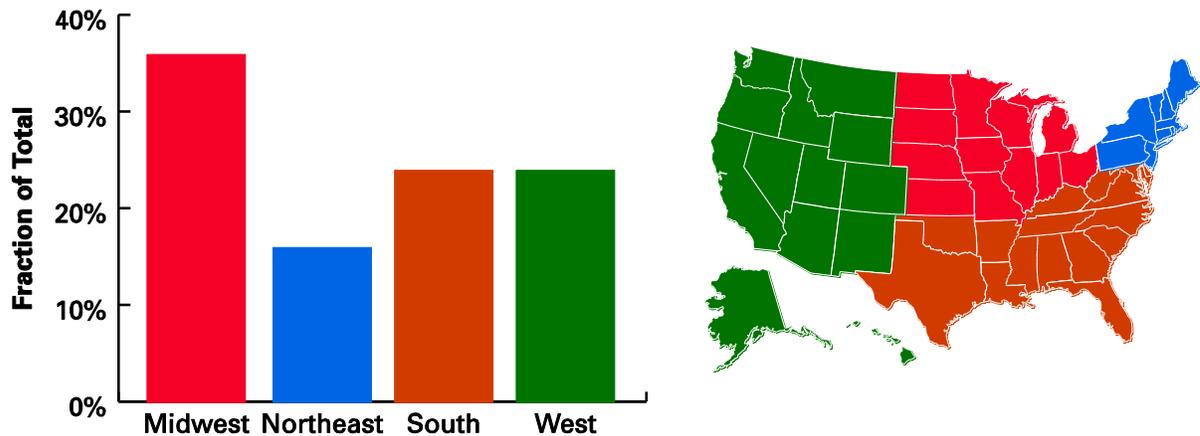


Figure 4: Location of U.S. biobased products survey respondents.

The ten states with the greatest number of respondents are displayed in Figure 5. These ten states encompass 54% of all the U.S. respondents.



Figure 5: Top 10 states responding to the survey.

The locations of the respondents were classified in two separate ways, by a rural-urban classification and by the size of the town or city where the company was located.

The RUCA, Rural-Urban Commuting Area Codes, is a designation mechanism that uses the Bureau of Census Urbanized Area and Urban Cluster definitions and commuting information to classify Census tracts [5]. The ZIP Code RUCA approximation was used to categorize each biobased product company.

Figure 6 displays the locations of the U.S. survey respondents by grouped RUCA classifications. Specifically, metropolitan includes RUCAs 1-3, micropolitan 4-6, small town 7-9, and rural 10. As evidenced by the results, the vast majority of the biobased product companies are classified as metropolitan. This means the companies are located in a county with a city with 50,000 or more inhabitants or they are located in a county where 10% or more of the inhabitants commute to an urbanized area.

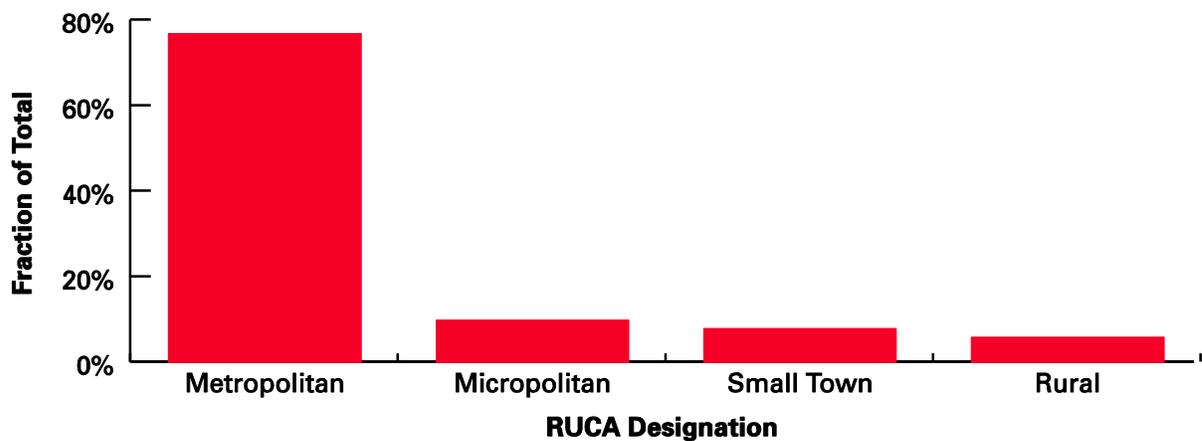


Figure 6: Location designation of U.S. biobased products survey respondents –RUCA classification.

There are strengths and weaknesses of any definition. For example, a company located in Nevada, Iowa, population 7,000, is considered a metropolitan company because of the proximity to Ames, population 51,000. Since so much of the U.S. population is classified as living within metropolitan areas, a different definition of rural and urban was investigated.

A second analysis of the respondents was conducted based on the size of the town or city where the company was located. Three broad classifications were used: Cities with 50,000 or more inhabitants, cities with 20,000-49,999 inhabitants, and cities with fewer than 20,000 inhabitants. Figure 7 displays the locations of the respondents by city size.

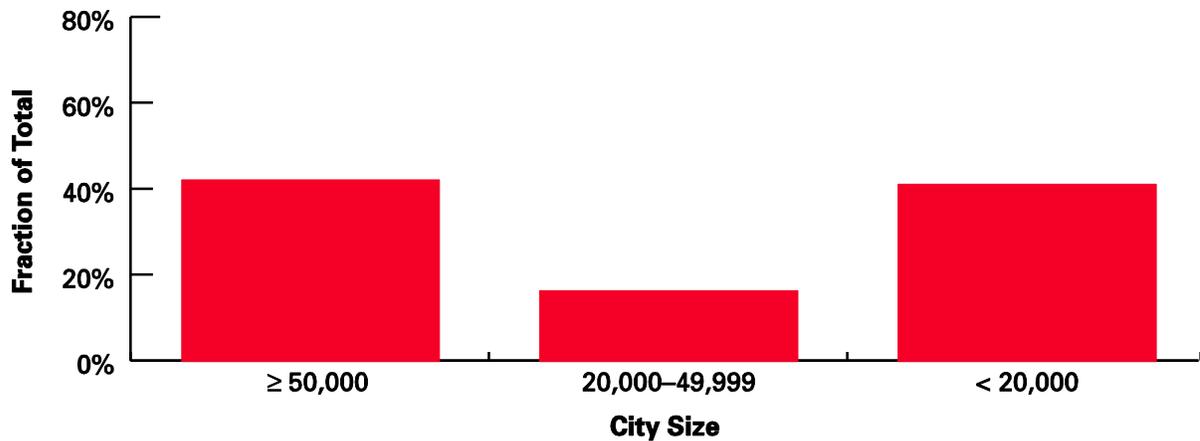


Figure 7: Location designation of U.S. biobased products survey respondents –city size.

A city-size approach has weaknesses as well. For example, a company located in Clive, Iowa, population 13,000, is designated to be within a small population city even though it is located seven miles, center-to-center, from Des Moines, population 199,000.

Company Age

Figure 8 displays information on the length of time in business of the survey respondents. More than 40% of the total had been in business for ten years or less; two-thirds for less than twenty years.

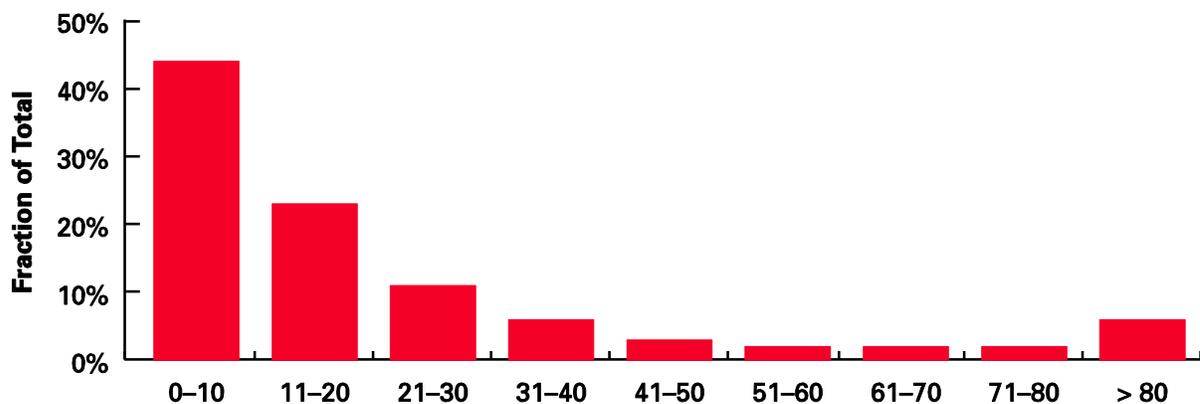


Figure 8: Age of biobased product companies (years).

Figure 9 displays the length of time the respondents had been producing or distributing biobased products. Nearly two-thirds of the companies had been selling biobased products for less than ten years; over 86% for less than twenty years. Only 4% had been selling a

biobased product for more than 50 years, though 13% had been in business for that length of time.

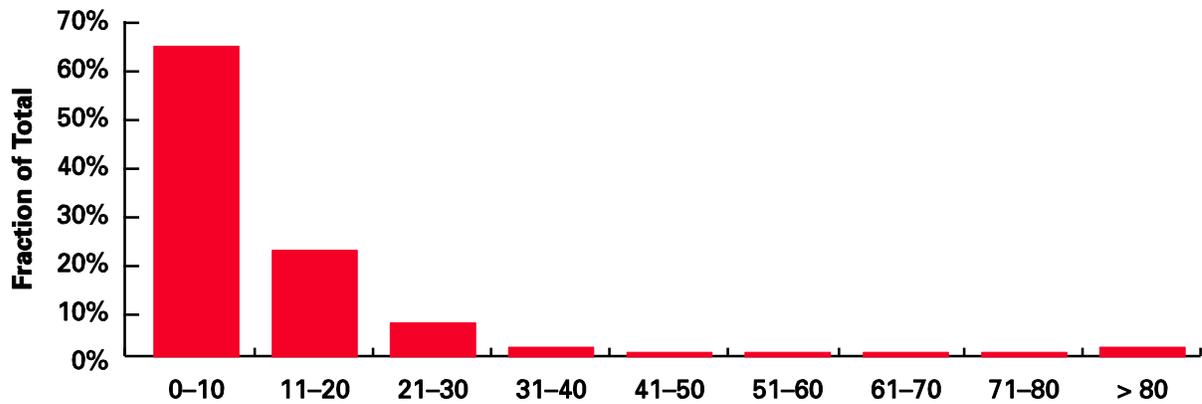


Figure 9: Length of time selling biobased products (years).

It is not surprising to find such a small number of companies selling biobased products for more than fifty years. As discussed earlier, the BioPreferred database was developed with a focus on new-use biobased products.

Company Size

The size of the companies responding to the survey is displayed in Figure 10. One-third of the companies had five employees or fewer. Nearly two-thirds had twenty employees or fewer.

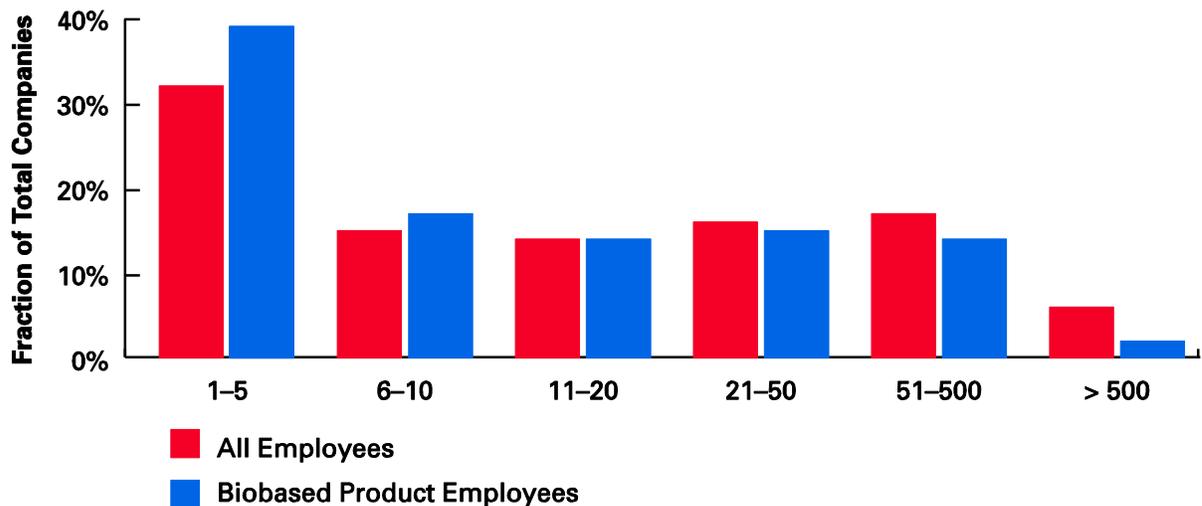


Figure 10: Number of employees at biobased product companies.

The companies were also asked how many of their employees, including support staff, contributed to the production or distribution of biobased products. See Figure 10. Two of every five companies had five employees or fewer working with biobased products. Fewer than 3% of the respondents to this question stated they have 500 or more employees working on biobased products.

Of the 923 companies that gave a number of biobased employees, the combined number of biobased employees exceeded 54,000. Of these, nearly 48,000 were in companies that primarily considered themselves a manufacturer. The remaining companies were wholesalers, retailers, product developers, or something else. Ten percent of the companies employed seventy-seven percent of the total number of biobased employees reported.

Of all surveyed companies, 903 provided information on the age of the company, the length of time selling biobased products, the total number of employees, and the number of employees involved with biobased products. The number of companies (by fraction of total) and the size of companies, and how these vary with the length of time they have been in business, is displayed in Figure 11. As expected, the median size of the companies and the number of employees working on biobased products tend to increase as the company age increases.

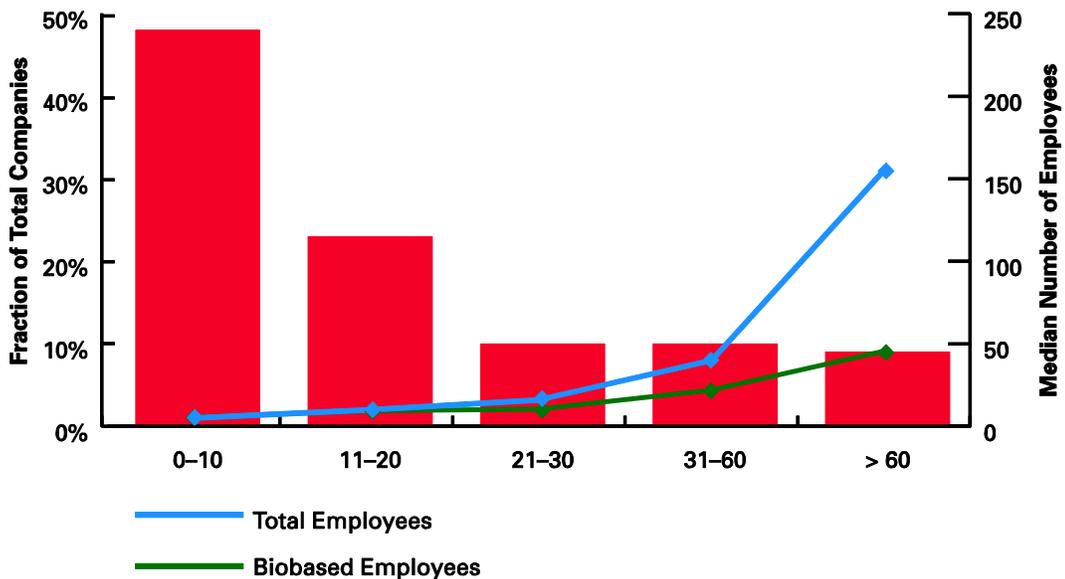


Figure 11: Variation of employment size with company age (years).

Biobased Sales

Figure 12 displays the fraction of the companies' total sales attributed to biobased products. Two-thirds of the respondents stated that 80% or more of their sales came from biobased products. Conversely, 23% of the companies reported less than 40% of their sales to be from biobased product lines.

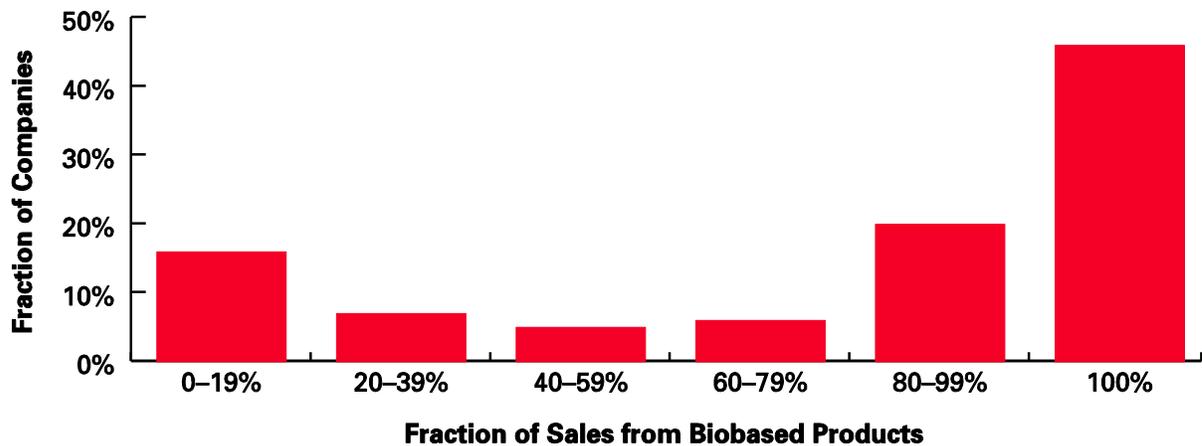


Figure 12: Company sales from biobased products.

Fraction of sales from biobased products, employment levels, and employment associated with biobased products was provided by 861 of the survey respondents. The variation in the median number of biobased employees with company dependency on biobased product sales is displayed in Figure 13. Companies that were more dependent on biobased product sales for their sales revenue tended to be smaller. Companies that had been in business longer tended to be larger and added biobased product lines to their existing non-biobased product lines.

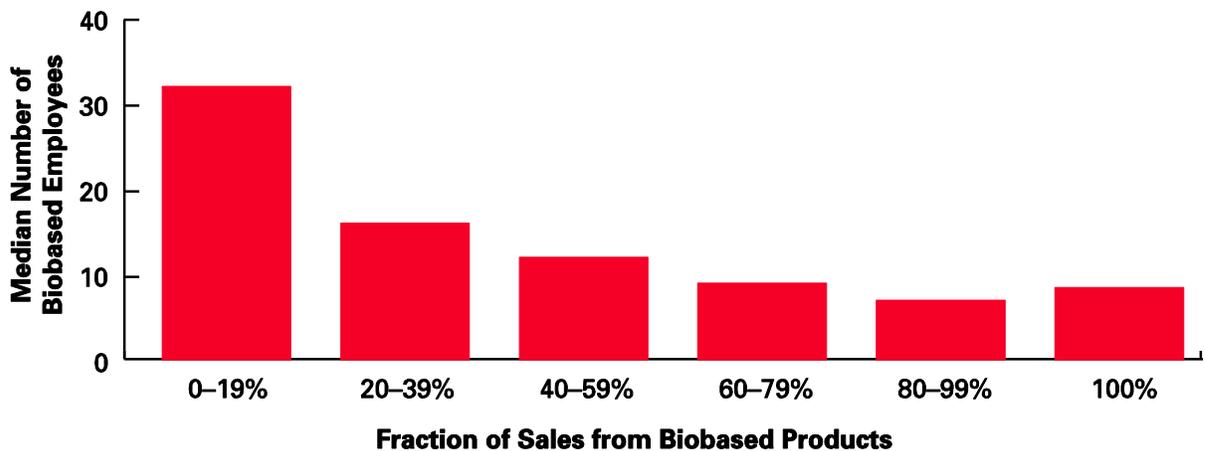


Figure 13: Size variation with sales focus.

The respondents' methods for selling biobased products were categorized into one of three broad types – business-to business (B-to-B), direct to the final customer, or through a distributor. The make-up of the respondents is displayed in Figure 14. The total in the chart adds up to more than 100% because some companies sold products through multiple channels. The companies that reported direct sales included companies that sold through a storefront, over the web, at public events, etc.

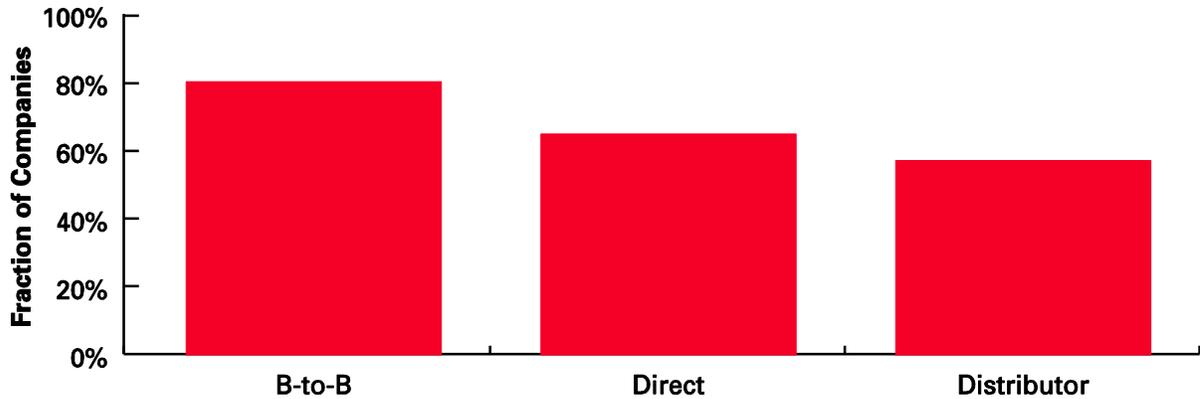


Figure 14: Methods used by companies to sell their products.

The respondents were asked to compare the price range of their primary biobased product to the non-biobased alternative. As seen in Figure 15, about one third of the companies sold their primary biobased product at about the same cost as a non-biobased product. However, 44% of the companies were selling their product for over 10% more than the comparable non-biobased product.

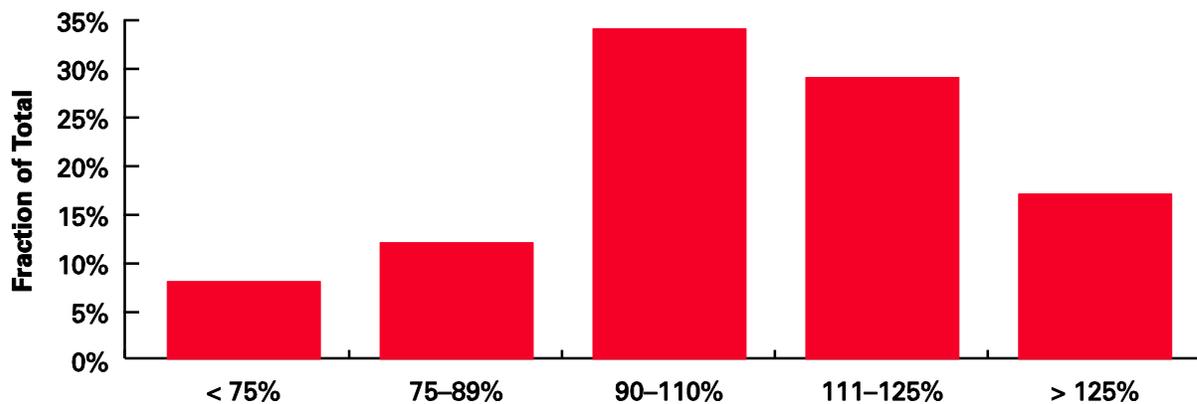


Figure 15: Price of biobased products compared with conventional products.

The companies were asked the reasons why customers buy their biobased products. The responses are displayed in Figure 16. Environmental benefit and performance were the top reasons given, with about 90% of the companies responding in the affirmative for each.

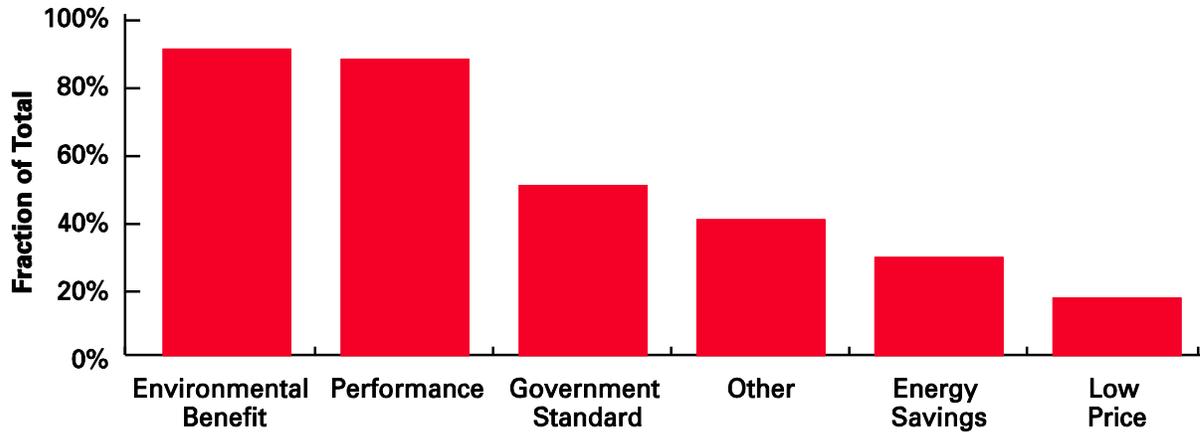


Figure 16: Top reasons given why customers buy biobased products.

Limitations to Growth

Figure 17 displays the level of importance given to various items that were limiting the growth of the companies. Except for transportation, the average rating for each of the limiting factors was below three on a one-to-five scale. The survey was conducted in the summer of 2008, when the price of petroleum and fuel, and the cost of commodities, particularly corn and soybeans, was still very high relative to historic levels. This may have elevated the ratings for transportation and raw material costs over what might otherwise have been expected.

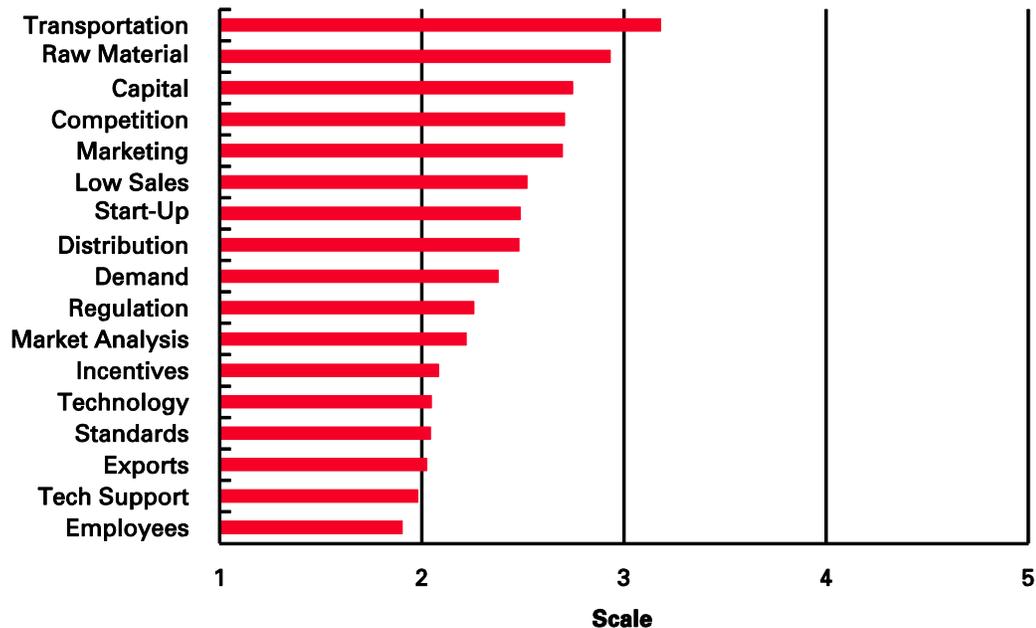


Figure 17: Factors limiting the growth of biobased products companies.

After the basic data were summarized, a more in-depth analysis was completed to see if there were any characteristics that surfaced between different types of companies.

Characteristics – High/Low Price

The responses were analyzed to determine if there were any distinguishing features between companies that primarily sold products at a high price compared to the alternative (>110%) and those companies that primarily have lower priced products (<90%).

Compared to companies that primarily sold higher priced biobased products, companies that sold at a low price had been in business for a slightly shorter time. No significant difference was noted between the two groups in the median number of years they were selling biobased products.

The typical low-price company had a slightly higher fraction of their overall sales from biobased products. The fraction of companies that reported overall sales or biobased sales to be growing was similar for both groups with slightly more of the high-price companies reporting growth.

The median number of biobased employees at the low-price companies was fifteen compared with a median of six employees for the high-price companies.

Not surprisingly, 65% of the companies that were selling at lower prices than the alternatives gave low price as a reason their products were purchased versus 1% of the companies selling at higher prices. Companies selling at lower prices also cited government standards and energy savings as reasons why their products were purchased. There was little difference between the two groups in regard to environmental benefits or performance standards.

There were few differences in average scores for the factors limiting growth. Companies selling at low price tended to give higher scores to lack of government incentives and regulations. Companies selling at higher prices tended to give higher scores to low sales, standards, and cost of feedstocks.

Characteristics – Small/Large Size

The responses were analyzed to determine if there were any distinguishing features between small companies and large companies. Small companies were defined as those with 50 or fewer employees and large companies, more than 50 employees. The median size of the group of small companies was seven employees versus 185 employees for the large companies. The median number of biobased employees of the small companies was six employees versus 95 for the large companies.

The average time in business of the group of small companies was 15 years compared to 49 years for the large companies. The average length of time the small companies had been selling biobased products was 11 years compared to 21 years for the large companies.

The typical small company had a higher fraction of their overall sales from biobased products. The fraction of companies that reported overall sales or biobased sales to be growing was similar for both groups with slightly more of the large companies reporting growth.

No significant difference was noted between the two groups in the fraction of companies that sold at low price and those that sold at a high price.

There was little difference between the two groups in regard to reasons given for why their products were purchased. A higher fraction of the large companies gave standards as a reason.

There were a number of differences in average scores between the two groups for the factors limiting growth. Small companies tended to give higher scores to low sales, access to capital, poor connection to distribution channels, lack of government incentives, lack of start-up funds, need for marketing, and transportation costs. Large companies gave higher scores to government regulations, cost of feedstocks, and technology.

Characteristics – Metro/Non-Metro Location

The responses were analyzed to determine if there were any distinguishing features between companies in metro areas versus non-metro areas, according to the RUCA classification. Metro companies with a zip code in an area with a RUCA less than four were defined as metro. Companies with a RUCA greater or equal to four (micropolitan, small town, rural) were defined as non-metro.

The average time in business of the group of metro companies was 25 years compared to 17 years for the non-metro companies. The average length of time the metro companies were selling biobased products was 14 years compared to 11 years for the non-metro group.

The typical non-metro company had a slightly higher fraction of their overall sales from biobased products. The fraction of companies that reported overall sales or biobased sales to be growing was similar for both groups with a slightly larger fraction of the metro companies reporting sales growth.

There was a substantial difference between the two groups regarding sale price compared to the alternative. Only 16% of companies in the metro group sold products classified as low price (< 90% of alternative). This compares with 36% of non-metro companies. Of the metro companies, 49% stated their products were high price (>110% of alternative). This compares to 34% of non-metro companies.

No significant difference was noted between the two groups in the median number of employees or the median number of employees involved with biobased products.

There was little difference between the two groups in reasons given for why their products are purchased. A higher fraction of the non-metro companies gave low price as a reason, which aligns with the data on price comparison to alternatives.

There were few differences in average scores for the factors limiting growth. Metro companies tended to give higher scores to product standards. Non-metro companies gave higher scores to access to capital, access to export markets, cost of feedstocks, and transportation costs.

Conclusions and Recommendations

The biofuels sector has received considerable attention from federal and state legislators and the media, and the industry has seen substantial growth over the past decade. On the other hand, the end-use biobased products sector has received much less attention, partly because information about the sector is limited. This work provides a snapshot of the industry in 2008, resulting from a survey of nearly 1,000 companies that sell biobased products.

Companies responding to the survey were very diverse, ranging from large multinational companies to small start-ups. About one-third of the respondents had five or fewer employees. Nearly half had been in business for less than ten years and nearly two-thirds had been selling biobased products for less than ten years. Nearly 80% of the companies were located in a metropolitan area; about 40% in cities with a population less than 20,000.

Nearly half of the respondents only sold biobased products, the other half sold both biobased and non-biobased products. About two-thirds of the companies stated that biobased products comprised 80% or more of their sales. Some of the products cost less than alternative non-biobased products, but nearly half of the respondents stated their products cost 10% or more.

Since a convenience sample was used in this pilot study, definitive, detailed conclusions should be avoided. That said, since such a high fraction of companies where contact was made completed the survey (69%), since the biobased product companies in the sample were the result of a nearly five-year effort to locate biobased product companies, and because of the authors' personal knowledge of the industry, it is felt that the results accurately describe high-level characteristics of the industry.

As a more accurate compilation of the companies in the industry becomes available and additional companies are removed from the BioPreferred database that do not meet the definition of new-use biobased products, more accurate analysis techniques can be explored. Improvements to the survey tool can also be incorporated. For instance, a more accurate description of who would or would not be considered a biobased employee should be developed. Also, since it is difficult for a single person to accurately respond to a wide variety of questions, sending a copy of the survey with definitions in advance of the phone interviews might improve accuracy and completeness.

The BioPreferred program was developed to help improve biobased products companies' access to federal markets [2]. Since that time, a variety of state programs have been developed to further enhance markets [6,7,8,9,10]. Future surveys might incorporate questions to attempt to ascertain the effectiveness of these various programs.

As more detailed analyses of the biobased products sector are completed and disseminated, it is hoped that a better understanding of the industry will lead to the development of improved

policies and economic development strategies, enhanced awareness of the industry by procurement officials, and a subsequent growth in the industry.

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