Economic Linkages of the U.S. Greenhouse and Nursery Products Industry[1]

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Abstract

The greenhouse and nursery products sector is a growth industry. Economic linkages of this growth industry to other sectors of the national economy are of interest. The total economic activity generated by the greenhouse and nursery products sector is approximately equally divided between economic activity derived from input purchases by the greenhouse and nursery products sector (backward linkages) and processing and distribution of output by the greenhouse and nursery products sector (forward linkages).

Index words: interindustry, input-output, backward linkages, forward linkages, economics

Significance to the Nursery Industry

Five and half billion dollars ($5.5 B) in economic activity was generated nationally from business activity associated with the greenhouse and nursery products industry in 1977. Of this total, $2.5 billion or 45 percent was economic activity generated from the input purchases of the greenhouse and nursery products sector (backward linkages). Economic linkages generated by the processing and distribution of output from the greenhouse and nursery products sector amounted to $3.0 billion or 55 percent of total economic activity (forward linkages).

For final demand sales (final demand sales are classified as sales to households, government, and exports), the largest sales at both the farm and retail level were to private individuals followed by sales to state and local government. The greenhouse and nursery products industry was a net exporter with total exports of $194.5 million and imports of $147.3 million.

Results show that the greenhouse and nursery products industry, unlike the total national food and fiber industry, had approximately equal proportionate share of economic activity between backward and forward linkages. Therefore, as output of the greenhouse and nursery products sector expands to meet increased final demands, impacts to both input suppliers and output processors and distributors will be somewhat equal.

Introduction

In 1987, the Census of Agriculture estimated that 37,298 farms were producing greenhouse and nursery crops, up five percent from 1982 totals (16). These farms in 1987 had sales of $5.8 billion in flowers, plants, and other related products which was an increase of 51 percent over sales in 1982. In addition, the Census of Retail Trade reported sales of retail nurseries and lawn and garden supply stores amounted to $2.9 billion in 1982 compared to $4.8 billion in 1987 (sales reported in real dollars where Implicit Price Deflator for Gross National Product in 1982 = 100) or a 66 percent increase in five years (17). Given increased population and disposable income along with changes in consumer demand for horticultural products, the greenhouse and nursery products sector should realize continued increase in demand for their output (9).

Most economic studies covering the greenhouse and nursery products industry have concentrated in two areas: 1) estimation of efficient farm level operations in greenhouse and nursery products sector; and 2) estimation of demand factors at the wholesale and retail trade level. Research at the farm level has concentrated on costs of production (1, 2, 3, 6) with limited studies associated with the financial aspects of greenhouse and nursery management. Sabota (11) used linear programming procedures to derive optimal plant and container sizes for Illinois nurseries to give alternative production scenarios and input requirements. Hall (7) used linear programming procedures to derive optimal product mix for a woody landscape nursery subject to meeting alternative monthly cash flow constraints. Willis and Willis (19) employed multiple objective analysis and nearly optimal linear programming procedures to derive alternative firm level production plans. Willis and Willis (19) argue that nearly optimal solution analysis gives greenhouse and nursery decision makers more information to decide which firm level operation to employ compared to a single optimal solution from standard linear programming procedures.

Research at the wholesale and retail level of the greenhouse and nursery products industry has focused on the influence of socioeconomic variables and product characteristics on the demand for greenhouse and nursery products and assessing target markets for retail greenhouse and nursery product establishments. Gineo (4) identified product attributes of nursery stock sales from the wholesaler to retail garden center and landscaper levels. In a later study by Gineo and Omamo (5), determinants of household expenditures were estimated for nursery products and their specific impacts on different subregions of the nation. Turner and Dorfman (13) derived target markets for different types of

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landscape plant retail outlets. Their results showed that different landscape plant retail outlets have different target markets.

With expansion of the greenhouse and nursery industry at the farm and retail levels, studies to examine the economic linkage of the greenhouse and nursery sector among other sectors in the national economy are of interest. The primary objective of this paper is to measure and evaluate the backward and forward economic linkages of the greenhouse and nursery sector with other sectors in the national economy. In pursuit of this objective, this paper is divided into three sections. First, a discussion of backward and forward linkages using interindustry analysis is presented. Second, estimation of backward and forward linkages of the greenhouse and nursery sector through the national interindustry model is made. Finally, implications of these economic linkages by the greenhouse and nursery products sector to the national economy are presented.

Methods and Materials

Interindustry or input-output analysis was developed by Wassily Leontief in the 1930's (10). Input-output analysis derives the economic interrelationships and linkages between sectors in an economy. Therefore, input-output analysis can be used to estimate the overall economic impacts from increased purchases of inputs (backward linkages) or increased sales of output (forward linkages) by a selected sector.

For this paper, input-output analysis was used to derive backward and forward linkages of the greenhouse and nursery products sector. Establishments primarily engaged in the production of landscape plants and other nursery products, such as bulbs, florists greens, flowers, trees and shrubs, flower and vegetable seed and plants, and sod grown undercover or outdoors are classified in the greenhouse and nursery products sector (18). The 1977 national interindustry model (15) was used to derive the economic interrelationships between sectors of the national economy and the Economic Research Service of the U.S. Department of Agriculture constructed final demand vectors for the greenhouse and nursery products industry. Given the national input-output model and final demand vectors, backward and forward linkages of the greenhouse and nursery products sector was derived following procedures outlined by Henry and Schluter (8).

Results and Discussion

Backward and forward linkages for the greenhouse and nursery products sector are presented in Table 1. Five and a half billion ($5.5 B) in economic activity was generated nationally from business activity associated with the greenhouse and nursery products sector in 1977. Of this total, $2.5 billion or 45 percent was economic linkages generated from input purchases by the greenhouse and nursery products sector (backward linkages). Backward linkages are defined as economic activity by sectors other than the greenhouse and nursery products sector necessary to meet the input purchases by the greenhouse and nursery products sector. Economic linkages associated with the processing and distribution of output (forward linkages) by the greenhouse and nursery products sector had a larger share accounting for 55 percent (approximately $3.0 billion) of total economic activity attributable to the greenhouse and nursery products sector. Forward linkages are defined as activities associated with economic sectors other than the greenhouse and nursery products sector necessary to process and distribute the output of the greenhouse and nursery products sector.

The overall linkage amounts and shares are of interest but sector level linkage activity gives insights as to the economic interrelationships of the greenhouse and nursery products sector with other sectors in the national economy. For ex-

Table 1. Backward and forward linkages of the greenhouse and nursery products sector, 1977.

Sector	Economic Activity ($1,000,000)	Backward Linkages ($1,000,000)	(Percent)	Forward Linkages ($1,000,000)	(Percent)
Agriculture, Forestry, & Fisheries	43.4	28.3	65.20	15.1	34.80
Metal Mining	8.4	7.0	83.54	1.4	16.46
Petroleum & Natural Gas Mining	298.6	238.4	79.81	60.3	20.19
Other Mining	36.6	30.5	83.36	6.1	16.64
Construction	109.6	59.4	54.22	50.2	45.78
Food, Feed, & Tobacco Products	45.3	26.0	57.37	19.3	42.63
Textile Products & Apparel	33.5	25.6	76.24	8.0	23.76
Wood Products & Furniture	21.4	11.5	53.78	9.9	46.22
Paper, Printing, & Publishing	113.5	65.4	57.58	48.2	42.42
Chemicals & Chemical Products	680.7	657.6	96.62	23.0	3.38
Petroleum & Coal Products	407.4	330.0	81.01	77.4	18.99
Rubber, Plastics, & Leather	69.5	54.5	78.46	15.0	21.54
Stone, Clay, & Glass Products	36.9	29.8	80.86	7.1	19.14
Primary & Fabricated Products	123.7	86.1	69.61	37.6	30.39
Machinery, Except Electrical	55.5	40.6	73.11	14.9	26.89
Electrical Equipment and Supplies	30.5	20.1	65.88	10.4	34.12
Transportation Equipment	27.3	9.9	36.27	17.4	63.73
Other Manufacturing	16.6	8.3	50.04	8.3	49.96
Transportation & Trade	2,360.2	283.3	12.00	2,076.9	88.00
Utilities	155.1	104.3	67.23	50.8	32.77
Services	804.6	363.9	45.23	440.7	54.77
Government Enterprises	42.6	19.8	46.44	22.8	53.56
TOTAL	5,521.1	2,500.4	45.29	3,020.7	54.71

ample, $680.7 million in output of the chemical and chemical products sector was required to support the economic activity of the greenhouse and nursery products industry. Of that total, 97 percent or $657.7 million was used to support production levels or input purchases of the greenhouse and nursery products sector. This backward linkage was the economic activity generated by the purchases of chemical fertilizers, pesticides, and other uses of chemical inputs by the greenhouse and nursery products sector. However, all linkages to the chemical and chemical products sector were not backward. Approximately $23 million or three percent was used to support the processing and distribution activities (forward linkages) of the greenhouse and nursery products sector.

As with the chemical and chemical products sector, it seems that for some sectors all linkages should be backward or forward. However, this did not occur for any of the national economic sectors. The transportation and trade sector had approximately $2.4 billion in sales related to the greenhouse and nursery products sector. Approximately 12 percent of its output supported production or input purchases by the greenhouse and nursery products sector while 88 percent supported the processing and distribution of the output by the greenhouse and nursery products sector.

The transportation and trade sector had the largest economic linkage activity of all the national sectors of $2.4 billion. Conversely, the metal mining sector had the lowest linkage value of $8.4 million.

As shown in Table 1, all sectors in the national economy have linkages with the greenhouse and nursery products sector. Therefore, as the greenhouse and nursery products sector expands production, processing, and distribution activities in the future, all sectors in the national economy will be impacted. The impacts from the greenhouse and nursery products sector are realized in two ways: linkage effects (Table 1) and size of final demand (Table 2).

Linkage impacts have been examined earlier, but importantly these linkages will expand as final demand at the farm and retail levels increase. Henry and Schluter (15) found that for the national food and fiber industry, backward linkages accounted for only 11 percent of nonfarm business activity. However, for the greenhouse and nursery products industry, backward linkages proportionate share was 45 percent (Table 1). The larger proportionate share of backward linkage for the greenhouse and nursery products sector was due to stronger interdependencies of the greenhouse and nursery products sector has with input suppliers than the overall food and fiber industry. Therefore, with expansion of production levels by the greenhouse and nursery products sector, sectors which act primarily as suppliers of input to the greenhouse and nursery products sector will also benefit.

From Table 2, personal consumption expenditures for output from the greenhouse and nursery products industry was the largest of the selected final demand sectors. The dominance of personal consumption expenditures was evident at both the farm and retail level. Also from Table 2, the greenhouse and nursery products industry was a net exporter with total exports of $194.5 million and imports of $147.3 million. Imports and exports for the national model are trade between the U.S. and foreign countries. Interestingly, purchases by state and local governments both at the farm and retail level are quite sizeable. With expenditures by local and state governments to enhance parks, highways, and office buildings forecasted to increase in the future (14), the impacts of demand from the state and local government on the greenhouse and nursery products sector will continue to be sizeable. Unlike the results for the food and fiber industry (8) where forward linkages dominated economic activity, forward linkages of the greenhouse and nursery products sector are larger than backward linkages but do not dominate (55 percent versus 45 percent) to the same degree as for the entire food and fiber industry.

Personal consumption expenditures at both the farm and retail level dominated final demand sales. Given the forecasts for continued increases in personal consumption of greenhouse and nursery products, both forward and backward linkages will be impacted. Imports of farm level greenhouse and nursery products have increased because of lower production costs, especially labor and energy costs in the exporting countries (14). This increase in imports at the farm level reduced both forward and backward linkages. Policies which enhance both production levels and production efficiencies by the U.S. farm level greenhouse and nursery products sector will not only increase the competitiveness of the U.S. greenhouse and nursery products sector but will also yield larger economic impacts to sectors outside the greenhouse and nursery products sector because of strengthened backward and forward linkages. Lastly, unlike the national food and fiber industry, policies which enhance both farm and retail levels of the greenhouse and nursery

Table 2. Final demand of greenhouse and nursery products system, selected elements, 1977.[z]

Input-Output Sector	Personal Consumption Expenditures	Exports	Imports	State and Local Governments	Sector Type
	($1,000,000)				
Greenhouse and Nursery Product Sector[y]	1,499.3	78.2	147.3	156.3	Farm Level
Transportation and Trade Sector[x]	1,433.9	116.3	0.0	212.5	Retail Trade-Processing

[z] Source of final demand estimates by Schluter (12).

[y] Final demand sales of greenhouse and nursery products at the farm level.

[x] Final demand sales of greenhouse and nursery products at the transportation and trade level.

products industry will yield expansion in national economic activity. This occurs because of approximately equal proportional share of backward and forward linkages in the greenhouse and nursery products industry.

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