:CONOMICS
FORMATION
REPORT

AN ANALYSIS OF OPPORTUNITIES
FOR CANNING GREEN BEANS
IN THE SOUTH

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PREFACE

This report is the first in a series on processing vegetables in the South. It uses information on costs and returns from processing green beans to derive estimates of plant investment values. It is a cooperative effort of the Department of Economics, North Carolina State University, and the Marketing Economics Division, Economic Research Service, United States Department of Agriculture.

The data used to estimate costs of processing green beans are the same as those published in <u>Planning Data for Marketing Selected Fruits and Vegetables in the South: Part I--Canning Handbook</u>, Southern Cooperative Series Bulletin No. 146. This report was prepared by the SM-30 Regional Technical Committee in which the following agencies participated: the Agricultural Experiment Stations of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee and Texas and the Marketing Economics Division, Economic Research Service, U. S. Department of Agriculture.

ACKNOWLEDGMENTS

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AN ANALYSIS OF OPPORTUNITIES FOR CANNING GREEN BEANS IN THE SOUTH

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Introduction

The possibility of a larger complex for processing fruits and vegetables in several southern states has received considerable attention over the last several years from state and local agencies interested in industrial development. The possibility of having another outlet to market the raw product is also attractive to green bean producers now selling to the fresh market. Farmers in rural areas of the South have experience in growing fruits and vegetables, but most of their products have been marketed fresh. The transition from a fresh market to a processing market orientation is not considered by industry promoters to be a serious obstacle to the development of a processing industry.

The hypothesis has been stated that once a processing plant is constructed and ready for operation in a given area, the raw product will be available at a price mutually acceptable to producers and processors. Little evidence is available to test this hypothesis since there has been very little investment in modern processing plants in the southern states. It is known that obtaining quantities of raw product sufficient to operate at capacity over the season at a mutullly acceptable price is one of the most difficult problems confronting plant managers.

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The relatively small size of operations and outdated technologies are undoubtedly responsible for a large part of the procurement problem since their ability to pay prices for raw product comparable to prices paid by larger, more efficient plants in other producing areas or prices received by local producers on the fresh market is impaired. Whether a modern plant large enough to gain the economies of large size operations and to pay comparable prices for raw products can operate profitably in the South is an important question which this study will evaluate.

The evaluation of the profitability of modern large scale processing operations in the South can be approached by assuming that local producers are willing to produce for a processor at either local fresh market prices or at prices paid by processors in other major processing areas. In this study, raw product prices comparable to prices paid by processors in major producing areas are considered sufficient to induce producers to provide processors with needed raw products. In this pricing framework, a processing activity is considered profitable only if it yields a positive net investment value within a specified period of time.

Historical production and consumption trends in the South and the U. S. are presented in the first section of this report. Also, trends in fresh and processed consumption are analyzed for the purpose of determining the extent of the southern and national markets. Costs and returns from processing green beans and plant investment values at selected raw and finished product prices assuming a 10 percent rate of return are then presented.

<div align="center">The Green Bean Situation</div>

Production Aspects

U. S. production of green beans for the fresh and processed markets during the 1960's is presented in Table 1. Harvested acres and production for the fresh market since 1965 have been slightly lower than during the 1961-65 period. Prices have been slightly higher in 1966-68 than during the 1961-65 period.

Harvested acreage and production for processing increased during the 1966-68 period. This suggests that there has been a shift nationally

Table 1.   U. S. acreage, production and average price of green beans
           for fresh market and commercial processing, average 1961-65,
           and 1966-68

Year	Fresh market			Processing market[a]		
	Harvested acreage	Production	Price	Harvested acreage	Production	Price
	(1,000 acres)	(1,000 cwt.)	(dols./ cwt.)	(1,000 acres)	(1,000 tons)	(dols./ ton)
Average (1961-65)	107	4,119	9.77	203	483	101.00
1966	98	3,633	11.97	246	522	100.82
1967	98	3,792	11.57	276	621	102.39
1968	96	3,582	12.41	266	627	99.84

[a]Includes green beans for both canning and freezing purposes.

Source: Vegetable Situation, February 1968 issue, Statistical
          Reporting Service, Economic Research Service, U. S. Department
          of Agriculture, Washington, D. C.

from fresh to processed market production. The price for processing has remained relatively stable at around $100 per ton nationally.

Trends in harvested acres, production and prices by states for the fresh and processed markets are shown in Tables 2 and 3. Florida and North Carolina are leading producers for the fresh market. Average prices in North Carolina have been lower than prices in Florida and in most states. Period of peak harvest is much later in the season in North Carolina which may be one reason North Carolina prices are lower than Florida prices. Relatively higher prices on the fresh market suggest that Florida has an advantage over North Carolina in producing green beans for fresh market. Some of this advantage may be offset by lower transfer costs from North Carolina to major markets in the Northeast. Nevertheless, lower fresh market prices in North Carolina may result in lower raw product costs to processors.

The major producers for the processing market are Oregon, New York and Wisconsin (Table 3). None of the typically defined southern states is considered as a major producer. Yet, the average processing price per ton for green beans has been higher in southern states than prices in Oregon, New York and Wisconsin. This suggests that the fresh market for southern produced beans and high production costs may be more important factors in procuring the raw product for processing than the fact that producers in other areas receive higher prices for the raw product.

The commercial pack and stocks of green beans for the United States during the 1965-68 seasons are presented in Table 4. The national pack has trended upward since 1965 as well as stock on hand as of July 1. Production has exceeded disappearance during the 1965-68 period, resulting in an increase in the level of stocks. Total seasonal shipments were 46 million cases of 303 can-equivalents during the 1967-68 season. Data for the 1968-69 season are not available.

Consumption Aspects

Trends in consumption of fresh, canned and frozen green beans are shown in Table 5. Fresh consumption declined from 2.6 pounds per capita in 1960 to 2.0 pounds in 1967. Per capita consumption of canned and frozen beans increased during the same period of time. However, per

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Table 2. Harvested acreage, production and average price per hundredweight of green beans for fresh market by states, average 1962-66, 1967 and 1968

States	Harvested acres Average 1962-66	1967	1968	Production Average 1962-66	1967	1968	Price Average 1962-66	1967	1968
	(acres)			(1,000 cwt.)			(dols./cwt.)		
Southern states									
Alabama	1850	1500	1450	44	43	38	9.68	11.81	13.18
Florida	37780	39000	38300	1413	1514	1311	11.10	11.88	13.48
Georgia	4080	4300	4200	116	121	118	9.05	10.89	10.60
Louisiana	2790	2750	2700	76	94	83	8.75	9.56	9.86
North Carolina	10190	9450	9600	390	393	409	8.03	9.00	9.05
South Carolina	6180	5400	5200	188	191	157	9.19	11.45	9.29
Tennessee	1150	900	1200	51	42	54	8.26	8.80	9.70
Texas	1380	1300	1300	36	30	29	10.17	13.20	13.07
Virginia	6650	7100	5900	246	234	219	8.26	10.72	9.38
Non-southern states									
California	3580	2700	2500	345	216	243	13.37	15.89	16.68
Illinois	1220	1200	1200	35	36	31	9.00	11.60	10.10
Maryland	2910	2400	2550	94	80	79	7.10	9.14	9.19
Michigan	2160	2100	2200	70	63	84	9.52	11.00	13.80
New Jersey	5800	6000	6000	228	203	202	9.55	12.70	11.76
New York	8860	7200	6700	336	295	281	9.38	10.30	12.90
Ohio	2020	1600	1600	108	96	96	9.08	10.50	10.30
Pennsylvania	1040	800	800	44	40	40	10.02	11.00	12.30
Others[a]	2610	2490	2580	117	106	108	13.77	15.74	17.51

[a]Includes Colorado, Connecticut, Hawaii, Massachusetts, New Hampshire and Rhode Island.

Source: Vegetables--Fresh Market (1968 Annual Summary), Statistical Reporting Service, U. S. Department of Agriculture, Washington, D. C.

Table 3. Harvested acreage, production and price of green beans for processing by states, average 1962-66, 1967 and 1968

State	Harvested acres			Production			Prices		
	Average 1962-66	1967	1968	Average 1962-66	1967	1968	Average 1962-66	1967	1968
	(acres)			(tons)			(dollars/ton)		
Southern states									
Arkansas	4,060	6,200	6,000	7,720	13,000	14,400	91.30	102.00	95.40
Florida	7,220	9,300	6,000	13,220	18,600	10,200	116.50	111.00	109.00
North Carolina	2,640	4,000	3,300	5,260	6,800	5,900	108.00	110.00	102.00
Oklahoma	2,600	4,100	2,100	3,880	7,400	4,200	94.60	105.00	98.10
South Carolina	860	650	800	1,080	1,700	1,500	109.80	105.00	109.00
Tennessee	11,300	11,600	12,600	22,160	20,900	18,900	113.20	120.00	111.00
Texas	6,160	5,500	7,000	11,740	10,400	20,300	91.50	95.40	108.00
Virginia	1,980	3,400	2,700	2,680	4,800	5,900	103.80	138.00	101.00
Non-southern states									
California	6,800	13,500	13,900	25,900	28,400	29,200	132.20	122.00	133.00
Colorado	2,180	2,300	2,300	5,420	5,800	6,000	83.30	84.20	87.10
Delaware	6,700	9,300	9,700	7,520	15,800	13,600	86.10	95.20	89.50
Illinois	4,540	10,300	10,900	7,660	20,600	19,600	74.20	99.40	104.00
Maryland	13,000	11,900	13,000	18,800	20,200	22,100	99.70	99.20	97.60
Michigan	10,460	14,900	10,600	16,960	22,400	22,300	79.60	92.40	89.30
New York	48,440	52,600	51,900	87,000	105,000	93,400	92.60	92.00	91.40
Oregon	19,880	29,600	29,000	120,740	148,000	153,700	114.40	113.00	108.00
Pennsylvania	7,740	8,800	9,800	11,880	18,500	17,600	93.70	97.70	92.40
Washington	2,520	4,700	4,200	13,300	15,500	16,000	116.20	122.00	110.00
Wisconsin	35,500	43,000	41,200	69,660	90,300	90,600	72.30	81.00	81.20
Others[a]	19,360	28,360	29,110	38,960	62,490	61,400	98.10	103.65	103.26
United States	213,940	274,010	266,110	491,540	636,790	626,800	100.12	101.64	99.84
For freezing	51,720	65,550	58,940	121,270	149,960	139,730	109.34	110.80	102.92
For canning	162,220	208,460	207,170	370,270	486,830	487,070	97.11	98.82	98.96

Table 3 (continued)

aIncludes Alabama, Georgia, Idaho, Indiana, Kentucky, Louisiana, Maine, Massachusetts, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, Ohio, South Dakota, Utah, Vermont, and Wyoming.

Source: Vegetables--Processing (1968 Annual Summary), Statistical Reporting Service, U. S. Department of Agriculture, Washington, D. C.

Table 4. Carry-over, commercial pack and seasonal supply, stocks
July 1 and total seasonal shipments of green beans, 1965–
1966 through 1968–1969

Season	Carry-over	Pack	Seasonal supply	Stocks July 1	Total seasonal shipments
			(million cases, 24/303's)		
1965–66	4.1	45.6	49.7	7.2	41.9
1966–67	7.2	40.5	47.7	4.6	43.8
1967–68	4.6	53.2	57.8	11.4	46.2
1968–69	11.4	51.8	63.2	n.a.	n.a.

n.a.--not available.

Source: Vegetable Situation, quarterly issues, Economic Research
Service, U. S. Department of Agriculture, Washington, D. C.

Table 5. Consumption of fresh and processed green beans, U. S.,
1960–1968

Year	Consumption			
	Fresh	Canned	Frozen	Total
	(lbs. per capita)[a]			
1960	2.60	2.98	.92	6.50
1961	2.50	3.01	.87	6.38
1962	2.30	3.16	.97	6.43
1963	2.20	3.06	1.04	6.30
1964	2.10	3.27	.99	6.36
1965	2.00	3.30	1.07	6.37
1966	1.90	3.49	1.24	6.63
1967	2.00	3.53	1.06	6.59
1968	1.80	3.75	1.18	6.73

[a]Fresh equivalent basis.

Source: Vegetable Situation, October issue, Statistical Reporting
Service, Economic Research Service, U. S. Department of
Agriculture, Washington, D. C.

capita consumption of canned green beans increased at a much more rapid rate than frozen per capita consumption. Total per capita consumption remained relatively stable over the 8-year period at about 6.5 pounds. Therefore, consumption of green beans changed in direct proportion to the increase in population.

A study of household consumption patterns conducted in 1965 provides some indication of how fresh and processed bean consumption varies with income. Consumption patterns by income level for the South and the nation as a whole are presented in Table 6. Income had little effect on total fresh bean consumption in either the South or the entire United States. The quantity purchased did increase with income in the South as well as the nation as a whole. Total fresh consumption per household was much greater (about double) in the South than total consumption in the United States.

The level of consumption of processed green beans increased as income increased in the South. Total U. S. consumption of processed beans was much greater in the aggregate than in the southern states. This suggests that the major markets for beans processed in the South lie in states other than the South. As income and population in the South increase, however, total demand for processed beans will likely increase.

Processing Green Beans

Type of Plant

Processing green beans in the South has been done in single and multiple product plants. Processing more than one product in a given plant tends to reduce per unit investment costs by increasing the length of season operated. This assumes that the seasons for the products do not conflict with each other and that some or all of the equipment used for one product can be utilized to process others. Of course some specialized equipment for each product may be needed.

The length of season for processing green beans is relatively long when compared to other vegetable lines. The season can be lengthened further by trucking the raw product longer distances. For this reason, it was decided that processing green beans should be first analyzed

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Table 6. Consumption of fresh and canned green beans in the U. S. and South by income class, 1965

Dollars of disposable income	Consumption			
	Fresh		Canned[a]	
	South	U. S.	South	U. S.
	(lbs. per household per week)[b]			
All households	.76	.42	.07	.65
1,000	.80	.58	.00	.38
1,000-1,999	.74	.52	.03	.39
2,000-2,999	.82	.51	.01	.45
3,000-3,999	.79	.51	.03	.61
4,000-4,999	.80	.47	.06	.65
5,000-5,999	.70	.38	.07	.73
6,000-6,999	.81	.40	.09	.84
7,000-7,999	.77	.37	.13	.70
8,000-8,999	.74	.40	.12	.87
9,000-9,999	.52	.27	.12	.71
10,000-14,999	.83	.33	.23	.68
15,000-and over	.77	.37	.30	.73

[a]Converted from a net processed weight equivalent to a fresh weight equivalent on the basis of .687 as given by The Almanac of the Canning, Freezing, and Preserving Industries, Fifty-third edition, 1968, Westminster, Maryland.

[b]Fresh weight equivalent.

Source: Household Food Consumption Survey, 1965-66. Report Nos. 1 and 4, Agricultural Research Service, U. S. Department of Agriculture.

as a single product line.[1] The single line green bean processing
plants are designed to process any acceptable quality of raw product
in two basic can sizes, i.e., No. 303's and No. 10's. Green beans
could be packed in other can sizes by adding appropriate equipment.
The proportion of the total pack is 75 percent by volume in cases of
24/303's and 25 percent by volume in cases of 6/10's for all plant
sizes except the very small sized plant described later. In this
plant, only 303's are canned.

Technical data used to estimate the costs of processing green beans
are the same as those in the Canning Handbook published by the Southern
Marketing Technical Committee (SM-30).[2] An economic-engineering ap-
proach was used to derive cost estimates for selected model plants.
Revenues were estimated on the basis of designed capacity operations
and selected lengths of season. Costs and revenues were then used to
calculate net returns to invested capital. This stream of net returns
was used to determine the value of a plant at any year of production
ranging from 1 to 10 years assuming salvage values of 40 percent of
original costs on structure, 50 percent of original cost of storage
area, and 20 percent of original installed costs of equipment at the
end of 10 years.

Plant Capacity

Single-product plants were designed to process green beans at five
hourly output levels--100, 400, 800, 1200, and 1500 cases of 24/303
can-equivalents. Each plant was equipped to can both No. 10's and
No. 303's simultaneously at the assumed proportion of 25/75, respec-
tively, except for the small plant as noted above.

Each plant was evaluated over a 10-year period with salvage values
for buildings, storage area and equipment included in the yearly value
of each plant. The life of a processing plant is surely longer than

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[1]Green beans will be evaluated as a line in multiple product
plants in later reports.

[2]Southern Cooperative Series Bulletin No. 146, Planning Data for
Marketing Selected Fruits and Vegetables in the South: Part I--Canning
Handbook, North Carolina Experiment Station, N. C. State University at
Raleigh, 1969.

10 years but the obsolescence of plant design and equipment could necessitate large expenditures in remodeling if the plant is operated longer than 10 years. No attempt is made here to estimate remodeling needs and costs.

Length of operating season for a green bean canning plant is affected by several factors of which the availability of the raw product is one of the most important. The difficulty of projecting the season's production makes it impractical to specify a given length of operating season. Consequently, three lengths of season are selected to show seasonal effects. Lengths of 500, 1000, and 1500 hours of operation per season are used in the evaluation. Receiving periods of 63, 125, and 188 days, assuming an 8-hour shift, are required to operate a plant 500, 1000, and 1500 hours per season, respectively.

Plant Design

Each plant is composed of a receiving, preparation, filling and closing and processing area in addition to space for general offices, shops and laboratories. The working area is considered apart from the storage area. Storage requirements depend on the level of output and distribution of sales. It is assumed that storage needs are satisfied if space is available to store 75 percent of total output at any one time.

The basic data reference (see Canning Handbook) describes the flow of product and the materials used in the structure. Costs of land were not included in the basic reference because of the wide variation in land values throughout the South. They are not included in this study for the same reason. The omission is not considered too critical since appreciation in land values would tend to offset the opportunity costs of land use. If appreciation in land values equals the opportunity cost of land use, land costs would affect the value of the investment but would not affect the investment decision.

Value of Inputs and Outputs

The basic data reference (see Canning Handbook) presents the values of all inputs based on 1968 prices. None of these prices are reproduced

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here except wage rates. Appendix Tables 1 and 2 present both salaried and hourly wage rates used to calculate labor costs. Again, these rates may have to be adjusted to local conditions.

The cost of raw product was set at a level comparable to the price received by producers in major processing areas. In addition, a second raw product price was used which was 25 percent higher than the first. This was done to account for possible changes in competitive conditions and the general price level which could occur within a 10-year planning horizon. The two prices were 100 and 125 dollars per ton delivered to the plant's receiving area.

The value of the finished product was originally set at an average price received by plants located in the eastern part of the United States as reported by two trade publications; namely, the National Canner and Canner-Packer. This gave a weighted price of about $3.00 per case of 24/303 can-equivalents. A variation in weighted price of 50 cents per case of 24/303 can-equivalents was selected to evaluate the effects of changing product prices. Consequently, the three product prices selected were $2.50, $3.00, and $3.50 per case of 303 can-equivalents. These prices are f.o.b. plant.

Costs of Processing Green Beans

Investment Costs

Buildings. Building and equipment costs by size of plant are presented in Table 7. Building costs include space for the processing operation and warehouse or storage space. Warehouse space including the costs of pallets is the most costly for all plants except the 100-case per hour plant operating for 500 hours a season.

Equipment. Equipment requirements were divided into common items required to process several vegetables and specialized items needed only for green beans (Table 7). Common equipment costs are related to rate of output but not to length of season. Total costs of common equipment items range from 44 thousand dollars for the small plant to 216 thousand dollars for the largest plant.

Costs for specialized equipment for canning green beans are also presented in Table 7. Some pieces of equipment are leased rather than

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Table 7. Summary of building and equipment costs by rate of output and length of season

Item	Output per hour (in cases of 24/303 can-equivalents)				
	100	400	800	1200	1500
	(dollars)				
Buildings					
Processing area[a]	24,820	55,700	84,334	123,234	151,378
Storage area including pallets[b]					
500-hour season	16,175	65,200	129,900	195,100	244,125
1000 hour season	32,350	130,400	259,800	390,200	488,250
1500-hour season	48,525	195,600	389,700	585,300	732,375
Equipment					
General[c]	44,207	99,470	155,993	196,385	216,161
Specialized (green beans)[d]	69,828	204,905	351,651	494,893	603,930
Total investment costs					
500-hour season	155,030	425,275	721,878	1,009,612	1,215,594
1000-hour season	171,205	490,475	851,778	1,204,712	1,459,719
1500-hour season	187,380	555,675	981,678	1,399,812	1,703,844
Average investment costs[e]	(dollars per case capacity)				
500-hour season	3.10	2.13	1.80	1.68	1.62
1000-hour season	1.71	1.23	1.06	1.00	.97
1500-hour season	1.25	.93	.82	.78	.76

[a] See Appendix Table 3 for detailed costs by item.

[b] Storage requirements were based on sufficient space to store 75 percent of the total season's production with 6.3 square feet per 100 cases. Cost per square foot was assumed to be $6. Total pallet requirements were based on total output at a rate of one pallet for 90 cases of 24/303's and/or 56 cases of 6/10's. The costs of pallets were calculated at a $3.75 price. Only 303 cans were used in the 100-case per hour plant which resulted in lower storage space and pallet costs at this rate of output.

[c] See Appendix Table 4 for detailed costs by item.

[d] See Appendix Table 5 for detailed costs by item.

[e] Represents the investment value per case capacity which can be used to approximate average annual depreciation by dividing each value by the number of productive years.

purchased. In these cases, leasing rates are used in calculating the costs. Costs of specialized equipment make up a fairly large part of total investment costs. In the case of the largest plant, over 600 thousand dollars are required to obtain the specialized equipment needed to can green beans. Most of these equipment items are associated with preparing the raw product for processing.

The economies resulting from either an increased rate of output or a longer length of season can be observed by comparing average investment costs per case capacity. For the 500-hour season, the 100-case per hour plant requires an investment of $3.10 per case capacity compared to only $1.62 per case for the 1500-case per hour plant. Investment costs per case capacity also decline for a given plant size as length of season is increased. For the 800-case per hour plant, per case costs decreased from $1.80 to $.82 as length of season was lengthened from 500 to 1500 hours per season.

Operating Costs

Labor. Total costs of labor and other inputs are presented in Table 8. Labor required to operate a green bean canning plant was divided into supervisory employees (annual wage) and production labor (hourly wage). These costs do not vary by length of operating season but increase as rate of hourly output increases. Annual costs of supervisory labor including maintenance help and night watchmen ranged from $31,175 per year for the 100-case per hour plant to $191,888 for the 1500-case per hour plant. Fringe benefits are included in these costs. Larger plants require a larger number of employees and more specialized help than smaller plants.

Total hourly costs of production labor are also summarized in Table 8. Fringe benefits are also included as a cost of labor. These costs vary by both length of season and rate of output. The annual labor bill for hourly labor ranged from a low of $21,915 for the 100-case per hour plant operating for 500 hours per season to a high $319,995 for the 1500-case per hour plant operating for 1500 hours per season.

Other Costs. Costs of raw product for several items are also included in Table 8. Costs of the raw product are calculated at two

Table 8. Summary of operating costs by rate of output and length of season assuming two raw product prices

Item	Output per hour (in cases of 24/303 can-equivalents)				
	100	400	800	1200	1500
	(dollars/season)				
Labor					
Salaried employees[a]	31,175	111,800	161,788	187,588	191,888
Hourly labor[b]					
500-hour season	21,915	52,710	69,025	91,135	106,665
1000-hour season	43,830	105,420	138,050	182,270	213,330
1500-hour season	65,745	158,130	207,075	273,405	319,995
Other costs[c]					
$100 per ton of raw product[d]					
500-hour season	124,945	454,530	901,990	1,348,235	1,683,440
1000-hour season	249,890	909,060	1,803,980	2,696,470	3,366,880
1500-hour season	374,835	1,363,590	2,705,970	4,044,705	5,050,320
$125 per ton of raw product[d]					
500-hour season	136,945	502,530	997,990	1,492,235	1,863,440
1000-hour season	273,890	1,005,060	1,995,980	2,984,470	3,726,880
1500-hour season	410,835	1,507,590	2,993,970	4,476,705	5,590,320
Total operating costs					
$100 per ton of raw product[d]					
500-hour season	178,035	619,040	1,132,803	1,626,958	1,981,993
1000-hour season	324,895	1,126,280	2,103,818	3,066,328	3,772,098
1500-hour season	471,755	1,633,520	3,074,833	4,505,698	5,562,203
$125 per ton of raw product[d]					
500-hour season	190,035	667,040	1,228,803	1,770,958	2,161,993
1000-hour season	348,895	1,222,280	2,295,818	3,354,328	4,132,098
1500-hour season	507,755	1,777,520	3,362,833	4,937,698	6,102,203
	(dollars/case)				
Average annual operating costs					
$100 per ton of raw product					
500-hour season	3.56	3.10	2.83	2.71	2.64
1000-hour season	3.25	2.82	2.63	2.56	2.51
1500-hour season	3.15	2.72	2.56	2.50	2.47

Table 8 (continued)

Item	Output per hour (in cases of 24/303 can-equivalents)				
	100	400	800	1200	1500
	(dollars/case)				
$125 per ton of raw product					
500-hour season	3.80	3.34	3.07	2.95	2.88
1000-hour season	3.49	3.06	2.87	2.80	2.75
1500-hour season	3.39	2.96	2.80	2.74	2.71

[a]See Appendix Table 6 for detailed costs by job classification.

[b]See Appendix Table 7 for detailed hourly costs by job classification.

[c]See Appendix Table 8 for detailed hourly costs by type of input.

[d]Assumes yield of 125 cases of 24/303 can-equivalents per ton of raw product.

prices. Total costs of these items are a low of $124,945 per year at the $100 per ton price and $136,945 per year at the $125 per ton price for the 100-case per hour plant operating 500 hours per season. It should be noted that only cases of 24/303 cans are considered at this hourly rate of output.

The four larger plants processed in No. 10's and No. 303's at the ratio of 25/75 by volume. Container costs per case for given volumes of raw product are less when #10 cans are used in combination with #303's than when only #303 cans are used. These costs range from a low of $454,530 for the 400-case per hour plant operating for 500 hours per season to $6,102,203 for the 1500-case per hour plant operating for 1500 hours per season.

The economies resulting from operating larger size plants and longer seasons can be observed by comparing average operating costs as presented in Table 8. Costs per case decrease as length of season and rate of output increase. These economies are shown graphically in Figure 1. Only slight reductions in costs are obtained at rates of output larger than 800 cases per hour and lengths of season longer than 1000 hours per season.
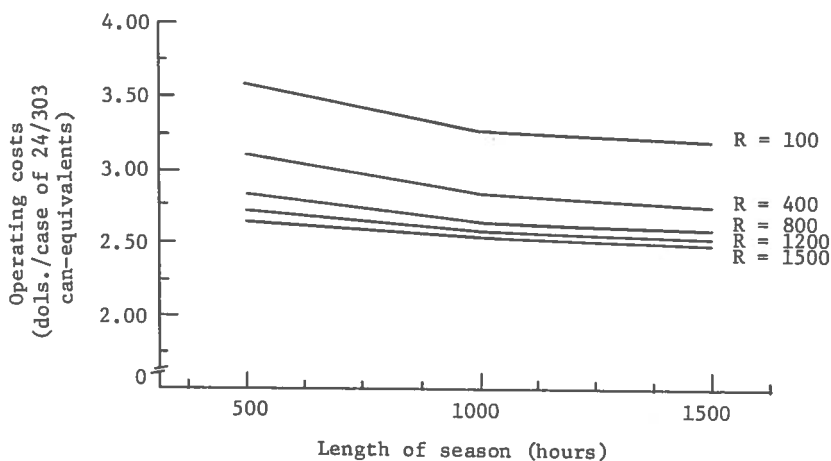
Figure 1. Average operating costs as related to
length of season and rate of output
assuming a raw product price of $100
per ton[a]

[a]R = rate of output in cases of 24/303 can-equivalents per hour.

The effect of a change in raw product price is shown graphically in Figure 2. Costs per case change by the same amount for all rates of output and lengths of season as the raw product price increases from $100 to $125 per ton. The $25 per ton price rise increases costs by 24 cents per case for an 800-case per hour plant.

Returns from Green Bean Processing

Total returns from processing green beans depend on rate of output, length of season, and finished product prices. Finished product prices of $2.50, $3.00 and $3.50 per case of 24/303 can-equivalents are selected to calculate total returns. Total revenues as a function of rate of output, length of season, and finished product price are presented in Table 9.

Costs of operating a green bean processing plant including salaried employees are subtracted from these total revenues to derive annual net returns available to pay for the investment in buildings and equipment. These net return estimates are presented in Table 10. Net returns were negative at all rates of output and lengths of season at the $2.50 per case price and the $125 per ton raw product price. Returns were negative at the $100 per ton price at the $2.50 per case price for all rates and lengths of season except the 1500-case per hour plant operating at 1500 hours per season.

The two higher finished product prices of $3.00 and $3.50 per case yielded positive net returns to investment capital. The question of whether these positive returns are large enough to recover the investment capital and the interest on its use is evaluated in the following section. The procedure used to evaluate the profitability of the investment is a modified capitalization process. The objective is to determine the discounted values of expected future incomes for any productive age of a plant. Salvage values are an expected income and are included in the discounted values. In this case, a planning horizon is specified with expected salvage values of the buildings and equipment. The estimates derived for each year, thus, represent the discounted salvage value of the plant and its remaining income stream.

The investment in new facilities can only be evaluated by comparing values of investment in the first year. A greater discounted value in

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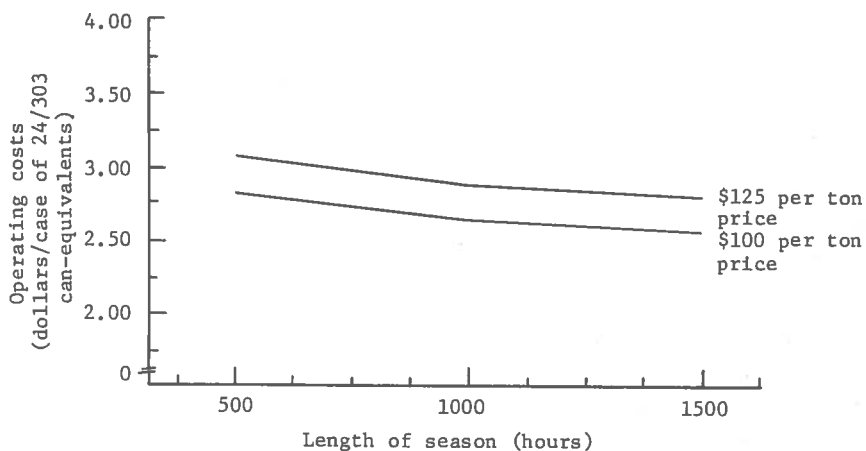
Figure 2. Average operating costs as related to price of raw product and length of season for a plant operating at 800 cases of 24/303 can-equivalents per hour

Table 9. Total revenues by selected rates of output, lengths of season and finished product prices

Rate of output	Length of season and product price								
	500 hours/season			1000 hours/season			1500 hours/season		
	Price of product (dols./case)								
	2.50	3.00	3.50	2.50	3.00	3.50	2.50	3.00	3.50
	(1000 dollars per season)								
100	125	150	175	250	300	350	375	450	525
400	500	600	700	1,000	1,200	1,400	1,500	1,800	2,100
800	1,000	1,200	1,400	2,000	2,400	2,800	3,000	3,600	4,200
1200	1,500	1,800	2,100	3,000	3,600	4,200	4,500	5,400	6,300
1500	1,875	2,250	2,625	3,750	4,500	5,250	5,625	6,750	7,875

Table 10. Estimated net annual returns to investment in structure and equipment at selected raw and finished product prices, rates of output and lengths of season

Length of season and rate of output	Price of product (dols./case)					
	2.50		3.00		3.50	
	Price of raw product (dols./ton)					
	100	125	100	125	100	125
500 hours						
100	−53,035	−65,035	−28,035	−40,035	−3,035	−15,035
400	−119,865	−167,040	−19,040	−67,040	80,960	32,960
800	−132,803	−228,803	67,197	−28,803	267,197	171,197
1200	−126,958	−270,958	173,042	29,042	473,042	329,042
1500	−104,588	−284,588	270,412	90,412	645,412	465,412
1000 hours						
100	−74,895	−98,895	−24,895	−48,895	25,105	1,105
400	−126,280	−222,280	73,720	−22,280	273,720	177,720
800	−103,818	−295,818	296,182	104,182	696,182	504,182
1200	−66,328	−354,328	533,672	245,672	1,133,672	845,672
1500	−17,288	−377,288	732,712	372,712	1,482,712	1,122,712
1500 hours						
100	−96,755	−132,755	−21,755	−57,755	53,245	17,245
400	−133,520	−277,520	166,480	22,480	466,480	322,480
800	−74,833	−362,833	525,167	237,167	1,125,167	837,167
1200	−5,698	−437,698	894,302	462,302	1,794,302	1,362,302
1500	70,012	−469,988	1,195,012	655,012	2,320,012	1,780,012

year one than computed investment costs of new facilities indicates a rate of return greater than 10 percent. A smaller discounted value in year one than investment costs indicates a rate of return less than 10 percent. The investment value of a plant with similar costs and revenue structure can be determined for any existing plant.

The same procedure as outlined above can be used to evaluate the feasibility of an investment in later years if the sales price of the plant is known. Sale of a used plant at its discounted value would enable the new owner to just pay the specified interest rate. Rate of return to the capital invested would be 10 percent if acquisition price is equal to the discounted incomes assuming that the specified operating conditions are satisfied.

Investment Values of Green Bean
Canning Plants

Investment values as stated above were computed for each of five model plants. Table 11 presents the investment values for the 100-case per hour plant. The $173,110 value under the $3.50 finished product price, $100 per ton raw product price and the 1000-hour operation represents the present value of this 100-case per hour plant operating for 10 years. The investment costs in a new plant at this size are estimated at $171,205 (Table 7). The first year values marked with an asterisk indicate that the present values computed at a 10 percent discount rate are greater than investment costs in new plants. In such cases, a rate of return greater than 10 percent results for the operation. The investment would therefore be favorable.

Investment in a new 100-case per hour plant was favorable only at $100 per ton and $3.50 per case for raw and finished product prices, respectively. It should be noted that this plant provides a rate of return greater than 10 percent if the plant can operate 1000 or 1500 hours per season, pay no more than $100 per ton for the raw product, and receive $3.50 per case for the finished product during every year of a 10-year period. Satisfying these conditions would be considered very unlikely by the trade.

Present values presented for years two through ten can be used to evaluate an investment in a plant with a similar cost and revenue

Table 11. Investment values yielding a 10 percent rate of return for years one through ten at selected raw and finished product prices, and lengths of season for a 100-case per hour plant[a]

Length of season and year of operation	Price of raw product (dols./ton)					
	100			125		
	Price of finished product (dols./case)					
	2.50	3.00	3.50	2.50	3.00	3.50
	(dollars)					
500 hours						
1	b	b	b	b	b	b
2	b	b	b	b	b	b
3	b	b	b	b	b	b
4	b	b	b	b	b	b
5	b	b	b	b	b	b
6	b	b	b	b	b	b
7	b	b	b	b	b	b
8	b	b	b	b	b	b
9	b	b	b	b	b	b
10	b	b	b	b	b	b
1000 hours						
1	b	b	173,110*	b	b	25,645
2	b	b	165,320	b	b	27,107
3	b	b	156,747	b	b	28,712
4	b	b	147,320	b	b	30,481
5	b	b	136,940	b	b	32,418
6	b	b	125,534	b	b	34,557
7	b	b	112,984	b	b	36,909
8	b	b	99,177	b	b	39,494
9	b	b	83,989	b	b	42,337
10	b	b	67,287	b	b	45,469
1500 hours						
1	b	b	349,127*	b	b	127,928
2	b	b	330,801	b	b	151,703
3	b	b	310,636	b	b	149,626
4	b	b	288,458	b	b	147,350
5	b	b	264,051	b	b	144,825
6	b	b	237,220	b	b	142,072
7	b	b	207,699	b	b	139,037
8	b	b	175,225	b	b	135,696
9	b	b	139,502	b	b	132,017
10	b	b	100,213	b	b	127,983

[a]First year values exceeding costs of facility, equipment and storage (Table 7) are marked with an asterisk.

[b]Net returns to investment (Table 10) were negative.

structure if the sales price is known. For example, an investment in
a seven year old plant would yield a rate of return greater than 10
percent if the sales price is less than $112,984, raw product can be
obtained at $100 per ton, finished product can be sold for $3.50 per
case of 24/303 can-equivalents and the plant can be operated at 1000
hours per season. An eight year old plant yields an investment value
of $99,177 at 10 percent under the above conditions.

Investment values for a 400-case per hour plant are shown in
Table 12. First year investment values were greater than original
investment costs for the two higher product prices and the $100 per
ton raw product price for all lengths of season except 500 hours at
$3.00 per case. The $25 per ton increase in raw product price resulted
in a sizable reduction in investment values. A finished product price
of $2.50 per case did not yield any investment values greater than
costs at the $125 per ton raw product price. Plants operating 1000
and 1500 hours per season and selling the finished product at $3.50
yield a net rate of return greater than 10 percent.

Investment values for the 800-, 1200- and 1500-case per hour plants
are presented in Tables 13, 14 and 15, respectively. The plant canning
800 cases per hour provided investment values greater than costs at all
lengths of season, and raw product prices when the finished product
price was $3.50 per case (Table 13). The $2.50 per case price did not
yield favorable investment opportunities under any conditions.

The same general pattern prevailed for the 1200-case per hour plant
as prevailed for the 800-case per hour plant (Table 14). The $2.50 per
case price still did not yield favorable value-cost relationships. It
is interesting to note that investment value is still quite large in
year 10 for the plant operating for 1500 hours at $100 per ton raw
product price and $3.50 per case finished product price. The $2,067,750
value in year 10 for this situation is still larger than the initial
investment cost of $1,399,812 (Table 7).

The 1500-case per hour plant provided favorable value-cost
relationships in year one for all situations at the $3.00 and $3.50
per case prices except at the 500-hour season and $125 per ton price
(Table 15). This size of plant is not profitable at the $2.50 per case
finished product price for either raw product prices. It is profitable

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Table 12. Investment values yielding a 10 percent rate of return for years one through ten at selected raw and finished product prices and lengths of season for a 400-case per hour plant[a]

Length of season and year of operation	Price of raw product (dols./ton)					
	100			125		
	Price of finished product (dols./case)					
	2.50	3.00	3.50	2.50	3.00	3.50
500 hours						
1	b	b	541,681*	b	b	246,749
2	b	b	514,899	b	b	238,471
3	b	b	485,428	b	b	229,358
4	b	b	453,019	b	b	219,340
5	b	b	417,344	b	b	208,299
6	b	b	378,133	b	b	196,179
7	b	b	334,990	b	b	182,840
8	b	b	287,530	b	b	168,164
9	b	b	235,321	b	b	152,017
10	b	b	177,905	b	b	134,268
1000 hours						
1	b	509,762*	1,738,642*	b	b	1,148,780*
2	b	487,030	1,638,810	b	b	1,085,956
3	b	462,012	1,528,972	b	b	1,016,832
4	b	434,502	1,408,162	b	b	940,805
5	b	404,213	1,275,233	b	b	857,143
6	b	370,929	1,129,069	b	b	765,162
7	b	334,306	968,266	b	b	663,965
8	b	294,018	791,378	b	b	552,645
9	b	249,697	596,797	b	b	430,189
10	b	200,959	382,779	b	b	295,505
1500 hours						
1	b	1,092,284*	2,935,604*	b	207,490	2,050,810*
2	b	1,035,052	2,762,722	b	205,770	1,933,440
3	b	972,077	2,572,517	b	203,865	1,804,305
4	b	902,817	2,363,307	b	201,781	1,662,271
5	b	826,951	2,133,121	b	199,457	1,505,987
6	b	742,796	1,880,006	b	196,935	1,334,145
7	b	650,602	1,601,542	b	184,151	1,145,091
8	b	549,186	1,295,226	b	191,087	937,127
9	b	437,623	958,273	b	187,711	708,361
10	b	314,924	587,654	b	184,014	456,744

[a]First year values exceeding costs of facility, equipment and storage (Table 7) are marked with an asterisk.

[b]Net returns to investment (Table 10) were negative.

Table 13. Investment values yielding a 10 percent rate of return for years one through ten at selected raw and finished product prices, and lengths of season for an 800-case per hour plant[a]

Length of season and year of operation	Price of raw product (dols./ton)					
	100			125		
	Price of finished product (dols./case)					
	2.50	3.00	3.50	2.50	3.00	3.50
500 hours						
1	b	490,067	1,718,947*	b	b	1,129,085*
2	b	471,891	1,623,671	b	b	1,070,816
3	b	451,882	1,518,842	b	b	1,006,701
4	b	429,885	1,403,545	b	b	936,187
5	b	405,650	1,276,670	b	b	858,580
6	b	379,036	1,137,176	b	b	773,268
7	b	349,746	983,706	b	b	679,405
8	b	317,525	814,885	b	b	576,153
9	b	282,076	629,176	b	b	462,568
10	b	243,102	424,922	b	b	337,649
1000 hours						
1	b	1,922,081*	4,379,841*	b	742,356	3,200,116*
2	b	1,818,139	4,121,699	b	712,430	3,015,990
3	b	1,703,771	3,837,691	b	679,489	2,813,409
4	b	1,577,985	3,525,305	b	643,271	2,590,591
5	b	1,439,560	3,181,600	b	603,381	2,345,421
6	b	1,287,377	2,803,657	b	559,563	2,075,843
7	b	1,119,944	2,387,864	b	511,342	1,779,262
8	b	935,763	1,930,483	b	458,297	1,453,017
9	b	733,155	1,427,355	b	399,939	1,094,139
10	b	510,319	873,959	b	335,772	699,412
1500 hours						
1	b	3,354,095*	7,040,735*	b	1,584,508*	5,271,148*
2	b	3,164,385	6,619,725	b	1,505,822	4,961,162
3	b	2,955,659	6,156,539	b	1,419,237	4,620,117
4	b	2,726,085	5,647,065	b	1,324,014	4,244,994
5	b	2,473,471	5,086,531	b	1,219,202	3,832,262
6	b	2,195,718	4,470,138	b	1,103,996	3,378,416
7	b	1,890,141	3,792,021	b	977,239	2,879,119
8	b	1,553,999	3,046,079	b	837,801	2,329,881
9	b	1,184,232	2,225,532	b	684,408	1,725,708
10	b	777,535	1,322,995	b	515,715	1,061,175

[a]First year values exceeding costs of facility, equipment and storage (Table 7) are marked with an asterisk.

[b]Net returns to investment (Table 10) were negative.

Table 14. Investment values yielding a 10 percent rate of return for years one through ten at selected raw and finished product prices, and lengths of season for a 1200-case per hour plant[a]

Length of season and year of operation	Price of raw product (dols./ton)					
	100			125		
	Price of finished product (dols./case)					
	2.50	3.00	3.50	2.50	3.00	3.50
500 hours						
1	b	1,173,145*	3,016,465*	b	288,352	2,131,672*
2	b	1,117,442	2,845,113	b	288,161	2,015,831
3	b	1,056,143	2,656,583	b	287,932	1,888,372
4	b	988,733	2,449,223	b	287,698	1,748,188
5	b	914,525	2,221,055	b	287,391	1,593,921
6	b	832,969	1,970,179	b	287,109	1,424,318
7	b	743,231	1,694,172	b	286,780	1,237,720
8	b	644,516	1,390,557	b	286,418	1,032,458
9	b	535,921	1,056,571	b	286,009	806,659
10	b	416,496	689,226	b	285,587	558,316
1000 hours						
1	b	3,426,606*	7,113,246*	b	1,657,018*	5,343,658*
2	b	3,235,645	6,690,985	b	1,577,081	5,032,421
3	b	3,025,539	6,226,419	b	1,489,116	4,689,996
4	b	2,794,451	5,715,431	b	1,392,380	4,313,360
5	b	2,540,163	5,153,223	b	1,285,893	3,898,953
6	b	2,260,578	4,534,998	b	1,168,855	3,443,275
7	b	1,952,984	3,854,864	b	1,040,080	2,941,960
8	b	1,614,621	3,106,701	b	898,421	2,390,501
9	b	1,242,410	2,283,710	b	742,585	1,783,885
10	b	833,028	1,378,488	b	571,207	1,116,667
1500 hours						
1	b	5,680,066*	11,210,026*	b	3,025,685*	8,555,645*
2	b	5,353,849	10,536,859	b	2,866,004	8,040,014
3	b	4,994,935	9,796,255	b	2,690,302	7,491,622
4	b	4,600,169	8,981,639	b	2,497,064	6,878,534
5	b	4,165,800	8,085,390	b	2,284,396	6,203,986
6	b	3,688,187	7,099,817	b	2,050,604	5,462,234
7	b	3,162,735	6,015,555	b	1,793,382	4,646,202
8	b	2,584,724	4,822,845	b	1,510,427	3,748,547
9	b	1,948,898	3,510,848	b	1,199,162	2,761,112
10	b	1,249,560	2,067,750	b	856,829	1,675,019

[a]First year values exceeding costs of facility, equipment and storage (Table 7) are marked with an asterisk.

[b]Net returns to investment (Table 10) were negative.

Table 15. Investment values yielding a 10 percent rate of return for years one through ten at selected raw and finished product prices, and lengths of season for a 1500-case per hour plant[a]

Length of season and year of operation	Price of raw product (dols./ton)					
	100			125		
	Price of finished product (dols./case)					
	2.50	3.00	3.50	2.50	3.00	3.50
500 hours						
1	b	1,795,146*	4,099,296*	b	689,154	2,993,304*
2	b	1,704,283	3,863,870	b	667,681	2,827,268
3	b	1,604,298	3,604,848	b	644,034	2,644,584
4	b	1,494,339	3,319,951	b	618,045	2,443,657
5	b	1,373,310	3,006,473	b	589,392	2,222,555
6	b	1,240,275	2,661,787	b	557,949	1,979,461
7	b	1,093,902	2,282,577	b	523,338	1,712,013
8	b	932,886	1,865,436	b	485,262	1,417,812
9	b	755,757	1,406,570	b	443,367	1,094,180
10	b	560,955	901,867	b	397,317	738,229
1000 hours						
1	b	4,682,757*	9,291,057*	b	2,470,773*	7,079,073*
2	b	4,418,388	8,737,563	b	2,345,184	6,664,359
3	b	4,127,518	8,128,618	b	2,206,990	6,208,090
4	b	3,807,596	7,458,821	b	2,055,008	5,706,233
5	b	3,455,565	6,721,890	b	1,887,729	5,154,054
6	b	3,068,503	5,911,528	b	1,703,851	4,546,876
7	b	2,642,668	5,020,018	b	1,501,540	3,878,890
8	b	2,174,238	4,039,338	b	1,278,990	3,144,090
9	b	1,658,950	2,960,575	b	1,034,170	2,335,795
10	b	1,092,198	1,774,023	b	764,922	1,446,747
1500 hours						
1	657,919	7,570,369*	14,482,819*	b	4,252,933*	11,164,843*
2	653,732	7,132,495	13,611,257	b	4,022,689	10,501,451
3	649,088	6,650,738	12,652,388	b	3,769,946	9,771,596
4	644,015	6,120,853	11,597,690	b	3,491,971	8,968,808
5	638,332	5,537,820	10,437,307	b	3,186,066	8,085,553
6	632,195	4,896,733	9,161,270	b	2,849,755	7,114,292
7	625,411	4,191,436	7,757,461	b	2,479,744	6,045,769
8	617,942	3,415,592	6,213,242	b	2,072,720	4,870,370
9	609,708	2,562,145	4,514,583	b	1,624,975	3,577,413
10	600,705	1,623,442	2,646,180	b	1,132,528	2,155,266

[a]First year values exceeding costs of facility, equipment and storage (Table 7) are marked with an asterisk.

[b]Net returns to investment (Table 10) were negative.

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at all other product prices and operating conditions except at $3.00 per case and $125 per ton prices and a 500-hour operating season.

Summary and Conclusions

The opportunities for canning green beans in single product plants in the South were evaluated in this report. The purpose of the report was to specify the conditions in which new modern processing plants could compete with modern plants in well-established processing areas. Alternative plant capacities measured by rate of hourly output and length of season were analyzed in terms of their expected investment values at a 10 percent rate of return.

Data on production, consumption and canning pack were included in the first part of the study. An analysis of these data suggested that most southern states have not gone more heavily into processing of vegetables because of their relatively favorable position in the national fresh market trade. This means that the raw product price for processing in the South is not necessarily below the processing price in other states but it is below the local fresh market price. Therefore, processors can obtain sufficient quantities of the raw product at a typical processing price only after the fresh market trade is supplied with the quantities demanded at the prevailing fresh market price.

Alternative raw product prices were considered in an attempt to measure their impact on processing costs. Also, alternative finished product prices were selected to show their effects on processing returns. These alternative prices, coupled with alternative rates of output and lengths of season, enable an investor to evaluate opportunities over a wide range of future conditions.

The results of the study indicated that all five green bean processing plants ranging in capacity from 100 to 1500 cases per hour can operate profitably if the length of season extends beyond 1000 hours per season, if the raw product price is not above $100 per ton and if the finished product price is $3.50 or more per case. However, the three larger plants (800, 1200 and 1500 cases per hour) yield a rate of return greater than 10 percent at much shorter lengths of season, higher raw product prices and lower finished product prices.

The investment values of all plants declined from year one through year ten except in those plants with small net returns above operating costs. In all plants, the value of the income stream declined with years of productive life. However, the discounted salvage values of buildings and equipment increased from year one to year ten. The investment values thus decreased for most plants since the discounted income stream declined more rapidly than the discounted salvage values increased.

The declining investment values with age of plant is consistent with expectations if plant equipment does tend to become obsolete during a relatively long planning period and the value of business activity (contacts with suppliers of raw product and other resources, buyers of finished product and the value of trademarks) is not included in the analysis. These considerations could have very large positive values but are difficult to measure for inclusion in a study of this nature.

The largest plant (1500 cases per hour) was profitable at a relatively low finished product price and a relatively high raw product price. Its annual output is 2.25 million cases of 24/303 can-equivalents when operated at capacity for 1500 hours per season. This annual output represents more than 4 percent of the 1968-69 national green bean pack. The effects of such an additional quantity of processed beans placed on the market are difficult to measure but can be predicted. First, the additional quantity would have depressing effects on the finished product price. Problems of finding markets at current prices for processed green beans could intensify. Carry-over of canned beans which has been increasing since 1965 would be pushed even higher than the 11.4 million cases of carry-over in 1967-68.

A new plant producing 2.25 million cases of canned beans per year would require a large supply of green beans. This plant alone would require around 18 thousand tons of raw product each year or the total output from around 7,200 acres yielding 2.5 tons per acre to operate for 1500 hours per season. The southern states produced only 81.3 thousand tons of green beans for processing in 1968. Tennessee and Texas were the only southern states that produced as many green beans for processing in 1968 as required for the large plant. North Carolina's processing output was only 5,900 tons or 40 percent of the 18,000 ton

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output required by the one plant. Therefore, the demand for the raw product in the supply area would increase sharply. The short-run effect would be higher raw product prices than currently prevail.

Many problems have to be resolved before any additional investment in green beans processing facilities is actually made in any of the southern states. Opportunities may exist for companies with well-established national and international markets, experience in developing raw supply sources and a ready source of investment and operating capital.

APPENDIX

Appendix Table 1. Wage rates for salaried employees by operation and
                   job description

Job description	Annual salary range (1968 estimate)	Wage used in analysis
	(dollars/year)	
General manager	15,000-30,000	20,000
Sales manager	10,000-20,000	15,000
Production manager	10,000-20,000	15,000
Plant superintendent	7,500-15,000	13,000
Field superintendent	7,500-15,000	13,000
Personnel manager	7,500-10,000	9,000
Office manager	7,500-10,000	9,000
Secretary	4,000-5,000	4,500
Clerk	3,000-4,200	4,000
Typist	3,000-4,000	4,000
Plant engineer	7,500-10,000	10,000
Mechanic	6,000-8,000	7,000
Yield control	6,000-8,000	7,000
Quality control supervisor	6,000-8,000	7,000
Custodian	4,000-5,500	4,500
Night watchman	5,000-6,000	5,000
Warehouse supervisor	6,000-8,000	7,000

Appendix Table 2. Wage rates for hourly paid employees by operation and
                   job description

Operation and job description	1968 wage rate (dols./hr.)
Receiving and unloading	
Yard man	1.60
Manual unload	1.60
Pallet box dump operator	1.60
Fork lift operator	2.00
Preparing	
Dry cleaner attendant	1.60
Washer and decluster attendant	1.75
Flotation cleaner attendant	1.75
Snipper attendant	1.60
Unsnipped bean separator	1.60
Inspection of snipped beans	1.60
Grader attendant:	
Double graders	1.60
Single graders (smallest sieve size only)	1.60
Cutter attendant	1.60
Nubbin grader attendant	1.60
Quality grader attendant	1.60
Temporary storage attendant	1.60
Blancher attendant	2.00
Inspection supervisor	2.00
Cleaning: clean and remove waste	1.60
Inspection	1.60
Empty can handling	
Manual unload	1.60
Manual unload w/tilting bin device	1.60
Operate empty can pallet unloader	1.60
Labeling	
Labeler operator	2.00
Casing	
Manual caser	1.60
Caser operator, semiautomatic machine	2.00
Caser operator, automatic machine	2.00
Manual case sealer	1.60
Case sealer operator	1.60
Case printer operator	1.60
Palletizing cases	
Manual loader	1.60

Operation and job description	1968 wage rate
	(dols./hr.)
Transporting	
Fork lift operator	2.00
Pallet loading bright cans	
Manual	1.60
Pallet loading and unloading bright cans	
Operator	1.60
Pallet unloading bright cans	
Manual	1.60
Labeling	
Labeler operator	2.00
Casing	
Caser operator	2.00
Case sealer operator	1.60
Case printer operator	1.60
Palletizing cases	
Manual	1.60
Transporting	
Fork-lift operator	2.00
Filling	
Filler attendant	1.60
Automatic filler attendant	1.60
Brine making	
Mix brine	1.75
Closing	
Closer attendant	2.25
Fill crates	1.60
Move filled and empty crates	1.60
Retort operator	2.50
Retort assistant	1.75
Attend cooling canal and move full and empty crates	1.75

Appendix Table 2 (continued)

Operation and job description	1968 wage rate
	(dols./hr.)
Dump crates	1.60
Operate crate loader	1.75
Move filled and empty crates	1.60
Operate crate unloader	1.75
Operate crate cat unloader	1.75
Attend cooling canal and unscrambler	1.75
Attend receiving canal and unscrambler	1.75
Electrician	3.00
Tool room clerk	2.00
Maintenance men	2.25
Quality control	2.00
Clean-up man	1.60
Warehouseman	1.60
Fork lift operator	2.00
Boiler attendant	2.00

Appendix Table 3. Cost of structure excluding warehouse area for canning green beans at selected rates of output

Item	Output per hour (in cases of 24/303 can-equivalents)				
	100	400	800	1200	1500
	(dollars)				
Receiving	160	640	1,280	1,920	2,400
Preparation	11,600	29,600	56,800	84,000	99,600
Filling and closing	1,280	2,200	2,720	2,720	3,840
Processing:[a]					
Alternative 1	3,320	8,560			
Alternative 4			3,904	6,864	10,768
Full and empty can handling:					
Alternative 1	4,260	6,300			
Alternative 4			6,510	7,890	8,970
Office	1,000	2,000	4,000	8,000	12,000
Rest rooms	2,000	4,000	6,000	8,000	9,000
Shops	800	1,600	2,000	2,400	3,200
Laboratory	400	800	1,120	1,440	1,600
Total	24,820	55,700	84,334	123,234	151,378

[a] Processing alternative 1 is a system using vertical retorts and a cooling canal with crates, whereas alternative 4 is a system using vertical retorts and a cooling canal without crates. (See Canning Handbook, Table 16.)

Source: Southern Cooperative Series Bulletin No. 146, op. cit., Tables 16 and 17.

Appendix Table 4. Costs of equipment to handle empty cans and to label, case and palletize full cans of green beans at selected rates of output

Item	Output per hour (in cases of 24/303 can-equivalents)				
	100	400	800	1200	1500
	(dollars)				
Handling					
Manual unloader		1,000			
Pallet unloader			1,800	2,715	2,715
Elevator	1,565	1,565	3,130	3,130	3,130
Conveyor	1,530	1,742	1,928	3,219	3,465
Divider			785	785	785
Labeling, casing and palletizing[a]					
Pallet loader and unloader			14,460	14,460	14,460
Labeler	2,700	2,700	2,700	3,145	5,400
Caser	1,185	5,285	5,285	6,005	6,005
Conveyor	100	200	200	200	1,225
Case sealer	455	5,555	5,460	6,045	6,045
Case coder		175	175	175	175
Case printer		b	2,900	2,900	2,900
Palletizer					
Miscellaneous equipment					
Truck scale	c	11,760	11,760	11,760	11,760
Boiler	10,760	19,440	28,750	37,480	44,500
Fork-lift trucks	8,735	20,600	31,400	47,100	47,100
Sewage disposal	7,500	10,000	12,000	14,700	17,300
Trucks	2,550	3,900	6,450	9,000	9,000
Air compressor	570	1,360	1,495	1,960	2,385
Janitorial	250	500	750	1,000	1,250
Office furniture	1,500	4,500	6,000	7,500	9,000
Shop equipment	1,500	3,000	6,000	9,000	12,000
Laboratory equipment	1,500	2,250	3,000	3,750	4,500
Hand trucks	300	300	1,800	1,800	1,800
Subtotal	42,700	95,827	148,228	187,829	206,900
Freight and installation charges for applicable equipment @ 20 percent of f.o.b. price	1,507	3,643	7,765	8,556	9,261
Total	44,207	99,470	155,993	196,385	216,161

[a]Alternative 2 (bright stacking full cans) was used for all rates of output except the 100-case per hour plant. For this plant, alternative 1 in which labels were applied before storing was used (see Canning Handbook).

[b]Uses preprinted cases.

[c]Assumes alternative means of weighing available on a per load basis.

Source: Southern Cooperative Series Bulletin No. 146, op. cit., Tables 1-5.

Appendix Table 5. Costs of specialized equipment for canning green beans at selected rates of output

Item	Output per hour (in cases of 24/303 can-equivalents)				
	100	400	800	1200	1500
	(dollars)				
Preparation					
Receiving and unloading					
Alternative 1--Pallet boxes		9,150	18,300	21,015	21,555
Dry cleaning	5,300	5,300	10,600	15,900	15,900
Washing	3,600	3,600	7,200	10,800	10,800
Declustering	3,100	3,100	6,200	9,300	9,300
Conveying	1,200	1,200	2,400	3,600	3,600
Distributing		2,500	4,700	6,000	8,200
Snipping	6,750	20,250	37,125	54,000	67,500
Separating	2,100	12,600	23,100	33,600	42,000
Conveying unsnipped beans	1,200	2,750	3,530	4,270	4,860
Inspecting and conveying					
snipped beans	900	5,400	9,900	14,400	18,000
Grading whole beans		12,600	23,100	33,600	42,000
Cross conveying for grader		2,070	3,260	4,620	5,610
Conveying (70 percent)[a]		3,770	4,035	4,545	4,670
Dewatering (70 percent)		2,550	2,550	2,550	2,550
Flume solids elimination					
(70 percent)		1,540	1,540	1,540	1,540
Elevating largest sieve sizes					
(30 percent)		1,340	1,340	1,705	1,705
Distributing			3,650	5,475	6,990
Grading smallest sieve					
size whole beans (30 percent)			4,350	7,250	8,700
Conveying for single graders					
(30 percent)			2,120	2,660	2,940
Separating (30 percent)			2,035	2,035	2,035
Slitting (30 percent)		5,400	10,800	10,800	16,200
Elevating (30 percent)			2,680	2,680	2,680
Cutting (70 percent)	1,755	7,020	10,530	15,795	19,305
Grading cut beans (70 percent)	4,650	7,000	10,500	15,750	19,250
Conveying (40-70 percent)			920	2,020	2,350
Elevating		3,615	5,090	5,345	5,665
Storage (temporary)	2,100	7,500	12,600	17,600	23,600
Conveying (70 percent)		1,060	2,120	2,500	2,730
Elevating	1,340	1,340	2,680	2,680	3,410
Blanching	4,095	4,095	8,190	9,230	12,805
Washing	1,050	1,275	2,550	2,550	3,825
Conveying	955	1,910	1,910	1,910	2,865
Fill-process					
Processing:[b]					
Alternative 1	10,110	29,609			
Alternative 4			37,316	56,401	68,955

Appendix Table 5 (continued)

Item	Output per hour (in cases of 24/303 can equivalents)				
	100	400	800	1200	1500
	(dollars)				
Filling, brining, etc.					
Washing and conveying	1,235	1,235	1,235	1,815	1,815
Filling	3,550	6,350	14,400	17,200	25,250
Brining	920	1,165	1,515	1,760	1,760
Can closing (steam vacuum)	2,280	2,460	5,305	7,510	10,355
Subtotal	58,190	170,754	301,376	412,411	503,275
Freight and installation charges for applicable equipment @ 20 percent of f.o.b. price	11,638	34,151	60,275	82,482	100,655
Total	69,828	204,905	351,651	494,893	603,930

[a]Percent of total product applicable if less than 100.

[b]Selection of processing technique was determined by those for which data were available in Tables 11 and 12 of the Canning Handbook. At the 400 rate of output, processing alternative 1 (vertical retorts with crates) was chosen over processing alternative 2 (vertical retorts with semiautomatic crate loader and unloader) because of the lower investment and operating costs. At the hourly output rates of 800, 1200, and 1500, processing alternative 3 (horizontal retort with semiautomatic crate-car loader and unloader) can be substituted for processing alternative 4 (vertical retorts without crates). Investment costs are lower for alternative 3 at the three rates of output but operating costs (labor and utilities) are greater for alternative 3 than for alternative 4. Investment costs for alternative 4 are $3,153, $12,225 and $15,613 greater than alternative 3 for the 800, 1200, and 1500 rates of output, respectively. However, operating costs are $8.41, $11.76 and $13.00 per hour less for alternative 4 relative to alternative 3 for the same rates of output. Thus, the gains in lower hourly costs for alternative 4 are greater than the losses in investment costs over an extended production period.

Appendix Table 6. Costs of salaried employees for canning green beans at selected rates of output[a]

Classification	Output per hour (in cases of 24/303 can equivalents)				
	100	400	800	1200	1500
	(dollars/season)				
General manager	20,000	20,000	20,000	20,000	20,000
Sales manager		15,000	15,000	15,000	15,000
Production manager			15,000	15,000	15,000
Plant superintendent		13,000	13,000	13,000	13,000
Field superintendent		13,000	13,000	13,000	13,000
Personnel manager			9,000	9,000	9,000
Office manager				9,000	9,000
Secretary	4,500	4,500	9,000	9,000	9,000
Clerk		8,000	12,000	16,000	20,000
Typist			4,000	8,000	8,000
Plant engineer			10,000	10,000	10,000
Mechanic		7,000		7,000	7,000
Yield control			7,000	7,000	7,000
Quality control supervisor		7,000	7,000	7,000	7,000
Custodian	4,500	4,500	4,500	4,500	4,500
Night watchman		5,000	5,000	5,000	5,000
Warehouse supervisor		7,000	7,000	7,000	7,000
Subtotal	29,000	104,000	150,500	174,500	178,500
Fringe benefits @ 7.5 percent	2,175	7,800	11,288	13,088	13,388
Total	31,175	111,800	161,788	187,588	191,888

[a]See Appendix Table 1 for salary ranges by job description.

Appendix Table 7. Costs of hourly labor for canning green beans at selected rates of output[a]

Classification	Output per hour (in cases of 24/303 can-equivalents)				
	100	400	800	1200	1500
	(dollars/hour)				
Empty can handling	3.20	3.20	3.20	3.20	3.20
Labeling, casing and storing Alternative 2 (bright stacking)		19.20	21.20	24.80	30.00
General help	9.45	14.05	23.50	30.70	38.15
Receiving and unloading pallet boxes Alternative 1 (pallet method)	3.20	5.20	8.80	12.00	12.00
Preparing	13.28	32.55	56.95	79.90	95.90
Filling	1.60	4.80	3.20	4.80	4.80
Brinemaking	1.75	1.75	1.75	1.75	1.75
Closing	2.25	4.50	4.50	6.75	6.75
Processing:[b] Alternative 1	5.70	12.00			
Alternative 4			4.25	4.25	4.25
Subtotal	40.43	97.25	127.35	168.15	196.80
Fringe benefits @ 8.4 percent	3.40	8.17	10.70	14.12	16.53
Total labor costs (dols.)	43.83	105.42	138.05	182.27	213.33

[a]See Appendix Table 2 for wage rates by job description.

[b]Processing alternative 1 is a system using vertical retorts, crates, and a cooling canal, whereas alternative 4 is a system using crateless vertical retorts and a cooling canal. (See Canning Handbook, Table 16.)

Source: Southern Cooperative Series Bulletin No. 146, op. cit., Tables 6, 7, 8, 13, 14 and 15.

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Appendix Table 8. Other costs of operating a green bean processing plant at selected raw product prices and rates of output

Type of input	Output per hour (in cases of 24/303 can-equivalents)				
	100	400	800	1200	1500
	(dollars/hour)				
Raw product @ 125 cases of 24/303's or 75 cases of 6/10's					
$100 per ton	80.00	320.00	640.00	960.00	1200.00
$125 per ton	100.00	400.00	800.00	1200.00	1500.00
Inspection	7.50	7.50	7.50	7.50	7.50
Containers					
Cans and lids	94.38	339.16	678.08	1017.24	1271.49
Labels	8.82	29.86	59.72	89.58	111.98
Cases	8.43	32.66	65.36	98.03	122.54
Salt	0.34	1.38	2.75	4.12	5.16
Utilities					
Electricity: Alternative 1	1.01	2.15			
Alternative 4			4.12	5.56	6.49
Fuel oil	1.70	6.66	13.48	19.38	25.26
Water	0.75	3.00	6.00	9.00	11.25
Sewage disposal services[a]					
Liquids	0.75	3.00	6.00	9.00	11.25
Repair work and supplies[b]	4.56	12.18	20.31	27.65	32.81
Miscellaneous[c]					
$100 per ton of raw product	41.65	151.51	300.66	449.41	561.15
$125 per ton of raw product	45.65	167.51	332.66	497.41	621.15
Total					
$100 per ton of raw product	249.89	909.06	1803.98	2696.47	3366.88
$125 per ton of raw product	273.89	1005.06	1995.98	2984.47	3726.88

[a]Receipts from sale of solid wastes considered sufficient to pay for disposal.

[b].004 percent of installed and/or delivered costs of all equipment.

[c]Miscellaneous items include such inputs as taxes, insurance, brokerage fees, legal fees, interest on operating capital, public relations, etc. and calculated as 20 percent of variable costs excluding labor.

Source: Southern Cooperative Series Bulletin No. 146, op. cit., Tables 18 and 19.