

Grower-Processor Agreements in the Sweet Corn for Processing Industry



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FOREWORD

The fruit and vegetable processing field has had a long history of contract crop production involving grower-processor contracts. The present procedures have evolved over the years through trial and error. This study attempts to determine the effects of different types of contractual arrangements on the job of producing and processing sweet corn, the experience gained in these arrangements over the many years they have operated, and the degree of satisfaction with the contract of each of the parties to the agreement.

The knowledge gained through experience in contract production by sweet corn growers and processors should be of value to other producers, processors, and marketers who are considering methods of integrating production and marketing functions. Certainly, the findings in the study of sweet corn growers and processors have significance and application in vertical integration in other areas of farm production and marketing as well as in sweet corn.

Members of the committee at the completion of this study were:

- M. E. Cravens, Ohio State University
- B. F. French, Michigan State University
- K. W. Johnson, Iowa State College
- R. A. Kelly, University of Illinois
- E. P. Lana, North Dakota Agriculture College
- V. J. Miller, University of Nebraska
- W. F. Mueller, University of Wisconsin
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- A. T. M. Lee, Office of Experiment Stations
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- O. B. Combs, University of Wisconsin

The authors wish here to give credit to the members of the committee for suggestions and criticism in the course of the study and in the preparation of the manuscript.

Grower-Processor Agreements in the Sweet Corn for Processing Industry in the North Central States

R. G. Kline and M. E. Cravens¹

INTRODUCTION

Sweet corn alternates with snap beans as the third or fourth most valuable vegetable crop for processing in the United States. While it is produced and processed throughout much of the United States, about three-fourths of the pack is produced in the North Central states. This study is an economic analysis of the marketing of sweet corn for processing in the North Central states, primarily from the standpoint of the arrangements for securing the raw sweet corn for processing.

During recent years, the farm price of raw sweet corn for processing has declined at the same time that many sweet corn processors have discontinued operations. Successful processors are participating in an increasing number of activities formerly done by growers, i.e. harvesting, hauling, spraying for insects and/or weeds, and, in some instances, processors are growing sweet corn on leased or owned land. These changes and the tendency for the acreage in sweet corn for processing to shift to new and different areas all indicate a change in the nature of the competition both from within the sweet corn industry and between this crop and other farm enterprises. It was for the purpose of analyzing these and related developments in the sweet corn industry that this study was made. The objectives of the study were:²

- (1) To describe the sweet corn-for-processing industry with respect to factors that may affect efficiency of processing and growing for processing. Primarily, this will include the effects of grower-processor agreements on efficiency.

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² This study is part of a larger study undertaken by the North Central Fruit and Vegetable Marketing Committee on "Quality-Price Relationships of Sweet Corn for Processing."

- (2) To determine the responsibility of growers and processors for decisions regarding production and harvesting practices.
- (3) To determine the areas in which misunderstanding and dissatisfaction may exist and to suggest ways in which these can be reduced.

Scope and Method of Analysis

This report summarizes the information obtained in a personal interview survey of 12 processors and 76 growers in Ohio, 7 processors and 67 growers in Indiana and 13 processors and 177 growers in Wisconsin. (Table 1a).

In Ohio and Indiana, all plants processing sweet corn in 1955 were included in the study. For sampling purposes, information concerning the maximum distance from the plant that a processor contracted with growers was obtained from each processor. All the area within this radius from the plant was considered the geographic universe for an area sample of growers contracting with each plant. The area surrounding each plant was then laid out in segments. Using a sampling rate of one-fourth, segments were selected for the grower survey.³ All growers producing sweet corn in 1955 in the segments selected were visited.

In Wisconsin, 13 of the 45 plants that processed sweet corn in 1955 were selected for the study. Three areas were selected randomly in the concentrated sweet corn area and all nine plants in this area were sampled. Four additional plants were selected in areas where sweet corn production was less concentrated. The method of selecting growers was similar to that used for Ohio and Indiana.

Some growers did not produce sweet corn every year, but produced it only as it fitted into their crop rotation. Slightly over 20 percent of those who grew sweet corn in 1955 had not produced it in 1954 (Table 1a).

Table 1a. Producers Who Grew Sweet Corn in 1954 Only, 1955 Only or in Both 1955 and 1954.

Production Pattern	Ohio	Indiana	Wisconsin	Total
	(Number of Growers)			
Grew 1955 and 1954	54	56	132	242
Grew 1955 but not 1954	21	7	39	67
Grew 1954 but not 1955*	1	4	6	11
Total interviewed	76	67	177	320

* The fact that the survey listing was of growers who produced sweet corn in the sample area in 1955 explains much of the difference between the number who are reported as growing in 1955 only as compared with 1954.

³ The selection of an area sample of sweet corn growers was completed under the guidance of Earl E. Houseman, Chief Statistical Officer, Statistical Clearance and Standards, AMSI, United States Department of Agriculture.

An additional 35 growers in the sample segments who had once grown sweet corn for processing but were no longer doing so were interviewed. The principal aim of the interview of these growers was to determine why they had stopped growing sweet corn.

NATURE OF THE SWEET CORN INDUSTRY

Total production of sweet corn for processing in the United States more than doubled between the mid 1930's and 1944. Since 1944, the increase has been at a much slower rate. Approximately two-thirds of all sweet corn production is used for processing (56 percent for canning and 9 percent for freezing).

The major area of production of sweet corn for processing is in the North Central States, which produce approximately three-fourths of the total United States supply. The eastern states declined from about 30 percent of the United States total in 1918 to about 13 percent today, while the western states increased rapidly from about 2 percent in 1935 to about 15 percent today.

Another trend is the increase in frozen sweet corn, which is gaining in importance relative to canning. A high proportion of the increase in production in the western states has been used for freezing.

Description of Processing Plants

In Ohio, Indiana, and Wisconsin, the processing of sweet corn is an old industry. In Ohio and Indiana, the majority of the plants surveyed have been operating 25 to 49 years and in Wisconsin the majority of the plants have been operating 10 to 24 years (Table 1). Of the 319 growers interviewed, 73 percent have always grown sweet corn for the same processor, and nearly 38 percent of the growers interviewed have been in the industry for more than 10 years (Table 2).

Table 1. Distribution of Sweet Corn Processing Plants According to Number of Years of Operation, 32 Plants in Ohio, Indiana, and Wisconsin in 1955.

Years of plant operation	Percent of plants operating specified period		
	Ohio (12 plants)	Indiana (7 plants)	Wisconsin (13 plants)
		(percent)	
Less than 10	0.	14.	0.
10 to 24	17.	14.	70.
25 to 49	58.	72.	15.
Over 50	25.	0.	15.

On the whole, the plants surveyed in Ohio and Indiana were small compared with those surveyed in Wisconsin. The average number of growers contracting with plants was 29 per plant in Ohio and 38 per plant in 6 of the 7 plants in Indiana. However, in Indiana, one

Table 2. Distribution of Growers According to Years of Sweet Corn Production and Percent of Growers Producing for One Plant All Years, 32 Plants in Ohio, Indiana, and Wisconsin 1955.

State	Number of		Percent of growers producing sweet corn for specified number of years				Percent of growers producing for same process—
	Plants	Growers ^a	1	2 to 5	6 to 10	Over 10	or all years
Ohio	12	76	7.7	24.4	26.9	41.0	81.5
Indiana	7	67	6.0	31.3	20.9	41.8	78.1
Wisconsin	13	176	5.7	27.0	32.2	35.1	68.2
Total or Average	32	319	6.3	27.3	28.5	37.9	73.1

^a Number of growers in the sample.

firm contracted nearly 80 percent of the sweet corn acreage surveyed, and through three adjacent plants contracted with over 600 growers. Only 2 of the 13 plants surveyed in Wisconsin contracted with less than 50 growers. In some instances the processor was growing sweet corn for processing on owned or leased land as well as contracting with growers for it. This practice was in evidence in 3 of the 12 plants surveyed in Ohio, 3 of the 7 in Indiana, and 8 of the 13 in Wisconsin. It accounted for 5.5 percent of the total acreage in Ohio, 6.6 percent in Indiana, and 22 percent in Wisconsin. The acreage packed per plant was 556 in Ohio compared with 1476 acres in Wisconsin and 1304 acres in Indiana. Except for the one large plant in Indiana, the acreage per processor in Indiana was much more comparable with that in Ohio than in Wisconsin.

In Ohio and Indiana cream style corn was packed almost exclusively, while in Wisconsin it was predominantly whole kernel. In Wisconsin, 4 of the 13 plants surveyed packed both cream style and whole kernel and only one plant packed cream style exclusively. (Table 3).

The percent fancy grade packed for each style was highest in Wisconsin with 95 percent and 92 percent respectively. (Table 3) In the plants where both styles were packed, Ohio and Indiana each reported 90 percent fancy, while Wisconsin only reported 78 percent fancy.

Table 3. Type of Corn Packed and Percentage Fancy Grade, Ohio, Indiana, and Wisconsin^b, 1955

State	Type of Corn Packed					
	Cream Style		Whole Kernel		Mixture	
	Percent fancy grade	Number of plants	Percent fancy grade	Number of plants	Percent fancy grade	Number of plants
Ohio	59	10	85	1	90	1
Indiana	70	6	—	—	90	1
Wisconsin	95	1	92	8	78	4

^b Plant averages not weighted by output per plant. Plants packing 75 percent or more cream style are classified cream style, those packing 75 percent or more whole kernel are classified whole kernel. Plants packing more than 25 percent and less than 75 percent of each kind (whole kernel or cream style) are classified mixture.

In Ohio 5 of the 12 plants surveyed in 1955 did not process other vegetables (Table 4). A larger proportion of the plants in Indiana and Wisconsin processed other vegetables in addition to sweet corn. The plants processing only sweet corn operated one to one and one-half months per year, while plants canning a combination of vegetables or vegetable products operated through a greater part of the year (Table 4). The crop most often processed in addition to sweet corn was peas, and many farmers grew both peas and sweet corn on contract for a processor.

Table 4. Total Months of Plant Operation and Vegetables Processed in Addition to Sweet Corn, 32 Sweet Corn Processing Plants in Ohio, Indiana, and Wisconsin, 1955.

Items Processed	Ohio		Indiana		Wisconsin	
	Number of plants	Average months	Number of plants	Average months	Number of plants	Average months
Only sweet corn	5	1.3	1	1.5	2	1.5
Sweet corn and peas	0	....	1	2.5	9	2.6
Sweet corn, peas, and other vegetables	4	7.4	3	4.3	2	4.8
Sweet corn and other vegetables	3	5.6	2	6.6	0	....
All for state	12	4.4	7	4.3	13	2.7

Description of Grower Operations

On most farms, the sweet corn enterprise was a minor one. On the average, sweet corn accounted for slightly less than 10 percent of the acreage of harvested crops. In addition, most of the farms had one or more livestock enterprises.

In Ohio and Indiana the beef, dairy and swine enterprises on farms growing sweet corn for processing were of about equal importance (Table 5). However, in Wisconsin the dairy enterprise was by far the most important enterprise. Wisconsin also had the highest number of animal units per acre of harvested cropland. In each of the states, as the acres of harvested cropland increased, the number of animal units per acre decreased. The number of animal units per acre also could have accounted for some of the differences in yields when crops received extra manure in addition to equal amounts of commercial fertilizer.

Sweet corn acreage was almost twice as important relative to that of field corn and small grains for Wisconsin as for Ohio and Indiana sweet corn (Table 6). A further indication of the relatively greater importance of field corn and small grain in Ohio and Indiana was in the percent of growers owning corn pickers and combines in Ohio and Indiana compared with Wisconsin (Table 7).

Table 5. Distribution of Major Livestock Enterprises on Farms Growing Sweet Corn, in Ohio, Indiana, and Wisconsin, 1955.

Major Livestock Enterprises	Ohio	Indiana	Wisconsin
		(Percent of Farms)	
Dairy	29.8	22.7	81.3
Beef	29.8	34.9	6.2
Swine	32.4	31.8	5.7
Others	4.0	0.0	3.4
Number of Animals	4.0	10.6	3.4
Total	100.0	100.0	100.0

In contracting for sweet corn acreage, the processor generally preferred to contract for 10 or more acres. Over half of the growers surveyed fell into this category (Table 8). This was especially true where the processor furnished such services as machine harvesting, labor crews for hand harvesting, and spraying or dusting for insect and disease control. The larger acreages also facilitated more economical supervision of the crop.

Table 6. Ratio of Small Grain and Field Corn to Sweet Corn, Ohio, Indiana, and Wisconsin, 1955.

State	Ratio of Small Grain to Sweet Corn	Ratio of Field Corn to Sweet Corn
Ohio	3.8:1	4.4:1
Indiana	4.3:1	3.9:1
Wisconsin	2.7:1	2.0:1

Table 7. Percent of Farms Owning Corn Pickers and Combines, Ohio, Indiana, and Wisconsin, 1955.

State	Percent of Farms Owning Corn Pickers	Percent of Farms Owning Combines
	(percent)	(percent)
Ohio	81.1	71.6
Indiana	90.5	74.6
Wisconsin	45.4	55.1

Table 8. Percent of Growers Producing Specified Acreage of Sweet Corn, Ohio, Indiana, and Wisconsin, 1955.

Specified Acreage	Ohio	Indiana	Wisconsin	Average
Less than 10	28.1	7.7	46.9	31.2
10 — 29	61.3	72.0	40.9	54.3
30 or more	10.6	20.3	12.2	14.5

One of the large items of expense in the production of sweet corn is the movement from the farm to the processing plant. Regardless of whether the grower or processor pays the expense, the cost increases as the miles from the farm to the plant increase. Other costs such as fieldman supervision, harvesting, and spraying also increase as the farm to plant distance increases. Of the plants surveyed, 84 percent had all of their acreage within 29 miles of the plant (Table 9). In Ohio there were no plants with contracted acreage more than 29 miles from the plant (Table 9).

Table 9. Percent of Plants Having Contracted Acreage Within Specified Maximum Miles, Ohio, Indiana, Wisconsin, 1955.

States	Less than 15 miles (Percent)	15-29 miles (Percent)	30 or more miles (Percent)	Total (Percent)
Ohio	58	42	---	100
Indiana	14	57	29	100
Wisconsin	23	54	23	100
Average	34	50	16	100

The function of sweet corn in the rotation differed in the different states. In Ohio and Indiana fall-sown wheat followed sweet corn much more often than it followed field corn. In Wisconsin, the most frequent crop following both sweet corn and field corn was oats. There was more competition between sweet corn and field corn for labor and equipment at planting time in Wisconsin than in Ohio and Indiana.

These facts point up the differences in the competition between sweet corn and field corn in the two areas. Apparently, in Ohio and Indiana, sweet corn more frequently allows the planting of winter grain than does field corn, while in Wisconsin there is apparently no difference in this respect for the two types of corn. In Wisconsin, sweet corn and field corn must compete directly in terms of dollar return per acre. In Ohio and Indiana, the grower has the added advantage of sweet corn as a crop in rotation to favor it (i.e., sweet corn makes possible a winter cover crop in Ohio, while field corn does not. In Wisconsin this is not true).

One other indirect advantage of sweet corn as a crop over field corn or small grain in 1955 was the fact that there were no government acreage restrictions on it. This made it possible for the grower to substitute sweet corn for acreages taken out of field corn, wheat, or other restricted crops. The practice of substituting sweet corn for restricted acres during one or more of the past three years was widespread in Ohio and Indiana, where 49 percent and 42 percent respectively of the growers reported the practice. In Wisconsin, only 14 percent of the growers took advantage of this opportunity. This was another factor that apparently favored sweet corn for the Ohio and Indiana grower more than for the Wisconsin grower.

Despite these advantages to Ohio and Indiana growers, the sweet corn processing industry appears to be moving towards the Wisconsin-Minnesota area. Apparently the existence of profitable alternative crops for Indiana and Ohio growers and superior production possibilities for processors in Wisconsin such as the availability of supplementary crops for processing and longer periods during which harvesting of a high quality sweet corn can be scheduled, more than offset the above advantages.

PRICE STRUCTURE FOR SWEET CORN CONTRACTED FOR PROCESSING¹

The return per acre he receives for his crop is of major interest to the grower. This return depends upon the price paid per unit and the number of units sold. These factors vary among processors depending upon the contract price and on grading and other policies.

A definite price to growers for sweet corn was set by 31 of the 32 processors before the contract to grow sweet corn was signed. For the other processor, a minimum price was set with the provision that the final price would depend on the sales of canned corn.

In addition to the stated price per unit there were numerous and varied provisions for services by the processors. These services and their value to the grower were major causes in variation in the net returns to growers from sweet corn for processing.²

The Pricing Unit

The unit by which farmers were usually paid for raw sweet corn was tons of usable corn in husk. The definition of "usable corn in husk" varied among plants. The following were representative interpretations of the terms:

¹ The following is an abbreviated statement of the structure for grower returns for sweet corn contracted for processing:

GROWER RETURNS DEPEND ON:

A. YIELD OF USABLE SWEET CORN SOLD

B. PRICE PER UNIT

A. Yield of usable corn depends on:

1. Natural factors such as weather, fertility, etc.
2. Management
3. Method of harvest
4. Style of corn packed
5. Incentives offered by processor are a factor as they affect management
6. Grade packed by processor

B. Price per unit depends on:

1. Sale price of canned corn (This in turn is affected by many factors such as supply, processing costs, consumer income, population, supply of competing items, grade of corn packed, etc.)
2. Competitive situation
 - a. Number of processors available to grower
 - b. Other crops competing for resources of grower
3. Services performed by processor for grower and charges for services

² See Appendix Table I

- (1) "Usable corn in husk shall mean sweet corn in husk, ears not mixed, snapped close to the ear, at least five inches long, 95 percent filled with kernels in a milky stage, and in suitable condition for canning."
- (2) "From each load of corn received a representative sample of not less than 25 pounds will be taken. It will be weighed, one-half inch of the shank cut off, and the husk stripped back. Ears showing an excessive number of worms or an excessive amount of damaged kernels, smut or frost damage, mixture of field corn, and ears with kernels which are not tender nor in a milk stage of maturity will be graded as not usable and not suitable for canning. The remainder of the ears in the sample will be trimmed free from worm damage, other damage, and any part not filled with edible kernels."

The weight of usable corn (the weight paid for) in the load was determined by the weight of the usable corn in husk in a sample taken from the load.

A few processors paid on a basis other than a flat rate for "usable corn in husk." One processor was paying for corn according to moisture content. A few processors had specified prices according to the variety. Several offered incentives for large acreage and/or high yields. These incentives were in terms of higher prices per ton.

Factors Affecting Returns to Growers

Many items in the contract agreement between growers and processors affected grower returns. The most important direct factors aside from the contract price were the services provided the grower by the processor, the charges for these services and their effect on yields of salable corn per acre.

Still another factor indirectly affecting the contract price and grower returns was the retail price for canned corn during the previous season. For the period 1918 - 1954, a 1 percent change in the retail price of canned corn was associated with a 1.48 percent change in the same direction of prices to farmers the following year.² The determination of factors affecting retail prices of canned sweet corn would, of course, be a study in itself. The major factors are the supply of sweet corn and the demand for it as indicated by levels of consumer income and population.

² Unpublished data, Gustavo Tejada, Research Assistant, Department of Agricultural Economics, The Ohio State University.

$$\begin{aligned} \text{Log } Y &= -1.436 + 1.485 \log X \\ r &= 0.92 \\ sb &= 0.105 \end{aligned}$$

$$\begin{aligned} Y &= \text{U.S. price per ton (usable corn in husk, year } t + 1) \\ &\quad \text{paid farmer} \\ X &= \text{U.S. retail price canned corn (number 2 can, year } t) \end{aligned}$$

Services and Cost of Services Provided By Processors

Seed. Each of the 32 processors furnished seed to the grower. The deductions to growers for this seed ranged from nothing to \$0.40 per pound. Processors reported actual cost of seed at \$0.40 to \$0.50 per pound.

Harvesting Service. Twenty-nine of the 32 plants provided machine harvesting service to the growers: one provided hand harvesting; and six provided either hand harvesting and machine harvesting or both. Processors reported that hand harvesting labor where provided was charged at cost. The charge for machine harvesting was usually calculated on the basis of expected maintenance, repair, and operation cost. However, the unit on which harvesting charges were based as well as the amount charged per unit varied among the plants. Of the 32 plants studied, 41 percent in Ohio, 55 percent in Indiana, and 8 percent in Wisconsin charged a flat rate per acre for machine harvesting. This method of charging made harvesting cost per acre a fixed cost to the grower and should have encouraged the production of higher yields when compared with other methods of charging for harvest. Modifications of "acre" as the unit of harvesting cost were as follows:

- (1) A direct charge per ton but a minimum and maximum charge per acre irrespective of yield.
- (2) One rate per ton up to a specified yield and a lower rate per ton for higher yields.
- (3) The same harvesting rate per ton for all yields but an incentive payment per ton for corn to growers with high yields.

Almost one-third of the 32 processors charged for harvesting at a flat rate per ton with no incentive for high yields.

Hauling. Varied services were offered to farmers in hauling the corn to the processing plants. Although no processors in Ohio did hauling for growers, many of the processors helped the growers make arrangements with commercial haulers. Eighty percent of the plants in Indiana and Wisconsin offered some services in hauling. These services ranged from renting trailers to providing the complete hauling service. Some of the plants in Wisconsin considered the harvesting and hauling service under one agreement. One plant in Wisconsin paid a flat rate per ton (usable corn in husk) for corn in the field, and harvested and hauled the corn at the plant's expense. Only two of the 32 plants provided hauling service where the hauling cost per ton was based on mileage hauled.

Other. Other services provided to growers which directly and indirectly affected growers' returns included: (1) Services of fieldmen, (2) disease and insect control, (3) furnishing planter plates, (4) soil testing, (5) spraying for weed control, (6) financing fertilizer, and (7) providing cannery waste for silage to the grower.

Factors Affecting Yields of Usable Corn Per Acre

Gross returns are affected not only by the price received per unit but also by yields of usable corn.

In each state the yields as reported by the processors were approximately 20 percent less than those reported by the growers contracting with the respective plants.³

Normally, the variations in yields of sweet corn are considered to be largely a result of the farmer's management program and the weather, the soil and other natural causes. This study has indicated that certain processor-grower practices have also affected yields per acre. (Table 11). The practices that appear to have affected yields per acre are:⁴

1. **Method of harvesting, hand or machine.** Growers indicated that the machine harvester cut or otherwise damaged some ears of sweet corn. If the harvester was not operated carefully, corn was left in the field.
2. **Style of corn packed.** Kernels of corn that were crushed or otherwise unacceptable for whole kernel corn could have been acceptable for cream style corn. Some cream style corn was packed at a more mature stage than was true of whole kernel corn.
3. **Presence of incentive for high yields.** It would seem logical that incentive payments to growers or incentive reduction in cost of services, based on yields per acre would have encouraged production practices that might result in higher yields. High yields not only meant higher gross returns per acre to the grower but also lower expense per ton for processor services such as spraying, supervision, and harvesting.

³ This difference may be partially explained by the manner in which processors estimated acreage contracted. Processors recommended a specified amount of seed to be planted per acre. The amount of seed the farmer accepted divided by the specified planting rate would be the processor's estimate of planted acreage. If the farmer planted at a rate per acre in excess of the recommended rate, or if the farmer did not plant all the seed he accepted, the acreage as estimated by the processor would have been higher than the acreage the farmer actually planted. Thus, the yields per acre as estimated by the processors were less than yields as estimated by growers. Another possible source of variation is the fact that processors reported usable corn in the husk while growers may have consciously or unconsciously reported total weight delivered.

⁴ For each of the years 1955 and 1954 yield of usable corn per acre was calculated by a regression technique to determine the effect of the above stated factors (style of corn packed, method of harvesting, incentive or no incentive payments according to yield, and percent of corn packed as fancy) on grower yields. (See Appendix II.) Since differences in yields may have been due to other factors such as the natural fertility of the soil and rainfall, two additional variables (yield field corn and state in which produced) were used in the equation to explain differences. The data were grouped according to states and differences noted. The yield of field corn on the same farm (bushel per acre) was an indication of the production possibilities within the specified year. Thus, the effects of management and natural factors were held at a minimum as factors affecting sweet corn yields. Yield of field corn was a continuous variable in the equation for determining sweet corn yields. Each grower's yield for his farm was considered one observation (tons of usable corn per acre) and was not weighted by acreage.

4. **Percent of corn packed as fancy.** To the extent that the fancy label indicates high quality, one would assume that an increase in the percent of corn packed as fancy would cause a decrease in the yield per acre for the grower. The percent of corn in husk which would be acceptable as "usable corn," would be less when packing a high quality product than when packing a lower quality product. Corn sold as fancy canned corn would probably be harvested at an earlier stage of maturity and consequently lower yield than corn sold under a lower grade.

Table 11. Average Yields Reported by Growers and by Processors for Sweet Corn for Processing, Ohio, Indiana, and Wisconsin, 1954 and 1955.

State	1955		1954	
	Grower estimate	Processor estimate	Grower estimate	Processor estimate
	(tons per acre)			
Ohio	3.32	2.70	4.20	3.21
Indiana	2.98	2.30	2.96	2.55
Wisconsin	2.89	2.58	3.86	3.20

Plant averages of yields of sweet corn per acre were not significantly different between any two of the three states in 1955. In 1954, sweet corn yields in Ohio and Wisconsin were significantly higher than yields in Indiana. Average yields in Ohio were higher than yields in Wisconsin in 1955 but the difference was not significant. When adjusted for the other factors considered, on the average, the ratio of sweet corn yields to field corn yields was highest in Wisconsin in both 1955 and in 1954. The ratio of sweet corn yields to field corn yields were significantly less in Indiana than in Ohio in 1954, but not in 1955.

Method of Harvest. Yields were slightly higher where hand harvest methods were used than where the sweet corn was harvested by machinery. The differences in yield, however, were not significant.

Style of Corn Packed. Yields per acre of sweet corn were greater in both 1955 and 1954 where farmers sold to plants that processed both cream style and whole kernel corn rather than whole kernel corn only.⁵ The differences in raw sweet corn yields between plants processing whole kernel corn and those processing a mixture, were 0.46 ton per acre and 0.15 ton per acre in 1955 and 1954 respectively. In both years 1955 and 1954, the sweet corn yields for growers selling to plants processing cream style corn were significantly greater than the yields for growers selling to plants processing whole kernel corn. Yields to growers contracting with plants packing cream style corn

⁵ Plants were divided into three groups according to type of corn packed; (1) cream style, 75 percent or more of the corn was packed as cream style; (2) whole kernel, 75 percent or more of the corn was packed as whole kernel; (3) mixture, more than 25 percent and less than 75 percent of the corn was packed as cream style or as whole kernel.

were 0.79 tons and 0.67 tons higher in 1955 and 1954 respectively than for growers contracting with plants packing whole kernel corn.

Incentive Program. Incentive payments resulted in higher yields. In 1955 and 1954 respectively, averages of yields per acre were 0.13 ton and 0.23 ton more for growers selling to plants where incentive payments for high yields were made, than for those who contracted with plants that made no incentive payments for high yields.

Grade of Corn Packed. As the proportion of a plant's pack that was fancy grade increased, the grower's yield per acre of raw sweet corn (usable corn in husk) decreased. A 1.0 percent increase in percentage of the pack that was fancy was associated with a 0.007 ton decrease in yield in 1955 and a 0.004 ton decrease in 1954.⁶

Grower Returns Per Acre For Growing Sweet Corn

In order to study grower returns from sweet corn, the major factors in gross returns per acre minus deductions for seed, fertilizer, harvesting and hauling costs were obtained from each grower. (Table 12). No allowance was made for value of stalks left in the field or for silage available from the processor.

The factors affecting these returns were then estimated by a regression technique where an independent variable, the yield of field corn, was used to indicate the level of productivity and management for the farm. The effect of method of harvest, type of pack and incentive payments on grower returns were tested (See Appendix III).

Method of Harvest. In both 1955 and 1954, the grower's returns per acre were less where the sweet corn was machine harvested than where the corn was hand harvested (Table 13).⁷ This difference was not statistically significant in 1954, however.

Style of Corn Packed. Grower's returns per acre for sweet corn were significantly greater where the plant packed 75 percent or more cream style corn, than where the plant packed 75 percent or more whole kernel corn. Where the plant packed both whole kernel and cream style corn (mixture — more than 25 percent and less than 75 percent of either whole kernel or cream style) the returns to growers were higher than where whole kernel style of corn was packed but less than where plants packed cream style corn.

Incentive Program. Average returns per acre to growers were less where the plant did not offer an incentive payment based on yield.

⁶ These relationships were significant at the 99 percent level in 1955, and at the 80 plus percent level in 1954. A partial explanation for the difference in the relationship in the two years may have been the fact that many processors in 1954 labelled corn that normally would have been fancy grade as extra standard since fancy grade corn was moving slowly.

⁷ If the plant furnished hand harvesting service, the plant's price for hand harvesting was used. If the plant did not offer hand harvesting service, the same price was charged per ton as was charged for machine harvesting. This difference in net returns was more of an indication of difference in yields (See Appendix II). Most hand harvesting not provided by the processor was done by family labor.

Production Area. When yields of sweet corn were adjusted according to the yield of field corn and when adjustments were made for type of pack, method of harvest and incentive payments, returns per acre for sweet corn were higher in Wisconsin than in Ohio or Indiana in both 1955 and 1954. After similar adjustments, returns per acre for sweet corn were higher in Indiana than in Ohio during 1955 but they were lower in 1954. The yield of sweet corn adjusted for growing season (yield of field corn) was higher in Ohio than in Indiana in both 1955 and 1954, but the difference was greater in 1954. The price received per ton by growers was higher in Indiana than in Ohio in both 1955 and 1954 but the difference was greater in 1955.

Competition Among Plants. The data did not support a hypothesis that the pricing structure was associated with the number of

**Table 12. Grower's Yields and Returns Per Acre from Sweet Corn, (plant averages)
32 Sweet Corn Processing Plants in Ohio, Indiana, and Wisconsin, 1955a**

Items	Ohio (12 plants)	Indiana (7 plants)	Wisconsin (13 plants) ^c
1955			
Yield per acre (tons)	3.32	2.98	2.89
Standard deviation for yield, s _x	0.53	0.48	1.04
Net returns (dollars per acre) ^b	34.32	32.73	28.83 ^d
Standard deviation for returns, s _x	7.55	8.55	15.73
1954			
Yield per acre (tons)	4.20	2.96	3.86
Standard deviation for yield, s _x	0.70	0.68	0.47
Net returns (dollars per acre) ^b	51.48	37.47 ^d	46.97 ^d
Standard deviation for returns, s _x	10.61	10.75	9.48

a Averages for the 12 plants in Ohio, 7 plants in Indiana, and 13 plants in Wisconsin are not weighted by number of growers per plant: The t values for differences between specified states are:

1955

Ohio—Indiana, difference—\$2.19 t (17 d.f.)=0.58 ns

Ohio—Wisconsin, difference—\$6.27 t (23 d.f.)=1.25 ns

Indiana—Wisconsin, difference—\$3.90 t (18 d.f.)=0.57 ns

1954

Ohio—Indiana, difference—\$14.01 t (17 d.f.)=2.76**

Ohio—Wisconsin, difference—\$4.51 t (22 d.f.)=1.10 ns

Indiana—Wisconsin, difference—\$9.50 t (17 d.f.)=2.01*

b Returns per acre were gross returns minus expenses for fertilizer, seed, harvesting, and hauling. Fertilizer is charged at \$0.165 per pound for nitrogen, \$0.07 per pound for phosphate, and \$0.09 per pound for potash. For plants where harvesting and hauling charges were established, these were used as a basis for these expenses. Where no estimate is made, hauling is charged at \$1.75 per ton and harvesting \$2.50 per ton. Net returns are on all acres contracted. Averages for individual plants are weighted by acres per grower. The averages for the states are unweighted plant averages not weighted by number of growers per plant.

c Twelve plants operated in 1954.

d Includes five growers in 1955 and one grower in 1954 in Wisconsin and two growers in Indiana in 1954 that reported zero yields and zero returns. The corn was put in the silo.

plants in an area. The returns per acre were not significantly different in areas where there were one, two or three processors competing (Table 14).

In eight of the nine plants where there was one additional plant in the area, all the growers contracted with the nearest one. In five of the 16 plants there were two or more additional plants in the area, all growers contracted with the nearest plant.

Table 13. Grower's Returns Per Acre from Sweet Corn as Related to Specified Processor-Grower Practices and Adjusted for Yields of 75 Bushels of Field Corn Per Acre, Growers Contracting with 32 Plants in Ohio, Indiana, and Wisconsin, 1955 and 1954a

Items of grower-processor practices	Ohio		Indiana		Wisconsin	
	Number of growers (Number)	Dollars return per acre (Dollars)	Number of growers (Number)	Dollars return per acre (Dollars)	Number of growers (Number)	Dollars return per acre (Dollars)
Whole Kernel Corn (304 Growers 1955 Season)						
Incentive Payment						
Hand harvest	1	33.78	0	—	1	40.86
Machine harvest	0	—	0	—	22	34.19
No Incentive Payment						
Hand harvest	5	30.74	0	—	56	37.82
Machine harvest	0	—	0	—	26	31.14
(250 Growers 1954 Season)						
Incentive Payment						
Hand harvest	0	—	0	—	0	—
Machine harvest	0	—	0	—	17	48.62
No Incentive Payment						
Hand harvest	2	36.67	0	—	58	46.47
Machine harvest	0	—	0	—	18	45.00
Mixture c (304 Growers 1955 Season)						
Incentive Payment						
Hand harvest	0	—	0	—	0	—
Machine harvest	10	30.51	0	—	4	37.59
No Incentive Payment						
Hand harvest	0	—	0	—	21	41.22
Machine harvest	0	—	4	28.73	26	34.54
(250 Growers 1954 Season)						
Incentive Payment						
Hand harvest	0	—	0	—	0	—
Machine harvest	9	41.13	0	—	0	—
No Incentive Payment						
Hand harvest	0	—	1	27.24	13	48.78
Machine harvest	0	—	3	25.76	23	47.31

Items of grower-processor practices	Ohio		Indiana		Wisconsin	
	Number of growers (Number)	Dollars return per acre (Dollars)	Number of growers (Number)	Dollars return per acre (Dollars)	Number of growers (Number)	Dollars return per acre (Dollars)
Cream Style (304 Growers 1955 Season)						
Incentive Payment						
Hand harvest	0	—	2	41.96	0	—
Machine harvest	33	34.02	56	35.28	6	41.09
No Incentive Payment						
Hand harvest	3	37.65	1	38.92	4	44.72
Machine harvest	24	30.97	0	—	0	—
(250 Growers 1954 Season)						
Incentive Payment						
Hand harvest	1	53.14	3	41.40	1	62.94
Machine harvest	24	51.67	50	39.92	7	61.47
No Incentive Payment						
Hand harvest	2	49.52	0	—	0	—
Machine harvest	17	48.05	1	36.30	0	—
(304 Growers 1955 Season)						
State Total and Average	76	32.52	63	35.13	166	36.50
(250 Growers 1954 Season)						
State Total and Average	55	48.22	58	38.98	137	47.79

a Returns per acre are gross returns minus expenses for fertilizer, seed, harvesting, and hauling. Returns per acre are estimated by the regression equation $Y_{ijkl} = a' + s' + p' + h' + i' + b_i X_{ijkl} + e_{ijkl}$, where Y is the returns per acre and X yield of field corn (bushel per acre). Each grower's returns per acre was one observation and was not weighted by acres per grower (See Appendix III).

b Five of the 171 growers and one of the 138 growers in Wisconsin in 1955 and 1954 respectively, and two of the 60 growers in Indiana in 1954 had zero return from sweet corn and no yield of field corn. They are not included in the estimates.

c Less than 75 percent and more than 25 percent of either whole kernel or cream style corn.

Table 14. Returns Per Ton for Sweet Corn Growers Grouped According to Number of Processing Plants in Area, 32 Plants in Ohio, Indiana and Wisconsin, 1954 and 1955

Number of Plants within 20 miles of grower	Average Price Per Ton		
	Ohio	Indiana	Wisconsin
		(1954 Season)	
one	\$18.19	\$19.46	\$
two	17.43	19.00	17.68
three	17.85	18.00	18.93
		(1955 Season)	
one	\$16.75	\$17.78	\$
two	16.00	18.00	16.39
three	16.20	17.00	17.76

SERVICES PROVIDED BY PROCESSORS

As was indicated in the previous section, the processors provided various services to contracting growers. For some of these, the processor made a specific charge to the grower while for others the processor absorbed the cost. Such services and/or materials as hauling, machine harvest, spray, planter plates, fertilizer finance, and soil testing were paid for by the grower. On the other hand, the cost of services of the fieldmen in advising the grower was paid for by the processor.

Fieldmen

The principal duties of the fieldmen are contracting acreage from growers; advising on production problems; and checking the stage of maturity of corn for harvest as desired by the processor. Only the second of these functions could be said to be of direct benefit to the grower.

The costs of the fieldmen were borne entirely by the processor. The extent of these costs varied among processors but were a significant item of expense. For processors with less than 600 acres contracted, an average of 2.9 months of fieldman's labor was used while for those with 600 acres or over, an average of 10.9 months of fieldman's labor was used. For the larger processors the number of visits per farm averaged 5.5 compared with 4.2 for the smaller processors (Table 15).

Apparently a major function of the fieldmen was to implement the written contract through personal contact with growers. Slightly over half of the growers indicated that the fieldmen were their only contact with the processor. About one-fourth of the growers indicated that fieldmen and/or newsletters, meetings, etc. were their means of obtaining information from the processor. Another 23 percent of the growers indicated that they received no information from the processor.

The type of information provided by the fieldmen and the proportion of the plants providing each type of information varied among the three states. Growers reported that the type of information supplied most frequently by fieldmen was the time of harvest. The planting rate and cultivation practices and fertilizer type were among the next in frequency. The least frequently reported information or instructions supplied by fieldmen were those regarding selection of location for sweet corn, on cultivation, and on weed, disease and insect control.

Table 15. Fieldmen's Labor Per Plant, Per 100 Acres and Per 100 Growers, Ohio, Indiana and Wisconsin, Sweet Corn Processors, 1955

Acreage	Number of Plants	Average acres of corn contracted/ planted (acres)	Fieldman labor employed by months/plant (months)	Fieldman months/100 acres/plant (months)	Fieldman labor employed per 100 growers (months)
OHIO					
Under 600	9	396	2.7	.69	1.02
600 over	3	882	7.5	.85	.98
Total and Average	12	517	3.9	.76	1.00
INDIANA					
Under 600	3	287	3.2	1.10	25.68
600 over	4	3,782	11.2	.30	5.29
Total and Average	7	2,284	7.6	.34	6.14
WISCONSIN					
Under 600	1	310	3.5	1.13	1.00
600 over	12	1,306	11.3	.87	.98
Total and Average	13	1,229	10.7	.88	.98
ALL PLANTS					
Under 600	13	364	2.9	.80	1.20
600 over	19	1,760	10.7	.61	.83
Total and Average	32	1,193	7.5	.63	.87

Other Services

The service most commonly provided by processors to growers was machine harvesting, which was provided by 29 of the 32 processing plants. The next most frequently provided services were hauling, by 14 processors, fertilizer finance, by 12 processors, and providing planter plates, by 10 processors (Table 16).

The mere availability of a service did not guarantee that the grower would use it. The harvesting service was used by over 90 percent of the growers to whom it was available, while only 30 - 50 percent of the growers used fertilizer finance and 23 - 55 percent used planter plates where these services were available. The use made of the other services provided were between these extremes.

Grower Desire for Additional Services

Only 10 percent of the growers indicated a desire for more services from the processor than they were presently receiving.⁸

⁸ This was in answer to the question: "Would you prefer that the processor provide more services than are now available?"

Table 16. Services Made Available by Processors to Growers and Percentage of Growers Using Services, 32 Processing Plants, Ohio, Indiana and Wisconsin, 1955

State and Services made available	Plants making services available								
	Number of plants			Number of growers in plants offering the service			Percent of growers in sample using service ^b		
	Ohio	Ind.	Wis. ^a	Ohio	Ind.	Wis.	Ohio	Ind.	Wis.
Fertilizer finance	1	4	7	7	50	93	30.0	34.0	51.6
Planter plates	5	2	3	36	17	39	55.6	41.2	23.1
Spray or dust	2	3	1	17	33	11	88.2	78.8	45.4
Testing soil	4	1	2	29	13	26	51.7	8.0	76.9
Machine harvest	11	7	11	71	66	144 ^c	95.8	93.9	59.7
Hand harvest	0	0	7	....	....	92 ^c	.....	.....	68.5
Hauling	0	2	12	....	17	162	.....	35.3	80.2
Other ^d	3	1	1	20	e	11	100.0	e	9.1

a Total plants in respective states: Ohio 12 plants, Indiana 7 plants, Wisconsin 13 plants.

b This is the percent of growers from plants offering specified service.

c Six plants in Wisconsin provided both machine harvest and labor for hand harvest. One of the 13 plants in Wisconsin provides no harvesting service.

d Three plants in Ohio gave \$1.25 per acre to farmers who applied fertilizer. One plant in Indiana and one in Wisconsin applied weed killer spray at cost.

e No estimate of the number who used these services.

The few who answered, "yes" desired some of the services now being provided by some but not all of the processors. The most frequently mentioned service, disease and insect control, was mentioned by only 18 of the 117 growers where this service was not provided in Wisconsin and Ohio. The next most frequently mentioned service, fertilizer financing, was mentioned by only nine growers. Hauling, harvesting and soil testing were other services mentioned.

Cannery Waste for Silage

The availability of silage from the cannery waste is valuable to growers who have a use for it. Twelve of the 13 Wisconsin plants and 21 of the 32 plants included in the study made provisions for the use of this product by growers. Slightly over a third of the Indiana and Wisconsin growers and one-eighth of the Ohio growers used this silage in 1955. The price ranged from 0 to \$3.50 per ton and averaged \$0.70 in Indiana, \$1.00 in Ohio and \$1.80 in Wisconsin. Price differences were in part due to the degree to which the waste was processed into silage by the processor and to whether hauling was included.

RESPONSIBILITY FOR DECISIONS ON PRODUCTION PRACTICES

Many of the decisions in the production of sweet corn for processing are made by the processor rather than by the farmer. This sharing of managerial functions (observing, analyzing, taking action and bearing responsibility for action) between the grower and processor in the production of sweet corn is both an advantage and a problem.

The processor, of course, assumed all the responsibility of plant operation, quality control, type of product to pack, etc. He generally assumed the risk of price change and variation in production, although in the latter case, he sometimes passed part of the risk to the grower in the form of passed acreage or acreage where the processor did not request delivery of the sweet corn. Acts of God, labor unrest, civil insurrection, fire, etc. were frequently excluded from the processors responsibility.

A large part of most grower-processor contracts is concerned with the responsibility for decisions on specified production practices.⁹ Unwritten understandings and agreements seek to further clarify the responsibility of each party for the many functions involved in growing and harvesting sweet corn.

Each firm as an entrepreneur seeks to maximize his returns, although some decisions may be to the advantage of one or the other. In most instances, however, a decision that helps one party will also help the other.

The responsibility for the decisions in growing and harvesting sweet corn can be grouped into three categories. These are where:

- (1) The processor is responsible
- (2) Joint responsibility of grower and processor
- (3) The grower is responsible

In general, the growers and processors surveyed agreed as to who was responsible for each of the major functions of sweet corn growing and harvesting. However, the answers varied from plant to plant depending on the policies of the management. These differences were found even on vital issues, the most frequent being who determined the planting date. On all other issues, the majority of all growers agreed with the processor as to where the responsibility for the decision lay.

Decisions as to Acreage Contracted

Changes in acreage contracted were generally associated with changes in price. However, not all the acreage change was explained

⁹ For a more complete analysis and discussion of these contracts see M. E. Cravens and L. D. Marlowe, *Grower-processor Agreements in Sweet Corn for Processing in the Midwest*, Ohio Agricultural Experiment Station Bulletin 800, 1957.

by the growers' response to price. Processors also reported that they restricted the acreage contracted according to expected demand and some growers reported that they were limited as to the acreage they could contract.

The changes in acreage on owned or leased land were different than those for contract growers. In each of the three states the acreage grown on owned or leased land either increased with the decrease

Table 17. Changes in Price Paid for Sweet Corn, 1954 to 1955, and Number of Growers Contracting. Acreage Contracted, and Acreage Produced on Owned or Leased Land in 1955, Ohio, Indiana, and Wisconsin

Changes 1954 to 1955	Ohio	Indiana	Wisconsin
		(Percent change)	
Average price paid	— 8.8	— 7.4	— 6.8
Number of growers	— 8.4	—24.9	— 8.4
Acreage contracted	—13.7	—19.7	—11.2
Acreage on owned-leased land	+ 6.6	—10.0	+13.8
Total acreage	—12.8	—14.4	— 8.1

in the price paid or else it decreased by less than that on contract land (Table 17). The same was true for each individual plant that produced some of its sweet corn on owned or leased land.

This indicates a possibility that the processors who were producing sweet corn on owned or leased acreage were using this production to fill the part of their requirements not met by contracting growers. It is also probable that for individual processors the reverse may also be true and that contracting is done merely to supplement the canner's own acreage. Either practice could have a profound effect on the response of price to year to year supply and demand changes or of supply to demand and price changes.

GROWER AND PROCESSOR SATISFACTION WITH AGREEMENTS FOR PURCHASING SWEET CORN FOR PROCESSING

Only one of the 320 growers interviewed reported that he or the processor had initiated legal proceedings over provisions of the contract. Thirty-one of the 32 processors interviewed reported that a standard written contract was used in obtaining sweet corn for processing. One large plant in Wisconsin used no written contract between processor and grower. The majority of growers surveyed concurred with this report, although a small minority of growers who contracted with three other plants reported that they had signed no written contract.

Very little bargaining was reported between grower and processor before the contract was signed. In nearly all cases, the agreements between processor and grower were in the form of written contracts

and were in reality an offer made by the processor to be accepted or rejected by the grower. A small minority of the growers contracting with 5 of the 32 plants reported that some bargaining occurred before the contract was signed. However, it is questionable whether any special privileges were promised. It appears likely that the fieldmen may only have explained alternatives that were available to all growers.

Grower Satisfaction With Contract

Less than 2 percent of the growers considered present contract arrangements as unsatisfactory and preferred major changes in it (Table 18). Thirty-seven percent of the growers considered the present

Table 18. Growers Reaction to Contract Agreements in 1955, Ohio, Indiana, and Wisconsin

State	Number of Growers Answering (number)	Percent of Growers Reporting Contract Agreements as —		
		Very Satisfactory ^a (percent)	Fairly Satisfactory ^b (percent)	Unsatisfactory ^c (percent)
Ohio	70	44.3	62.8	0.7
Indiana	67	52.2	47.7	0.0
Wisconsin	175	75.4	22.9	1.7
Total and Average	312	63.5	37.2	1.3

^a Growers would prefer no changes
^b Growers would prefer minor changes
^c Growers would prefer major changes.

contract arrangements as fairly satisfactory or they would prefer to see only minor changes made in them. Nearly two-thirds (63 percent) of the growers answering felt that the contract arrangements they had in 1955 were very satisfactory, and they desired no changes at all (Table 18). The factors that most concerned the growers that were satisfied with the overall contract arrangements were: variety of corn selected, assistance in harvesting, charges for harvesting, and maturity when harvested.

Grower Satisfaction With Items of Processor-Grower Agreements

Since some items in the processor-grower agreements were not satisfactory to all growers, an attempt was made to obtain the grower's opinion as to why these were unsatisfactory and how they could be improved. This dissatisfaction varied from plant to plant depending on the policies of management. In this report, only state summaries of the relative degrees of satisfaction are given.

The contract price was ranked as the most unsatisfactory item in the grower-canner agreement by the growers surveyed in each of the states (Table 19). This may be explained in part by the fact

Table 19. Grower Dissatisfaction With Specific Items in Grower-Processor Agreements and Relations, 320 Growers, Ohio, Indiana and Wisconsin

Items of Agreement	76 Ohio Growers	67 Indiana Growers	177 Wisconsin Growers	Average 320 Growers (percent of growers dissatisfied)*
Contract price	63.2	70.2	58.8	62.2
Harvesting charges	22.4	25.4	18.6	20.9
Harvest maturity	5.3	10.4	13.6	10.9
Time of payment	6.6	0.0	16.9	10.9
Harvesting assistance	15.8	10.4	7.3	10.0
Variety of corn	6.6	11.9	9.0	9.1
Disposition of silage waste	0.0	11.9	10.2	8.1
Fieldman services	2.6	1.5	4.5	3.4
Planting schedule	2.6	1.5	3.9	3.1
Delivery of corn	2.6	6.0	2.3	3.1
Method of sampling load	0.0	1.5	2.8	1.9

* These add to more than 100 since some growers were dissatisfied with more than one thing.

growers are seldom if ever satisfied with a "normal" price and part by the fact that the price paid for sweet corn in 1955 was lower than that paid in previous years (Table 20). When asked why they thought the processor did not pay a more satisfactory price, 48 percent of the 113 growers who gave reasons referred to the supply of sweet corn on the market, while another 23 percent associated the low price with high processing costs. Only 13 percent indicated either directly or

Table 20. Prices Received By Farmers for Sweet Corn, Ohio, Indiana, and Wisconsin, 1951 - 1955

Year	Ohio	Indiana (Dollars per Ton)	Wisconsin
1951	\$20.70	\$23.00	\$21.50
1952	21.90	24.60	22.70
1953	20.80	21.90	20.80
1954	17.90	19.20	19.20
1955	16.50	18.10	17.90

Source: Vegetable Processing, Annual Summaries, 1952-1955, Agricultural Marketing Service, United States Department of Agriculture.

indirectly that the processor's profit was the major cause for low prices.

Four plants reported no change in price in 1955 as compared with 1954. For these plants only 51 percent of the growers reported the contract price as unsatisfactory compared with 63 percent where the price was reduced (Table 21). This would indicate that only part of the dissatisfaction with the price was due to the 1955 price reduction.

In the grower's opinion, the second most unsatisfactory item in the agreements was the charge made by the processor for harvesting.

Table 21. Grower Satisfaction with Price in Relation to Change in Price
From 1954 to 1955.

Relation of 1955 Price to 1954	Plants (number)	Growers Reporting Unsatisfactory (percent)
No change	4	49
Decline in price	27	63

Almost 21 percent of the growers reported this. Of course, 26 growers or 70 percent of the growers who answered why this was unsatisfactory thought that the processors set harvesting charges high because of the high maintenance and repair costs of harvesters and another 25 percent thought the processors made a profit on the operation.

Harvest maturity was considered unsatisfactory by 35 of the 320 growers and harvesting assistance by the processor was unsatisfactory to 32 growers. Over three-fourths of those who gave reasons why they considered maturity unsatisfactory said that the sweet corn should be allowed to become more mature. The principal suggestion given for more satisfactory harvesting assistance was similar to that in connection with harvesting charges — the processor should supervise the harvest operation more closely.

Three other factors, time of payment, variety of corn, and disposition of silage waste, were mentioned by more than 10 percent of the growers in one or more of the states. All those who were dissatisfied with the time of payment wanted more prompt payment. With regards to variety, most of the dissatisfied growers seemed to recognize that the varieties were selected for consumer rather than grower satisfaction but they would have preferred other varieties.

The items that were considered most satisfactory in each of the 32 plants were: services and operations of fieldmen, planting schedule specified by processor, and sampling method used by processor. These items were reported satisfactory by over 80 percent of the growers contracting with each of the 32 plants.

Why Growers Selected Present Plant and Why Changed Plants

The nearness of a plant to the farm was the most frequent factor determining a grower's selection of it. It was mentioned by 89 percent of the 320 growers interviewed in the 32 plant areas. Twenty-one of the 32 plant areas had 100 percent of the contracting growers mentioning this factor. In the other 11 plant areas, only 29 percent of the growers contracted with other than the nearest plant in the area.

Other items which were reported by growers as reasons for contracting with a particular plant were: (1) best alternative as to price and services, (2) contacted first by fieldman of present plant, (3) previously contracted with present processor for other crops, and (4) liked present plant's silage agreement.

Of the 320 growers interviewed, approximately one-fourth had changed their contracts from a previous processor to the processor to whom they were then selling sweet corn (Table 22). Growers who had changed from a previous processor occurred most often in areas where there were other plants in addition to the one with which they were currently contracting. Where there was only one plant in the area, growers had little opportunity to change processors. In areas where there is now only one plant, growers who made changes did so because the plant to which they were previously selling sweet corn was no longer operating.

Other reasons advanced by growers for changing from a previous plant to the present plant were as follows: better arrangement for silage (8 growers); trouble with previous plant (6 growers); new plant went into operation closer to farm (4 growers); better arrangements for harvesting and unloading; better alternatives including pay and services; former plant not stable; present plant picks corn closer; and other plant would not take other crops (18 growers). Thirty-eight growers gave no reason for changing.

Table 22. Factors Which Influenced Farmers to Change From a Previous Plant to the Plant at Which They Now Sell Sweet Corn

Competitive Characteristics of Plants	Number of Plants (number)	Number of Growers In Sample (number)	Growers in Sample Who Have Changed Processors (percent)
No other plants reported in area	7	69	13.0
One additional plant reported in area	9	11	29.9
Two additional plants reported in area	16	174	28.7
All plants	32	320	25.6

Reasons for Discontinuing the Growing of Sweet Corn for Processing

Thirty-five growers in the sample areas who had discontinued growing sweet corn for processing were interviewed to determine why they had done so. Of these growers, 54 percent had discontinued growing sweet corn because of the low price paid for it in relation to costs (Table 23). Other reasons for discontinuing were: enterprise did not fit into farm operations (17 percent); unable to find efficient harvesting labor (11 percent); plant poorly organized to receive corn and harvesting operation poorly organized (each 5 percent).

A total of 35 percent of the growers who had discontinued sweet corn production considered the processor-grower agreements to be unsatisfactory (Table 24). Time of payment, price paid per ton, and onesidedness of the agreement were the items most frequently reported as unsatisfactory by this group of growers (Table 25).

Processor and Grower Reaction to the Use of Federal Grades for Raw Sweet Corn as the Basis of Payment to Growers

In the survey, the processors and growers were asked to state their reaction to the use of Federal grades for raw sweet corn as the basis of payment to growers. Ten of the 32 processors interviewed reported that they would favor the use of Federal grades for this purpose if a reliable basis of grading were developed. However, these processors indicated that if Federal grades were used, it would be necessary to have a system which provided a reliable indicator of the quality of the canned corn based on a raw corn grade.

Table 23. Why Farmers in Ohio, Indiana, and Wisconsin Discontinued Growing Sweet Corn for Processing^a

Reasons farmers stopped growing sweet corn	Number of farmers			Total
	Ohio	Indiana	Wisconsin	
Low price paid for sweet corn in relation to cost of fertilizer, harvesting and hauling	5	2	12	19
Did not fit into farm operations	3	0	3	6
Unable to obtain efficient labor for harvesting	0	1	3	4
Plant poorly organized to receive corn ^b	0	0	2	2
Harvesting operations poorly organized	0	0	2	2
Low yield of sweet corn	0	0	1	1
Had legal action against processor	0	0	1	1
Sweet corn production depletes soil	1 ^c	0	0	1
Total	9	3	24	36

^a Farmers were from the sample area. Interviewers asked growers in the sample if they knew farmers who had previously grown sweet corn for processing but were not growing sweet corn in 1955. These farmers were visited.

^b Wanted more corn than growers could supply one day and would not take corn the next day. Grower had to wait at factory to unload.

^c This grower also reported that sweet corn did not fit in his farm operations.

Nineteen of the 32 processors reported that they would not favor the use of a Federal grade system. The reason most frequently mentioned was the variation in grade among graders. Several processors mentioned that they had tried Federal grading and that it had not worked satisfactorily.

Table 24. Opinion as to Processor-Grower Agreement (Satisfactory or Unsatisfactory) for Farmers Who Had Discontinued Growing Sweet Corn for Processing.

State	Farmers interviewed (number)	Total (number)	Farmers answering	
			Satisfactory (percent)	Unsatisfactory (percent)
Ohio	8	7	71.4	28.6
Indiana	3	3	100.0	0.0
Wisconsin	24	16	56.2	43.8
Total and average	35	26	65.4	34.6

Table 25. Reason Given by Growers Who Had Discontinued Sweet Corn for Dissatisfaction With Contract

Items in processor-grower agreement reported unsatisfactory	Number of farmers by state			
	Ohio	Indiana	Wisconsin	Total
Time of payment	1	0	2	3
Price paid per ton for corn too low	1	0	1	2
Processor had all protection grower had none	0	0	2	2
Processor does not pay for "passed acreage"	0	0	1	1
Sampling (dockage for small ears, shanks, and husk too large)	0	0	1	1

Of the 270 growers who answered the question on Federal grades, only 26 percent favored the use of them as a basis of payment to growers for raw sweet corn. In two plants in Ohio that reported they had tried the Federal grade system and found it unsuccessful, 33 percent and 44 percent of the growers respectively reported that they favored Federal grading of raw sweet corn as a basis of payment.

Processors were also asked to give their reaction to a proposed pricing schedule that would pay growers according to the calculated tons of corn at optimum maturity. Where corn was harvested before optimum maturity, the calculated tons would be adjusted upward; and where it was harvested after optimum maturity, the calculated tons would be adjusted downward according to a formula based on average moisture-yield relationships. Thus, the returns per acre to growers would not be influenced by the stage of maturity at harvest.

A system similar to this was being used by one processor in Wisconsin and he reported that both he and the growers were satisfied. However, there was no significant difference in the percentage of growers satisfaction with the stage of maturity at which corn was harvested at this plant than in the other 12 plants in Wisconsin that were included in the study.

Six of the seven processors who reacted favorably to this system of purchasing sweet corn made certain qualifications. They stated that it would be essential that reliable and inexpensive estimates could be made quickly and that growers be educated as to the effects of such a program.

Processors who reacted unfavorably to the proposed system gave the following reasons: (1) The weight of usable corn in the husk increases up to the optimum quality-maturity stage, holds at a rather constant weight for several days, and then decreases in weight as quality decreases. (This was advanced by cream style processors mostly). (2) Some processors felt that estimating the optimum stage for harvesting according to moisture content of corn would be an excellent guide for fieldmen, but should not be used as a basis of payment to growers since the processor makes the harvesting decision.

(3) Many processors reported that by using the mechanical picker and controlling the acreage of sweet corn contracted, they were able to harvest corn in a period of time which would not cause variation in yield per acre among growers.

Difficulty for Processor In Obtaining Desired Acreage

At the time of the survey (1955-1956) the processors were having little or no difficulty in obtaining the acreage they desired. In fact, three processors reported turning down acreage offered them. The greatest difficulty occurred in the period immediately after World War II when 12 of the 32 processors reported that they had trouble contracting enough acreage for their needs. Two methods of obtaining the necessary acreage were reported by plant operators. One was the growing of sweet corn on their own or leased acreage. The other was working harder to get the acreage contracted for their needs (Table 26). None mentioned the offering of higher prices as a means of obtaining greater acreage although all were undoubtedly aware of this means.

There was no difference in the reported difficulty of contracting among plants in the three states, although only Indiana processors reported turning away acreage. However, there were two indicators which suggested that there may have been more difficulty in Wisconsin than in the other two states. One was the practice of growing on leased acreage the sweet corn that could not be contracted. This practice was more common among Wisconsin plants than for plants in other states. The other indicator was the fact that there were 11 percent "new" contract growers in Wisconsin compared with 5.6 percent and 3.1 percent "new" growers respectively in Ohio and Indiana (Table 27). On the other side was the fact that four of the processors in Wisconsin had larger acreage in 1955 than in 1954 compared with three processors with larger acreage in the other two states combined. This may have increased the problem in Wisconsin over Ohio and Indiana. The rate of turnover of contract growers in all states is low enough to indicate that there is either a high degree of grower satisfaction with contract provisions or an absence of a suitable alternative to sweet corn or both.

Passed Acreage

One of the most controversial aspects of sweet corn contracting is the provision for compensation of the grower for acreage not harvested or "passed" acreage. Reasons for non-harvested or passed acreage include such factors as weather, economic conditions, strikes, and plant breakdowns. For the two years covered by the study, the processors reported that about 5 percent of the acreage was passed for one reason or another. The growers who were interviewed reported only 2.6 percent passed acreage for the same period. Sixty-nine per-

Table 26. Comments on the Difficulty of Obtaining Sweet Corn Acreage That Desired to Contract, 32 Processing Plants Wisconsin, Indiana, and Ohio, 1946 - 1955**

Nature of Comment	Wisconsin	Indiana	Ohio	Total*
Easy to get acreage				
Now turning away acreage	0	3	0	3
Easier to get when do picking	0	0	1	1
Difficult to get acreage				
Always get what need but must work for it	2	0	4	6
Make up what can't contract on own or leased acreage	3	1	1	5
Price of corn and/or hogs good	1	1	2	4
Needed more acreage because demand good	1	1	0	2
Crop previous year poor so difficult this year	1	0	0	1
Can't afford over \$30. acre lease for land	0	1	0	1
Local condition in plant not too good	0	1	0	1
Total	8	8	8	24

* Since some processors made no comments and others made more than one comment, the totals are not the number of plants

** In the 320 plant-years covered (32 plants for 10 years each) some difficulty in contracting was reported in 65 plant years or about 20 percent of the years

cent of the acreage passed was due to sweet corn with yields that were too low to be harvested profitably (Table 28). The second reason, inability to harvest because of weather and the subsequent over-maturity of the crop, accounted for 10 percent of the passed acreage. One plant in Wisconsin which accounted for 6.5 percent of the passed acreage reported failure to harvest because there was too much corn and it would not have paid. The fact that yield was a major determining factor in whether to harvest or not suggests the probability that the major loss of unharvested acreage is borne by producers of the poorer crops for the year. Thus, the marginal grower is the one who tends to bear the risk of loss due to passed acreage.

Table 27. Percent of Contracted Acreage That Was "Passed" and Proportion of "New" Growers in 1954 - 1955

State	Percent "Passed" Acreage 1954-55		
	Reported by processor	Reported by growers interviewed	Percent of all growers "New" growers
Wisconsin	6.3	2.7	11.0
Indiana	5.1	3.6	3.1
Ohio	0.8	0.5	5.6
Average	4.8	2.6	6.7

Table 28. Reasons Given for Failure to Harvest Acreage Planted to Sweet Corn, Ohio, Indiana, and Wisconsin, 1954 and 1955

Reason for not harvesting	Wisconsin	Indiana	Ohio	Total
	(percent of acreage not harvested)			
Poor yield due to weather—				
Dry weather, frost, flood	59.0	82.4	40.9	68.8
Unable to harvest because of weather	17.0	.....	45.5	10.3
Weedy, poor stand, etc.	1.5	17.6	13.6	8.9
Supply too great—would not pay to harvest	12.1	.....	.....	6.5
Reason not given	10.4	.....	.....	5.5
Total	100.0	100.0	100.0	100.0

About half the sweet corn contracts make some mention of passed or non-harvested acreage. Each plant operator was asked whether his contract clearly defined passed acreage. Of the 10 Wisconsin plant operators answering this question none thought that their contracts clearly defined passed acreage. In Ohio 60 percent and in Indiana 67 percent of those answering thought that passed acreage was clearly defined. The interpretation by Ohio and Indiana plant operators would appear to be overly optimistic, while those in Wisconsin appeared overly conservative. Both suggest, however, that the contracts leave much to be desired as far as provisions for passed acreage is concerned. A satisfactory definition of passed acreage and the evidence of any loss from such a practice must precede a more satisfactory contract provision for it.

SUMMARY

The major purposes of this study were to develop information that would be useful for the adoption of yield-grade data for raw sweet corn into a pricing schedule and type of agreement which would promote efficiency in the production and marketing of the quality of processed sweet corn that would be most acceptable to consumers.

The analysis is based on a personal interview survey of 12 processors and 76 growers in Ohio, 7 processors and 67 growers in Indiana, and 13 processors and 177 growers in Wisconsin. These states were selected as being typical of the sweet corn-for-processing industry in the North Central Region. Ohio and Indiana were judged to be typical of the less concentrated sweet corn for processing states, while Wisconsin was judged to be typical of the more concentrated states.

Agreements, either written or unwritten, between sweet corn processors and growers used in Ohio, Indiana, and Wisconsin during 1955 were the results of long years of processor-grower dealings. The agreements (written contracts and unwritten understanding between processor and grower) usually have been processor-initiated. The grower either accepts the terms or does not choose to grow sweet corn.

Plants in Indiana and Ohio largely packed cream style corn. Although a large percentage of the corn packed in Wisconsin was whole kernel, a few plants packed only cream style corn, and some plants packed both whole kernel and cream style corn.

Sweet corn was a minor enterprise on most farms growing sweet corn for processing. The average acres of sweet corn per farm were 15.6 acres in Ohio, 26.5 acres in Indiana, and 18.5 acres in Wisconsin. In Ohio and Indiana, the percentage of dairy, beef and swine farmers growing sweet corn were not significantly different, while in Wisconsin 80 percent of the farmers growing sweet corn were dairy farmers. The possibilities of profitable production of small grains and corn for grain relative to the possibilities of profitable sweet corn production appeared to be greater in Indiana and Ohio than in Wisconsin.

Other than dissatisfaction with the price received for corn, there appeared to be very little grower dissatisfaction with the present agreements. However, the nature of the agreements was such that they frequently appeared to be more concerned with preventing or settling possible litigation than with promoting efficiency at various stages of growing and marketing sweet corn for processing. The agreements frequently offered no incentive to improve the quality or yield of sweet corn.

Some processors were apparently doing an excellent job in helping their growers to obtain high yields and efficient sweet corn production. These processors were effectively advising their growers on the latest production practices. One processor was going so far as to have the grower's entire farm soil-tested for fertilizer recommendation. On the other hand, the growers in 13 of the 32 plants reported that they had had no advice on selection of location for sweet corn; growers in 11 plants had received no advice on fertilizer and fertilization practices; and growers in 14 plants had received no assistance on methods of cultivation and weed control. Although the advantage of high yield and efficient production to growers and processors could not be measured from this study, it appeared that most processors could have profitably done more to promote efficient growing than they did.

Items in the agreements between processor and grower which affected growers' returns were factors affecting yield (usable corn in the husk), the price paid per ton, and the services provided by the processor and the charge for these services. The price structure was such that it would appear very difficult for a grower to make a rational choice among processors on the basis of expected returns per acre. To make a rational choice, the grower would need more information than is now available regarding the costs and values of services performed by the processor and dockage practices in addition to price per ton.

From the regression analysis made, associations were indicated among yield of sweet corn per acre and growers' returns per acre, and specified processor practices. Both yields (tons of usable corn in husk)

and growers' returns per acre (gross returns minus expenses for seed, fertilizer, harvesting, and hauling) were higher for cream style corn than for whole kernel corn. Both yield and growers' returns per acre were higher where the processor offered either incentive payments or reduction in cost of services for high yields. As the percent of corn packed as fancy by a plant increased, yields per acre for growers supplying the plant decreased. There was some indication that yields per acre were less when corn was machine harvested than when corn was hand harvested although the differences were not statistically significant.

There was no indication in this study that a difference in the farm price structure was associated with the degree of concentration of plants or potential contractors in an area. However, the non-price services were slightly greater in areas having more than one plant.

The growers of sweet corn for processing shared very little with processors in making such decisions as variety of sweet corn to plant, setting the harvest date (determining stage of maturity for harvesting) and assuming the responsibility for harvesting. Yet growers' returns as a group have been and will continue to be affected by the decisions made relative to these production practices. Likewise the growers (as a group) have been limited in the role they have played relative to the supply of sweet corn available. Fourteen of the 32 plants studied grew part of the sweet corn process on their own or leased land. The proportion of the crop grown by the plants that grew on their own or leased acreage ranged from 80 percent of the acreage processed by one plant to less than ten percent of that processed by two other plants.

Other things being equal, the cost per ton of sweet corn processed would increase with the distance of the farm from the plant. The costs of supervision of the acreage, harvesting, and hauling are all related to the distance of the farms from the plants. Ninety percent of the growers contracting with the 32 plants in 1955 were contracting with the plant nearest to their respective farms. However, only two of the 32 plants offered any incentive to farms near the plant. These two plants based hauling cost per ton on miles hauled.

Nearly all of the processors stated that they preferred growers with ten or more acres of corn. Although some processors refused to machine harvest less than a minimum acreage, only two of the 32 plants offered an incentive for larger acreage.

A majority of both growers and processors reported that they would not favor the use of Federal grades for raw sweet corn as a basis of payment to growers. Likewise a majority of the processors reported that they would not favor the use of a pricing schedule which would pay growers according to calculated tons of corn at optimum maturity (based on moisture content of the corn). Processors who reacted favorably to the proposed system (pricing corn according to moisture content) stated that it would be essential to the success of such a program that reliable estimates on moisture be made quickly and at

low cost. One processor who had used a system of pricing based on the moisture content of the corn reported that both he and the growers were satisfied with the system. However, there was no difference in grower satisfaction with stage of maturity when harvested in this plant and other plants in the state.

DISCUSSION

No doubt the immediate goal of both sweet corn growers and processors is to make as much profit as possible. The attainment of this goal depends on two things:

- (1) Efficiency in production.
- (2) Production of the quality and quantity of product that consumers desire and will buy. Price is inferred here. However, for the individual packer or farmer, the price of what consumers want most should be the highest, with lower prices for what they want less — when we assume a given time, etc.

Neither of these can be ignored in a successful operation. The division of responsibility and the integration of the various operations in the production and harvesting of raw sweet corn is accomplished by both written and unwritten agreements. The agreements should be judged on the basis of whether they contribute to the continuing attainment of the goal above. An agreement that favors either party at the expense of the other will hinder the success of the operation to the extent that the party who is hurt tries to compensate for the inequity. Both parties, therefore, can benefit from an agreement that favors the efficient production of a satisfactory quality of sweet corn.

While dissatisfaction of growers in the survey was slight, some of that which occurred could have been prevented by a more complete discussion of the things that growers learn by hearsay or not at all. The wholehearted cooperation of both parties can best be attained by having both informed as to what is desired, why it is desired, and how best to produce what is desired. This includes a knowledge of maturity-yield-grade relationships in the raw as well as the processed sweet corn and of other factors including grade-price relationships for types of corn packed. It is desirable that each party understands the problems of the other, but it is vital that the processor keep the grower informed of what he needs and why he needs it.

The following recommendations for increasing the efficiency of resource use and/or profits are based on the findings of the study:

- (1) Provision should be made for informing growers on improved production practices and means of disease and insect control.
- (2) Provide incentives for high yields. These could take the form of reduced harvest and handling charges per ton or higher prices per ton.

- (3) Provide incentives for the production of sweet corn on farms near the plant.
- (4) Provide incentives for larger acreage of sweet corn per contracting farm.
- (5) Continue to attempt to improve provisions in present contracts that are the least desirable from either processor or grower viewpoints. This may mean group study by processors and growers of these problems for possible solutions.

An alternative to the production of sweet corn under the contract system is its production on land leased or owned by the processor. This practice could well be studied to see if there is a trend in this direction and, if so, why. Would the further development of such production affect the importance of sweet corn production in the North Central region, and if so, would the industry benefit from it?

Appendix I

Price Structure of Sweet Corn for Processing, 32 Plants, Ohio, Indiana, and Wisconsin, 1955

Plants classified by type of corn packed and method of charging for harvest ^a	Plants No. of	Plants Paid per ton ^b (\$)	Seed cost per pound (\$)	Cost per unit			Hauling per ton (\$)	Number of plants offering following services ^c				
				Harvesting Hand (\$)	Machine (\$)	(unit)		1	2	3	4	5
OHIO (12 plants)												
Cream Style (harvesting charged per)												
Acre	4	16.00	0.16	d	5.25	acre	d	0	2	0	1	0
Acre and ton ^e	2	16.00	0.28	d	2.00	ton ^d	d	0	0	0	0	0
Ton	4	16.50	0.19	d	2.12	ton	d	1	1	0	1	3 ^f
Whole Kernel (harvesting charged per)												
Not provided	1	18.00	0.40	d	d	—	d	0	1	0	1	0
Mixture (harvesting charged per)												
Acre	1	16.00	0.25	d	6.00	acre	d	0	1	1	1	0
INDIANA (7 plants)												
Cream Style (harvesting charged per)												
Acre	4	17.62	0.36	5.00 ^g	4.62	acre	d	3	2	1	0	1 ^f
Acre and ton ^{e,h}	2	17.50	0.25	d	2.50	ton ^e	0.60 ^{to}	1	1	2	1	0
Mixture (harvesting charged per)												
Ton	1	18.00	0.25	d	2.50	ton	1.70 ^h 0.50 ⁱ	0	0	0	0	0
WISCONSIN (13 plants)												
Cream Style (harvesting charged per)												
Ton (incentive) ^{ij}	1	18.00	0.25	d	2.50-	ton ^j	0.25 ⁱ	0	0	0	0	0
Whole Kernel (harvesting charged per)												
Acre	1	17.00	0.35	d	5.00	acre	1.50 ^l	0	0	0	0	0
Ton (incentive) ^k	1	18.70	0.35	2.50	1.50	ton	1.50	1	0	1	1	1 ^f
Ton	4	17.09	0.36	3.33 ^l	2.81	ton	1.56 ^m	2	2	0	0	0
Not provided	1	18.00	0.30	d	d	d	2.50	0	0	0	0	0
No charge	1	14.50	0.35	0.00	d	d	0.00	1	1	0	1	0
WISCONSIN (13 plants)												
Mixture (harvesting charged per)												
Acre and ton ^e	1	18.00	0.40	2.75 ⁿ	3.00-	acre-	2.00	1	0	0	0	0
					1.50	ton						
Ton	3	16.79	0.35	3.00 ^o	2.50	ton	1.58	2	1	0	0	0

See footnote next page.

- a Plants are divided into three groups according to type of corn packed:
 - (1) Cream style, 75 percent or more of the corn is packed as cream style;
 - (2) whole kernel, 75 percent or more of the corn is packed as whole kernel;
 - (3) mixture, more than 25 percent and less than 75 percent of the corn is packed as cream style or as whole kernel.
- b The average price paid growers per ton in plants specified.
- c Services available with no direct deductions to grower: (1) fertilizer finance, (2) planting plates, (3) spray or dust for insect and disease control, (4) testing soil, (5) other.
- d Service not provided.
- e Charge per ton for harvesting with a minimum or maximum charge per acre: Ohio, cream style, two plants, \$5.00 minimum and \$7.00 maximum per acre; (2) Indiana, cream style, two plants, \$7.00 maximum per acre; (3) Wisconsin, mixture, \$3.00 per acre plus \$1.50 per ton.
- f Other services: (1) Three plants, Indiana, cream style, paid \$1.25 per acre for all growers using fertilizer and one of the three plants gave Christmas baskets to growers at a total expense of \$600.00, approximately \$8.00 per grower; one plant, Indiana, cream style, did weed spraying at \$1.50 per acre; one plant, Wisconsin, whole kernel, did weed spraying at cost.
- g Only one of the four plants offered hand harvest service; all four plants offered machine harvest.
- h One plant, Indiana, cream style, paid for corn on the tonnage basis with an incentive for yield on white corn (yellow corn \$17.00 per ton); white corn yields up to 1.99 ton per acre, \$17.00 per ton; 2.00 to 2.69 ton per acre, \$18.50 per ton; over 2.7 ton per acre, \$19.50 per ton. This same plant had a hauling charge per ton based on mileage.
- i Two plants do not haul for farmers but rent trailers to them. One plant offers farmers hauling service or rents trailers to them.
- j Harvesting charge \$2.50 per ton for ten acres or more if yield is four ton per acre or more; otherwise \$3.00 per ton.
- k Price is based on yield up to 2.74 ton per acre, \$17.00 per ton; 2.75 to 3.74 ton per acre, \$18.00 per ton; 3.75 ton per acre or more, \$19.00 per ton.
- l Three of the four plants offered hand harvest service, but all four offered machine harvest service.
- m Three plants have hauling charges of \$1.50 per ton. One plant has a hauling charge per ton based on mileage at \$1.50 per ton, less than ten miles, \$2.00 per ton, ten to twenty miles; \$2.50 per ton over 20 miles.
- n Machine harvest charge is \$3.00 per acre plus \$1.50 per ton; hand harvest charge is \$2.75 per ton.
- o One of the three plants offered hand harvest, \$3.00 per ton. All plants offered machine harvest. One plant based machine harvest charge on acreage: \$2.75 per ton, less than 25 acres; \$2.25 per ton, over 25 acres.

Appendix II

Estimates of the Effects of Processor Practices on Grower Yields of Usable Corn in Husk, 32 Plants in Ohio, Indiana, and Wisconsin 1955 and 1954

Constant		Estimate (tons)	Standard error (tons)
304 Growers 1955			
Intercept	a ¹	+1.0085*	0.4290
State — Indiana	s ¹	-0.0667 ns	0.1623
State — Wisconsin	s ²	+0.7984**	0.1938
Pack — Mixture ^b	p ¹	+0.4567**	0.1475
Pack — Cream style	p ²	+0.7915**	0.2078
Harvest — Machine	h ¹	-0.2051 ns ^a	0.1414
Payment — No yield incentive	i ¹	-0.1286 ns ^a	0.1441
Percent of corn packed as fancy	b ₁	-0.0070**	0.0025
Field corn yield per acre (bushel)	b ₂	+0.0294**	0.0026
250 Growers 1954			
Intercept	a ¹	+1.8726**	0.5176
State — Indiana	s ¹	-0.9812**	0.2414
State — Wisconsin	s ²	+0.6147*	0.2841
Pack — Mixture	p ¹	+0.1522 ns	0.2294
Pack — Cream style	p ²	+0.6703*	0.3153
Harvest — Machine	h ₁	+0.0583 ns	0.2042
Payment — No yield incentive	i ¹	-0.2293 ns ^a	0.2148
Percent of corn packed as fancy	b ₁	-0.0039 ns ^a	0.0033
Field corn yield per acre (bushel)	b ₂	+0.0242**	0.0038

a Estimate, **, significant at 99 percent level, *, significant at 95 percent level, ns, not significant at 95 percent level, ns—0.2051 significant at 90 percent level, ns—0.1286 significant at 80 percent level, ns—0.2293 significant at 80 percent level, ns—0.0039 significant at 80 percent level.

b Corn was classified according to pack as follows: Plants that packed 75 percent or more whole kernel were classified whole kernel; plants that packed 75 percent or more cream style were classified cream style; and plants that packed more than 25 percent but less than 75 percent of either whole kernel or cream style were classified mixture.

a R. L. Anderson, "The Use of Regression Techniques with Economic Data," Proceedings of Auburn Conference on Statistics Applied to Research in the Social Sciences, Plant Sciences, and Animal Sciences, September 7 to 9, 1948.

The regression equation used to estimate the sweet corn yield (tons of usable sweet corn in the husk) included four discrete classifying variables, (states – Ohio, Indiana, and Wisconsin; type of pack – whole kernel, cream style, and mixture; harvest method – hand or machine; payment – incentive or no incentive, according to yield), and two continuous variables (percent of sweet corn packed as fancy, and bushel yield of field corn per acre). The mathematical model was $Y_{ijkl} = a' + s'_1 + p'_1 + h'_k + i_l + b_1X_{ijkl} + b_2X_{ijkl} + e_{ijkl}$ where Y_{ijkl} is the yield (tons of usable corn in the husk) in the i 'th state, packed according to the j 'th style, harvested according to the k 'th method, when farmers were paid according to the l 'th system.

Classifying variables were included in a regression analysis by assigning a value of unity to a class in which a particular observation occurred and zero to all other classes for that particular observation. When all classes were included, the coefficients were not independent and direct effect could not be calculated. Thus, differential contrast was estimated instead of direct effect.^a One class was given a value of zero in all cases. This class became the base class and the coefficients for other classes were then interpreted as a (+) or (–) differential from the base. The coefficients were estimated by the method of least squares in the usual regression procedures; however, the intercept included the value of the base class.

In the equation, a' was the intercept which included the value for: (1) in the base state (Ohio), and s'_1 and s'_2 were the (+) or (–) differentials for Indiana and Wisconsin respectively; (2) the base pack (whole kernel), and p'_1 and p'_2 were the (+) or (–) differentials for mixture and cream style respectively; (3) the base method of harvesting (hand harvesting), and h'_1 was the differential for machine harvest; (4) the base method of payment (incentive according to yield), and i'_1 was the differential for payment with no incentive for yield. The percentage of corn packed as fancy, and yield of field corn (bushels per acre) were represented by X_1 and X_2 respectively. The constants for the continuous variables were represented by b_1 and b_2 respectively. The error term e was assumed to be normally and independently distributed with zero mean and equal variance.

Appendix III

Estimates of Effects of Processor Practices on Grower Returns per Acre, Growers Contracting with 32 Plants in Ohio, Indiana, and Wisconsin, 1955 and 1954

Constant		Estimate ^a (dollars)	Standard error (dollars)
304 Growers 1955			
Intercept	a ₁	+ 8.3622**	3.9781
State — Indiana	s ₁	+ 1.2692 ns ^b	1.9641
State — Wisconsin	s ₂	+ 7.0778**	2.3125
Pack — Mixture ^c	p ₁	+ 3.4008*	1.7852
Pack — Cream style	p ₂	+ 6.9080**	2.4443
Harvest — Machine	h ₁	- 6.6753**	1.7195
Payment — No yield incentive	i ₁	- 3.0441*	1.7386
Field corn yield per acre (bushel)	b ₁	+ 0.3389**	0.0306
250 Growers 1954			
Intercept	a ₁	+ 15.9841**	5.9391
State — Indiana	s ₁	- 11.7412**	2.6175
State — Wisconsin	s ₂	+ 9.8028**	2.7777
Pack — Mixture ^c	p ₁	+ 2.3070 ns ^b	2.9804
Pack — Cream style	p ₂	+ 12.8460**	4.0741
Harvest — Machine	h ₁	- 1.4707 ns	2.6741
Payment — No yield incentive	i ₁	- 3.6208 ns ^b	2.7856
Field corn yield per acre (bushel)	b ₁	+ 0.3241**	0.0497

a Estimates are based on 304 observations in 1955 and 250 observations in 1954. Equation for estimates is $Y_{ijkl} = a' + s'_1 + p'_1 + h'_1 + i'_1 + b_1 X_{ijkl} + e_{ijkl}$; ** significant at 99 percent level, * significant at 95 percent level, ns not significant at 95 percent level.

b ns 1.2692 — significant at 75 percent level; ns 2.3070 — significant at 75 percent level; ns - 3.6208 significant at 90 percent level.

c Corn was classified according to pack as follows: Plants that packed 75 percent or more whole kernel were classified whole kernel; plants that packed 75 percent or more cream style were classified cream style; and plants that packed more than 25 percent but less than 75 percent of either whole kernel or cream style was classified mixture.

The regression technique was similar to that explained previously. In the equation a' was the intercept which included the value for: (1) the base state (Ohio), and s'_1 and s'_2 were the (+) or (-) differentials for Indiana and Wisconsin respectively; (2) the base pack (whole kernel), and p'_1 and p'_2 were the (+) or (-) differentials for mixture and cream style respectively; (3) the base method of harvest (hand harvest), and h'_1 was the (+) or (-) differential for machine harvest; and (4) the base method of payment (incentive according to yield) and i' was the (+) or (-) differential with no incentive for yield. The yield of field corn (bushel per acre) was represented by X_1 , and the constant was represented by b_1 . Y_{ijkl} was the growers' dollar return per acre for sweet corn in the i 'th state, packed according to the j 'th style, harvested according to the k 'th method, when farmers were paid according to the l 'th system.

Appendix IV

Processor's and Grower's Opinion on The Unit (Grower or Processor) Responsible for Decisions on Specified Production Operations

Production, operations, and processor's opinion of unit responsible for decisions concerning them ^a	Number in the sample		Growers' opinion of unit responsible for decisions. Percent indicating ^a		
	Processors (number)	Growers (number)	Processor	ORP (percent)	Grower
Select variety of sweet corn to plant					
Ohio (12 plants)					
Processor	12	75	92.0	8.0	0.0
Indiana (7 plants)					
Processor	7	66	51.5	9.1	39.4
Wisconsin (13 plants)					
Processor	12	161	75.8	20.5	3.7
Processor recommends	1	16	43.7	56.3	0.0
Total (32 plants)					
Processor	31	302	74.5	14.9	10.6
Processor recommends	1	16	43.8	56.2	0.0
Amount of seed to plant per acre					
Ohio (12 plants)					
Processor	4	28	10.7	53.6	35.7
Processor recommends	7	42	16.7	59.5	23.8
Grower	1	5	0.0	40.0	60.0
Indiana (7 plants)					
Processor recommends	7	66	4.5	45.5	50.0
Wisconsin (13 plants)					
Processor	2	31	48.4	45.2	6.4
Processor recommends	10	129	20.2	36.4	43.4
Grower	1	17	0.0	17.6	82.4
Total (32 plants)					
Processor	6	59	30.5	49.2	20.3
Processor recommends	24	237	15.2	43.0	41.8
Grower	2	22	0.0	22.7	77.3
Insect and disease control ^b					
Ohio (12 plants)					
Processor	5	32	65.6	0.0	34.4
Grower	2	9	0.0	0.0	100.0
Indiana (7 plants)					
Processor	4	37	75.7	5.4	18.9
Grower	1	10	0.0	0.0	100.0
Wisconsin (13 plants)					
Processor	1	11	100.0	0.0	0.0
Processor recommends	2	26	19.3	15.3	65.4
Total (32 plants)					
Processor	10	80	75.0	2.5	22.5
Processor recommends	3	26	19.2	15.4	65.4
Grower	2	19	0.0	0.0	100.0
Selection of location for planting					
Ohio (12 plants)					
Processor	1	10	10.0	0.0	90.0
Processor recommends	4	26	26.9	0.0	73.1
Grower	7	38	0.0	0.0	100.0

Production, operations, and processor's opinion of unit responsible for decisions concerning them ^a	Number in the sample		Growers' opinion of unit responsible for decisions. Percent indicating ^a		
	Processors (number)	Growers (number)	Processor	ORP (percent)	Grower
Indiana (7 plants)					
Processor recommends	4	50	28.0	0.0	72.0
Grower	3	12	0.0	0.0	100.0
Wisconsin (13 plants)					
Processor recommends	11	147	1.4	2.0	96.6
Grower	2	30	0.0	0.0	100.0
Total (32 plants)					
Processor	1	10	10.0	0.0	90.0
Processor recommends	19	223	10.3	1.3	88.3
Grower	12	80	0.0	0.0	100.0
Analysis and amount of fertilizer to apply					
Ohio (12 plants)					
Processor recommends	5	34	0.0	26.5	73.5
Grower	7	41	0.0	4.9	95.1
Indiana (7 plants)					
Processor recommends	6	44	47.7	6.8	45.5
Grower	1	4	0.0	0.0	100.0
Wisconsin (13 plants)					
Processor recommends	10	125	4.0	11.2	84.8
Grower	3	41	0.0	0.0	100.0
Total (32 plants)					
Processor recommends	21	203	12.8	12.8	74.4
Grower	11	86	0.0	2.3	97.7
Date of planting sweet corn					
Ohio (12 plants)					
Processor	11	69	81.2	13.0	4.4
Processor recommends	1	6	16.7	33.3	50.0
Indiana (7 plants)					
Processor	2	18	38.9	33.3	27.8
Processor recommends	4	44	56.8	18.1	25.0
Grower	1	3	0.0	66.7	33.3
Wisconsin (13 plants)					
Processor	11	154	54.5	31.8	13.6
Processor recommends	2	23	69.6	21.7	8.7
Total (32 plants)					
Processor	24	241	61.0	27.0	12.0
Processor recommends	7	73	57.5	20.5	21.9
Grower	1	3	0.0	66.6	33.3
Cultivation and weed control					
Ohio (12 plants)					
Processor recommends	3	19	0.0	0.0	100.0
Grower	9	56	0.0	0.0	100.0
Indiana (7 plants)					
Processor recommends	6	62	0.0	3.2	96.8
Grower	1	4	0.0	3.0	97.0
Wisconsin (13 plants)					
Processor	1	14	0.0	3.0	97.0
Processor recommends	5	67	0.0	0.0	100.0
Grower	7	94	0.0	1.1	98.9
Total (32 plants)					
Processor	1	14	0.0	0.0	100.0
Processor recommends	14	146	0.0	2.7	97.3
Grower	17	154	0.0	0.0	100.0

Production, operations, and processor's opinion of unit responsible for decisions concerning them ^a	Number in the sample		Growers' opinion of unit responsible for decisions. Percent indicating ^a		
	Processors (number)	Growers (number)	Processor	ORP (percent)	Grower
Setting harvesting date					
Ohio (12 plants)					
Processor	12	75	93.3	6.7	0.0
Indiana (7 plants)					
Processor	7	66	100.0	0.0	0.0
Wisconsin (13 plants)					
Processor	13	177	97.7	2.3	0.0
Total (32 plants)					
Processor	32	318	97.2	2.9	0.0
Responsible for harvesting					
Ohio (12 plants)					
Processor	6	42	92.9	2.4	4.8
Processor recommends	5	28	92.9	3.6	3.6
Grower	1	5	20.0	0.0	80.0
Indiana (7 plants)					
Processor	7	66	89.4	0.0	10.6
Wisconsin (13 plants)^c					
Processor	8	109	87.2	5.5	7.3
Processor recommends	4	55	58.2	18.2	23.6
Total (32 plants)					
Processor	21	217	88.9	3.2	7.8
Processor recommends	9	83	69.9	13.2	16.9
Grower	1	5	20.0	0.0	80.0

a Growers opinions are for plants with specified processor's opinion.

b Only 7 of the 12 plants in Ohio, 5 of the 7 plants in Indiana, and 3 of the 13 plants in Wisconsin indicated unit responsible for insect and disease control.

c One plant in Wisconsin did not designate who is responsible for decisions on unit responsible for harvesting.

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