PRODUCTION RESPONSES TO AGRICULTURAL CONTROLS IN FOUR MICHIGAN FARMING AREAS IN 1954

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By

Myron Eugene Wirth

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Submitted to the College of Agriculture of Michigan
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AN ABSTRACT

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Approved Lawrence Witt

The purpose of this study was to analyze specific actions and adjustments which farmers have made to farm price and acreage adjustment programs.

With this purpose in mind, slightly over 400 farms in important commercial farming areas of Michigan were visited during the summer of 1954. Farmers were asked questions which would answer, among other things, (1) whether or not they would comply with allotments and quotas, (2) would improved practices be used to increase yields of controlled crops, (3) what would be the pattern of diverted acre use, and (4) whether or not production control had caused cropping problems.

Existence of heavy penalties for non-compliance with wheat marketing quotas in 1954 apparently was a strong enough motive to Michigan farmers to bring about compliance of 94 percent of the farmers producing wheat. Sixty-six percent of the wheat growers indicated that they would have planted more wheat had there been no allotments assuming price conditions held.

With respect to use of commercial fertilizer, 35 percent of wheat growers increased applications from 1953 to 1954; however, the majority maintained fertilizer levels at the same rate. Further increases in fertilizer use can be expected since 64 percent of those using fertilizer thought they could profitably apply larger amounts on wheat. From 1953 to 1954 59 percent of wheat growers who used nitrogen increased applications. Increases in the use of nitrogen can be expected since 41 percent of all fertilizer users thought that it would be profitable on wheat but only 27 percent were actually using it.

It could be tentatively concluded that farmers were not generally using the best land for wheat in an effort to increase yields. Fifteen percent of wheat growers said they used the best land for wheat but only about half this number said they had done so to increase yields.

Cropping sequences or rotation problems caused by allotments did not appear serious since over half of the wheat growers reducing wheat acreage because of government controls said that allotments had not caused them any rotation problems. Over a period of years, if controls continue, rotation adjustments could become a serious problem.

Acreage allotments appear to have had little effect on Michigan corn producers in 1954 since only about one-third of the state corn producers complied with allotments. This study found that those complying with corn acreage allotments and those not complying did not react differently with respect to farming practices on corn in 1954. This result is logical in view of the farmers apparent indifference to acreage allotments. Since corn acreage was not in effect rationed, no strong motive was present which would encourage farmers to make greater than normal efforts to gain high yields.

Conclusions drawn from this study must be tentative since the survey data upon which it is based is for the first year of controls only. Similar data for subsequent years is needed to determine the pattern of farmers responses to production controls under varied conditions and over time.

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CHAPTER I

INTRODUCTION

The Problem Considered

With the exception of the period 1941 to 1952, United States Agriculture, since the early 1920's, has been dominated by chronic surpluses of agricultural commodities, depressed price levels, and low farm income.

During this period Agriculture has been engaged in a continuous struggle to enlist the aid of Federal Government in solving the low income problem by improving and stabilizing prices of farm products.

Farm income has been considered very inadequate when compared with the level of income enjoyed by urban populations. Because of this condition attempts were made to raise farm income toward the level existing in cities and towns. Although a variety of schemes were proposed to correct this condition, those adopted were generally of the price raising variety.

Since the passage of the Agricultural Adjustment Act of 1933, the most publicized and widely known aspect of United States agricultural price policy is the type of program which employs production control or adjustment features. These programs, chiefly emphasizing acreage allotments but sometimes augmented by marketing quotas and marketing agreements, have been applied to the politically designated "basic crops," wheat, corn, cotton, tobacco, peanuts, and rice.

Production controls are used with the assumption that a larger total revenue can be derived with an inelastic demand by reducing output from the level which would result from normal interplay of supply and demand. Production control theory further assumes that production can be regulated by controlling acreage.

More often than not these plans of raising price by controlling output have resulted in production greatly in excess of amounts demanded at the fixed price. This happens because the elasticity of supply and advances in technology are often overlooked.

If the demand for a farm product is quite inelastic, a small reduction in output will result in a large increase in price with a gain in total revenue. If the supply curve is also relatively inelastic, surpluses will be small. On the other hand, if supply is relatively elastic, pegging prices above equilibrium levels will call forth large excesses in production. In addition, efforts to control production by limiting acreage have been ineffective because advances in farm technology such as higher yielding crop varieties, new tillage methods, and increased knowledge of fertilization, have worked to offset acreage restrictions by increasing yields.

Acreage allotments and marketing quotas are the two main implements used to control production, acreage allotments being the least restrictive and most generally used.

The acreage allotment is a method of apportioning to individual farms an acreage intended to bring about the desired national production of a particular commodity. Compliance is more voluntary than with marketing quotas since only price support is lost for those not

complying. Marketing quotas are a means of regulating amounts of commodities farmers can sell. Acreage allotments are used also in conjunction with marketing quotas in which case the quota is generally the amount produced on the alloted acres. Penalties for non-compliance with marketing quotas are usually quite severe.

Since some type of production control programs are with us to stay, it would seem that some measures should be taken to find whether or not controls are effective at the farm level and to find out what can be expected in the way of production changes.

With this purpose in mind, slightly over 400 Michigan farms were visited in the summer of 1954. Farmers were asked questions which would answer, among other things, (1) whether or not they would comply with allotments and quotas, (2) would improved practices be used to increase yields of controlled crops, (3) what would be the pattern of diverted acre use, and (4) whether or not production controls caused cropping problems.

It is the purpose of this study to analyse these answers and present conclusions that may be drawn from them.

History of Production Control Programs

Production control or adjustment programs are probably the most widely known and publicized features of agricultural price policy.

From the initiation of production control programs by the Agricultural Adjustment Act of 1933, marketing quotas and acreage allotments have been used intermittently to control certain crop production.

The object of such controls is to raise and stabilize prices by regulating output and marketings.

Contrary to popular opinion, government control of agricultural production was practiced long before 1933. Attempts to control production were practiced in the early days of the Virginia Colony.[1] In 1631 the Virginia Colonial Legislature passed a law fixing a minimum price for tobacco. A year later production had increased so much that it necessitated adoption of controls. A crop acreage curtailment and price-fixing agreement was signed between the colonial authorities and the principal merchants, and officials were appointed to destroy inferior tobacco and, if necessary, burn surplus crops.[2]

In 1906, some 250 years after production controls were adopted in Virginia, burley tobacco growers in Kentucky tried to organize to control output and raise price. This program was soon abandoned as efforts to enforce controls brought outbreaks of violence by "night riders."[3]

With the tobacco price break of 1920, tobacco producers organized again and this time formed a huge cooperative. It was the purpose of this cooperative to act as the selling agent of the farmers and thus sell only what would clear the market at the established price support level. This project was also doomed to failure because they were

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[1] Edward Everett, American Agriculture--The First 300 Years, Farmers in a Changing World, 1940 Yearbook of Agriculture, USDA, 1941, p. 184.

[2] Ibid., p. 185.

[3] Halcrow, Harold G., Agricultural Policy of the United States, Prentice-Hall, Inc., New York, New York, 1953, p. 287.

unable to control a sufficiently large share of the marketings and therefore could not make good their price objectives.[4]

Between 1922 and 1933 intermittent attempts were made in California to control production and marketing of various fruit and vegetable crops. They failed for the same reasons that tobacco controls failed.

The idea of production controls to increase farm price, however, remained very much alive in farm circles. One popular plan, called the "Domestic Allotment Plan" was laid out in great detail. Basically, it involved the use of marketing quotas apportioned among individual farmers according to previous acreages. As planned it would concentrate on those commodities such as wheat and cotton which must pass through processing channels where sales could be checked.[5] This plan was modified into a voluntary type of domestic allotment plan in 1932, which in turn formed the basic concepts of production control effected in the Agricultural Adjustment Act of 1933.

The Agricultural Adjustment Act passed in 1933 was the first of a series of such acts that are often referred to as the AAA acts.

The year 1933 was a time of severe depression in agriculture as well as the rest of the economy. Industrial production had fallen and urban unemployment was up sharply. The structural nature of agriculture is such that resource use is slow to respond to changes in demand. The result was that production was out of line with demand and resources used in production of certain commodities were malallocated and actually

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[4] Ibid., p. 288.

[5] John D. Black, Agricultural Reform in the United States, McGraw-Hill Book Company, New York, New York, 1929, Chapter 10.

excessive. There was also a marked movement of labor from the cities to the farms. Thus, when farm prices were falling, more labor resources were being used in agricultural production. In times of rising agricultural prices the opposite is usually true and a strong migration from farm to city is effected. Under these conditions the 1933 AAA was instituted as emergency measures to furnish short-run aid and assistance to a distressed agriculture.

The 1933 act authorized the government to make rental or benefit payments to producers of named "basic" agricultural commodities who participated in programs developed under the act. The basic commodities initially designated were wheat, cotton, field corn, hogs, rice, tobacco, and milk and its products.[6] The payments to farmers were to be financed by a processing tax.

The primary objective of the original act was to establish and maintain a level of production of the designated commodities that the market would move at what were considered "reasonable" prices. Reasonable prices were defined in terms of "parity," i.e., agriculture's relative price position 1910-14.

Under this act millions of farmers entered into contracts with the federal government to reduce production of the so-called "basic commodities" in return for which they would receive benefit payments. Marketing quotas in addition to acreage allotments were applied to cotton and tobacco. Since farmers had planted most of the cotton crop before the act became effective, plow-down campaigns were used to

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[6] Later, rye, flax, barley, grain sorghums, cattle, sugar cane, sugar beets, and peanuts were added.

reduce the acreage of cotton available for harvest. Steps were also taken to reduce the 1933 pig crop coming to market.

The Commodity Credit Corporation was established in 1933 by executive order. The 1933 AAA did not specifically authorize price support loans; however, a legal basis for such loans was found in the acts establishing RFC and NRA.[7] At first loans were made to farmers by CCC only on corn which the farmer would store rather than sell. Later these loans were broadened to include other basic commodities.

Early loan programs were meant to aid the farmer in carrying surplus stocks until production adjustments brought about improved price conditions. The emphasis was not on guaranteeing farmers a satisfactory price directly through price support.

In January, 1936, the Supreme Court ruled that the right to regulate and control production rested with state governments. The AAA of 1933 was subsequently declared unconstitutional along with the processing tax. New measures for adjusting farm production had to be found immediately and as emergency legislation, the Soil Conservation and Domestic Allotment Act of 1936 was enacted. In contrast to the original AAA of 1933, this act authorized an annual appropriation of 500 million dollars to be spent to encourage farmers to carry out certain soil conserving practices.

The 1936 act established a soil depleting base which indicated rates of fertility depletion of soil caused by certain crops. This formed a basis of payment and farmers were paid for planting specified

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[7] Charles B. Schuman, President, AFBF, Statement Before House Committee on Agriculture Regarding HR12, February 23, 1955, Exhibit III, p. 2.

soil-conserving crops as well as for complying with acreage control programs. Acreage allotments were then calculated for each individual farm. When the farmer received his total farm allotment he then had the choice of deciding what crops would be seeded out of several different soil depleting crops such as wheat, corn, cotton, oats, and rye. Because this method involved weak controls, usually large crops of wheat and cotton were produced in 1937.

Failure of the 1936 act to control output brought pressure on Congress to provide more stringent controls. The AAA of 1938 was enacted to correct this condition.[8] It contained the major features that have since been associated with production control. This act provided for, (1) retention of acreage allotments but with payment to cooperators based on the amount of acreage in the allotment, (2) marketing quotas with penalties for non-compliance, if in a special referendum, producers accepted them by a two-thirds majority, and (3) continuance of marketing agreements permitting farmers and processors to organize to exercise control over marketing of certain agricultural produce with exemption from anti-trust laws. Marketing of milk is often cited as an example of this type of agreement.

In addition the act authorized the CCC to make loans on agricultural commodities including dairy products; however, loans were mandatory on only three commodities--corn, wheat and cotton.

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[8] Some soil conservation features were retained. Beginning with 1944, practices were made the sole basis for payment under the AAA of 1936.

Production Controls During the War

During World War II production control as a means of restricting output gave way in favor of devices for expanding output such as production goals, price supports, and production subsidies.

Shortly before and during the early days of the war there was a growing awareness that agriculture would be called upon to increase output of food and farm products. The restrictionist policies previously used could not be relied upon to stimulate the necessary production. There was also a desire on the part of most farm groups to see farmers participate in the general rise in the price level. Under these strong motives new legislation was passed in both 1941 and 1942 which effected a rise in the level of farm prices.[9]

Post War Developments

At the end of war, prices of a considerable list of farm commodities were still under price ceilings. With the removal of ceilings many farm prices advanced rapidly. This rise was not peculiar to agricultural prices but like other non-farm prices, they reflected a pent-up inflation which had been held in check by ceilings. Another reason contributing to the rise was the great demand abroad caused by world shortages of food coupled with the poor crop year of 1947.

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[9] Support price for each of the five "basic" commodities was made mandatory at 85 percent of parity in 1941, 90 percent in 1942. In July, 1941 the Steagall Amendment to AAA 1938, was passed providing that whenever the Secretary of Agriculture formally requested an increase in production of a commodity he must support its price through a commodity loan or other operation at not less than 85 percent of parity, and to be continued for two years after the war. In 1942 the supports were also raised to 90 percent of parity on Steagall commodities.

The outbreak of the Korean War in 1950 brought on another general inflationary move and in 1951 acreage allotments were dropped on all crops except cotton and winter wheat. Though announced for winter wheat at planting time, acreage restrictions were never made effective.

Recent Legislative Developments

In 1948, two years after the cessation of World War II with the high wartime price supports scheduled to expire, Congress passed the Aiken Bill of 1948. Its objective sought to bring about a return of Flexible price supports prevalent before the War.

In principle, the Aiken Bill sought to restore to the market a part of its traditional function of guiding the farmer as to what is profitable to produce and how much of each product should be grown. It did not advocate the return to a completely free market but did drop provisions which caused "price pegging" during the war.[10] Although the Aiken Bill contained provisions for flexible supports, (from 60% to 90% parity), lower supports were postponed until 1950, thus the principle was there, but in fact, supports were left high and rigid.

The Agricultural Act of 1949 which is now in effect (with amendments in 1952 and 1954) is a diluted version of the 1948 flexible principle, and actually superceded Title II of the 1948 Act before it became effective. The relation of supply at the beginning of a crop year to the normal supply determines the rate of support (between 75% and 90% of parity). This applies to all "basic" crops except tobacco

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[10] "Price pegging," a name often used to describe the act of supporting prices at a level other than the normal equilibrium price.

where the support is 90 percent when marketing quotas are in effect. Support was made mandatory for whole milk, butterfat, and other dairy products at 75 to 90 percent of parity and for tung nuts, wool and Irish potatoes at 60 to 90 percent, with actual levels in that range to be determined by the Secretary of Agriculture.

With some modifications the 1949 act continued the parity formula which was modernized by the 1948 act. The main difference between "old" parity and "new" is that under the "old" formula relationships among the parity prices of various commodities was determined by the relationship that existed in a fixed base period, usually 1910-14. The "new" formula determines parity by the relationships existing in the most recent ten-year period. Both formulas use 1910-14 as a base for determining the ratio of prices paid to prices received. The "new" formula also includes consideration of wages paid farm labor. In addition the 1949 act contained a step-down provision for support level reduction. It provided that parity price could be reduced, but not more than 5 percent per year under the new formula.[11]

In 1952 the Agricultural Act of 1949 was amended to provide for the first time since 1942, mandatory 90 percent supports on the "basic" agricultural commodities.

In 1954 as in 1948 Congress provided at least lip service to the concept of a flexible or variable price support program. The Act provided in the main provisions for a gradual transition to a variable price support program. It provides a permanent program of variable

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[11] For a detailed discussion of the changes involved see Agricultural Information Bulletin No. 13 Price Programs of the United States Department of Agriculture 1954.

supports ranging from 75 to 90 percent of parity for wheat, cotton, corn, rice, peanuts, and the non-quota types of tobacco, with a one year transitional period for which the range was fixed at not lower than 82.5 nor higher than 90 percent of parity.

Why Price Programs are Needed

Certain conclusions are suggested from the trial and error experience of farmers, the Department of Agriculture, and the Land Grant System in trying to bring about a rational use of agricultural resources.

Agriculture seems to have most of the characteristics of "pure" competition. Large numbers of producers, relatively easy entry, and no one farmer exerting an appreciable influence over the market. In this setting it would seem that production would be controlled by competition.

Several characteristics peculiar to agriculture have prevented the free-market pricing system or "pure" competition from guiding production. The demand for most agricultural commodities is inelastic. Small changes in the amounts supplied to the market will cause large changes in price. This results in wide fluctuations in farm income. Secondly, though acreages planted may remain stable, weather conditions may cause wide differences in the amounts of commodities farmers have to sell from year to year. A third characteristic is the production period. These periods vary from one growing season to several years for certain livestock. Production cannot be turned off and on or quickly shifted as is the case in some other industries. It takes a year to grow a crop of wheat and several years to raise beef.

In addition technological developments in agriculture which are largely labor-saving, have caused a labor surplus. The presence of too many small marginal producers who for social or cultural reasons or because of lack of knowledge or ability to follow alternative opportunities also tends to aggravate surplus production problems. Because of these internal difficulties, farm groups turned to government for assistance in improving the lot of farmers.

Arguments for price supports in general follow three main lines, (1) the income parity argument--farm income lags behind city income partly because farmers sell in a very competitive market and buy in a restricted of semi-controlled one. There is a feeling that because of this, farmers deserve some form of protection or compensation to give them a reasonable degree of security, (2) the price stabilization argument--because of the sensitivity of farm prices to changes in supply schedules due to the impact of technology or demand schedules due to the impact of wars and business cycles, a slight change in either can reduce farm income drastically, hence the need of some type of price floor, (3) the forward pricing argument--because of the great uncertainty in farm prices, the function of price in guiding production is not fulfilled. Therefore, support prices should be announced in advance so that farmers can adjust production with changes in demand.

The first two arguments are the basis for political action in price policy since they have a great amount of popular appeal. The third argument is mainly one advanced and discussed in the economic profession.[12]

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[12]An excellent discussion of forward prices is contained in D. Gale Johnson's book "Forward Prices for Agriculture" University of Chicago Press, 1947.

Effects of Price Programs on Production

Measuring the effects on production of a price program is very difficult and at best only approximate. Production and consumption or supply and demand change through time and these shifts are difficult to measure. For instance both supply and demand for farm products in the aggregate increased from 1933 through World War I. Demand increased as a result of the great industrial expansion for war and the resulting increases in incomes. Supply increases were due to improving technology and also because of the price incentives of war-time legislation.

Although it may not be possible to measure accurately quantitative results of price programs, some important conclusions and deductions about the impact of programs on farmers can be drawn.

A general conclusion often stated is that when production controls are placed on a crop, substitution among the various inputs is induced.[13] When allotments ration land and the price outlook is favorable for the controlled crop; farmers may substitute increased amounts of fertilizer, labor, or higher yielding land.

Another general conclusion is that when acreage controls are placed on one feed crop, and are effective, shifts in feed consumption will occur to closely substitutable crops. Thus the price of the controlled crop may not improve very much. For instance, in the case of corn, the price effects of acreage controls are limited by the substitution of other feed grains in feed consumption when there is a relative rise in the price of corn.

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[13]Harold G. Halcrow, Agricultural Policy of the United States, Prentice Hall Inc., New York 1953, p. 298.

CHAPTER II

RESULTS FROM SIMILAR STUDIES

Many and varied are the stories appearing in magazines and newspapers about farmers attitudes and actions with respect to agricultural price policy programs. Some report attitudes of a few farmers, with respect to policy alternatives with the implication that most farmers react that way. Others report polls of public opinion gleaned from a few questions asked of many farmers. Still others deal with only a single commodity. Few studies dealing with attitudes are able to relate the reactions of farmers to their farming practices, size of business, age, education, or other social criteria.

Equally scarce are the studies concerned with analyzing specific action and adjustments which farmers have made to farm price and acreage adjustment programs.

This chapter will summarize some of the results obtained from studies concerned with effects of production controls and will point out some conclusions that have been drawn from them.

It is important to keep in mind the conclusions reached in these studies. This will enable one to compare the findings of this study with results from similar projects which analyze different segments of the farm operator population.

One of the earliest studies to be concerned primarily with production control was made by T. W. Schultz and O. H. Brownlee.[1] It examined the effects of AAA acreage allotments on crop acreages and production. It was found that for the four basic crops subject to AAA control, (corn, wheat, cotton, and tobacco), 45 million acres had been cut from production between 1931-33 and 1940-42. Collectively, this represented a 21 percent decrease for the four crops. It was noted that about half of the decrease in corn acreage could be attributed to the drought period although this effect was not present in the other crops. The authors suggest that most of the 45 million acre cut was due to AAA control features.

When considering changes in production for these crops in the same period, they found that: (1) aggregate feed production in the eleven states considered would not have been significantly different without crop acreage control, (2) corn had played a smaller role in the total feed supply because of corn acreage allotments, (3) about the same amounts of feed concentrates other than corn would have been produced without allotments, and (4) because of acreage controls, feed roughages were greater in absolute amount and as a proportion of the total feed supply than would be the case with no controls. They further remark that, "Drastic cuts in acreage do reduce output the first year or two but even with programs as severe as those administered in cotton, it appears that within a few crop seasons the total output recovers

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[1] T. W. Schultz and O. H. Brownlee, Effects of Crop Acreage Control Features of AAA on Feed Production in 11 Midwest States, Agricultural Experiment Station Research Bulletin 298, Ames, Iowa, April 1942, p. 683.

remarkably even in the face of a 40 percent cut in acreage."[2] They tentatively conclude, therefore, that acreage allotment as practiced by the AAA is not a satisfactory means for regulating farm production.

In the summer of 1950, Michigan State University conducted a survey to determine the effect of the price support program on production practices used on Michigan farms.[3] This study covered a random sample of 572 farms of greater than 70 acres taken from seven different counties, representing different types of farming areas. Support prices in effect at planting time 1950, seemed to be as high or higher than could be expected on the open market. This gave the farmers a greater price incentive to comply with allotments than is often the case.

The results of this study showed that those planning to comply with allotments, with the exception of potato farmers, increased levels of fertilizer generally.

Farmers who did not intend to comply made only minor changes in both acreage and fertilizer levels with the single exception of bean farmers who increased acreage by 25 percent.

With respect to potato growers, it was found that those complying with allotments increased fertilization from the previous year by 10 percent per acre. Those potato growers not complying in either 1949 or 1950 made less than one percent increase in fertilization from the previous year.

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[2] Ibid., p. 678.

[3] Carl W. Staser, Effects of the Price Support Program on Michigan Farms in 1950. Unpublished thesis for the degree of M. S., Michigan State University, East Lansing, 1951, pp. 89-95.

The conclusion to be drawn from this study is that improved production practices by farmers will offset at least in part, attempts to reduce production by acreage allotments.

Utilizing data from the 1950 Michigan survey previously mentioned, Dale E. Hathaway and E. E. Peterson conducted an analysis of the action of Michigan farmers who were producing crops eligible for price supports in 1949 and 1950.[4]

It was found that only 25 percent of the farmers interviewed used price supports in 1949. Supports were used most for field beans and least for corn and oats. Wheat producers growing more than 500 bushels use price supports considerably more than those growing less. Farmers with large farms used supports much more than did those with small farms.

With respect to social criteria, the farmer's age, education, debt status, membership in farm organization, experience, or political preferences were not found to be associated with the use of supports or compliance with acreage allotments.

> Nearly 90 percent of the corn producers, two-thirds of the wheat producers, more than one-half of the potato producers, and 45 percent of the bean producers who complied with allotments in 1950 said that their compliance was a coincidence since they had planned to plant no more than the alloted acreage in any event. Apparently, the production control program influenced the plans of few Michigan farmers.[5]

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[4] Dale E. Hathaway and E. E. Peterson, Michigan Farmers and the Price Support Program, Michigan State College Agricultural Experiment Station, East Lansing, Michigan, Technical Bulletin 234, December 1952, p. 3.

[5] Ibid., p. 4.

They further conclude that some farmers were making attempts to offset acreage reductions by increased fertilization. It was found that 60 percent of the farmers complying with wheat allotment and intending to use supports in 1950 increased fertilizer applications over the previous year.

In 1952 a very complete and comprehensive single commodity analysis was made of the potato industry by a committee from the various agricultural experiment stations in the north central region.[6]

Beginning with the 1943 crop, potatoes were supported under the Steagall Amendment at 90 percent of parity. The price support program created a market of nearly average prices and practically eliminated the risk of a lower price. Production increases were immediate and of a large magnitude until in 1947 acreage restrictions were put in force to reduce output. This program lasted until 1950 when all allotments and supports were discontinued.

It was found that the reason for large production increases under price support, was the fact that price was stabilized. Historically, potato prices fluctuate widely; therefore, with prospects of a stable profitable price many farmers expanded production.

From the standpoint of resource allocation, the study concludes that during the early stages or price supports, the program accelerated the movement of production toward the specialist areas. This was

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[6] Roger L. Gray, Vernon L. Sorenson and Willard W. Cochran, An Economic Analysis of the Impact of Government Programs on the Potato Industry of the United States, Minnesota Agricultural Experiment Station, Minneapolis, Minnesota, Technical Bulletin 211, June 1954, p. 49.

considered a desirable move. Use of acreage allotments had the undesirable effect of curtailing such movements.[7]

The dry bean industry was the subject of a single commodity analysis in 1953 conducted by Michigan State University.[8] This analysis attempted to determine the effects of the postwar price support and acreage allotment programs upon production, price, and income from dry beans in Michigan.

Hathaway found that production under the support program was only slightly higher than estimated production without a program, however, year to year variation in production would have been higher without the program.

Although yields were very high during the period considered--1948-52--he attributes this to concentration of bean production in the high yielding area and not to the effects of the support program.

> Bean producers did not offset the acreage allotments in 1950 by using more fertilizer or other improved practices. The state average yield was no higher that year than would have been expected without allotments. Thus, an acreage control program would not be likely to run into the steadily increasing yields that have bothered some other crops.[9]

During January 1954 a project was undertaken by the Iowa Agricultural Experiment Station to determine the production responses

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[7] Ibid., p. 7.

[8] Dale E. Hathaway, The Effects of the Price Support Program on the Dry Bean Industry in Michigan, Michigan State College Agricultural Experiment Station, Technical Bulletin 250, April 1955.

[9] Dale E. Hathaway, How Price Supports Affected the Dry Bean Industry in Michigan, Michigan State College Agricultural Experiment Station, Technical Bulletin 399, September 1955, p. 9.

farmers in Iowa and Northern Illinois would make to the 1954 acreage allotments on corn.[10] Detailed information was collected from 540 farms in January, which was prior to the announcement of acreage allotments for that year.

When questioned as to whether or not they would participate in the corn program if acreage were reduced 15 percent, only 40 percent of the farmers said yes. When asked why they wouldn't comply nearly half stated that they could see no advantage in the program since they fed all of their corn.

The study also considered the use of acres diverted from corn production by those who planned to participate. Soybeans would take up nearly 61 percent of the diverted acres; hay 18 percent; oats 14 percent; and other crops would take up 6 percent.

When farmers who planned to participate were asked if they would make efforts to increase yields, 54 percent said that they would take their poorest ground out of corn, 31 percent would use more fertilizer, and 14 percent would increase the seeding rate per acre.

This study concludes that the most significant changes would occur in the pattern of expected production--less corn, more soybeans, oats and hay. However, total crop production, (including non-feed crops), was not expected to change significantly.

In 1954 a similar study was made in Iowa but this study covered only the high producing corn area in Iowa. Records of 204 farms were

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[10] Donald L. Kaldor, Effects of Corn Acreage Allotments on Farmers Production Plans in Iowa and Northern Illinois, Iowa State Experiment Station, Iowa State College, Ames, Iowa, Preliminary Report No. 3, March 1, 1954, p. 1.

analyzed to determine what changes in cropping patterns were made because of the corn acreage allotments.[11]

The results show that on participating farms, corn acreage was reduced 18 percent while soybean acreage increased 69 percent. In absolute figures, of the 2,548 acres cut from corn production, 1,501 acres went into soybeans, the bulk of the remainder into oats and hay with a few acres into other crops.

The conclusions of this study suggest, that as long as soybeans remain profitable most acreage diverted from corn will be planted to soybeans.[12] A further conclusion is that if heavy soybean substitution continues for a period of years because of corn allotments, corn output per acre might be reduced since the soybean is not a soil building crop.

A study completed in Ohio is concerned with farmers' responsiveness to wheat price changes, and the effects the support programs had on farmers' management decisions, and on their income.[13] A personal survey was conducted in the spring months of 1955 which covered 152 farms randomly selected within districts throughout Ohio.

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[11] R. R. Beneke and H. B. Howell, How Do Farmers React to Corn Acreage Allotments, Iowa Farm Science, Iowa State College, Ames, Iowa, Vol. 10, No. 4, October 1955, p. 6-70.

[12] Soybean price has been favorable for several years, 1953, $2.56; 1954, $2.50. The 1944-53 average was $2.48 per bushel.

[13] Melvin G. Smith, Francis B. McCormick, and Donald A. Steward, An Analysis of Ohio Farmers Views and Response to the Wheat Price Support and Control Program, Ohio State University and Ohio State Agricultural Experiment Station, Columbus, Ohio, Mimeographed Bulletin No. AE258, October 1955, p. 1.

The success of a quota program is, of course, dependent upon per acre yields of wheat. Increases or decreases in yields are difficult to attribute to any one factor. Wheat yields on the farms surveyed in 1954 were about three bushels per acre lower than in 1953. The decreases, however, was believed to be the result of weather rather than controls.[14]

With respect to acreage in wheat, it was found that controls effected a 17 percent decrease from 1953 to 1954. Therefore, it was concluded that with lower yields and fewer acres planted, the 1954 wheat quota was successful in reducing production in Ohio.

When questioned concerning fertilizer, Ohio farmers did not credit fertilization for any expected increase in yields. About 35 percent increased fertilizer levels on wheat, 7 percent decreased, and 58 percent reported no change.[15] It was also noted that there was a noticeable shift to the higher analysis fertilizers such as 5-10-10 and 10-10-10.

As in some of the other studies, it was found that diverted acres were being heavily planted to soybeans with some increases in corn and oats.

To find out to what extent acreage allotments caused problems in crop sequence, farmers were asked if the control program had caused them to make changes.

About 51 percent said yes. Of the group who said acreage allotments caused cropping problems, 37 percent gave split fields as the

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[14] Ibid., p. 4.

[15] Ibid., p. 7.

problem, 24 percent said raising additional small grains created problems, 10 percent said their rotation plans were upset, and the remainder gave a variety of reasons.[16]

Results from these studies regarding production under controls is somewhat similar. It appears that production has been reduced when controls are effected, at least for the first several years of operation. Production, of course, depends on yields and over the long run yields have shown a steady upward trend. There is however no conclusive evidence that any one factor is responsible for these increases. To be sure, improvements in farm technology have contributed to higher yields but it is also reasonable to believe that control programs have had some impact in this direction.

With respect to diverted acres, soybeans have experienced the largest increase in acreage with some gains being made by oats and corn.

Nothing conclusive can be said with respect to farmers' changes in production practices due to acreage controls. Some of the studies conclude that farmers are making efforts to increase yields by raising fertilizer levels, planting more seed, and by planting controlled crops on their best fields. Other studies find that farmers are not making any special efforts to increase yields of controlled crops.

Schickele offers the following conclusion with respect to acreage control programs:

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[16] Ibid., p. 11.

Their performance in reducing the output of a particular crop below previous levels is quite poor in most cases; probably the most they can claim is that they prevented an acreage expansion in the price-supported products. For cotton and tobacco they seem to be considerably more effective than for other major crops, mainly on account of the use of marketing quotas in connection with acreage allotments.[17]

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[17] Rainer Schickele, Agricultural Policy Farm Programs and National Welfare, McGraw-Hill Book Company, New York, N. Y., 1954, p. 206.

CHAPTER III

PROCEDURES AND TECHNIQUES

Selection of the Sample

This study is based on data collected in the summer of 1954 by a personal interview survey covering four different types of farming areas in the lower peninsula of Michigan (See Figure I). This selection was made for two important reasons: first, to select farms with different types of production decisions and alternatives which were typical of the decisions being made in commercial[1] farming areas in Michigan; and secondly, to obtain a random sample within counties in these types of farming areas. This sample does not represent all Michigan farmers. It does represent responses to decision alternatives facing Michigan farmers with 15 acres or more of wheat.

Approximately 100 farms were surveyed in each area, yielding a total sample of slightly over 400 farms. The counties covered were Kalamazoo, Livingston, Sanilac, Gratiot, and Isabella, with Gratiot and Isabella considered as one area.

Kalamazoo county is designated as a dairy, livestock, and corn area. Sources of farm incomes are approximately equally divided between these enterprises.[2] The 1950 census classified this area as about 29 percent dairy, 24 percent general farms, 15 percent as cash grain,

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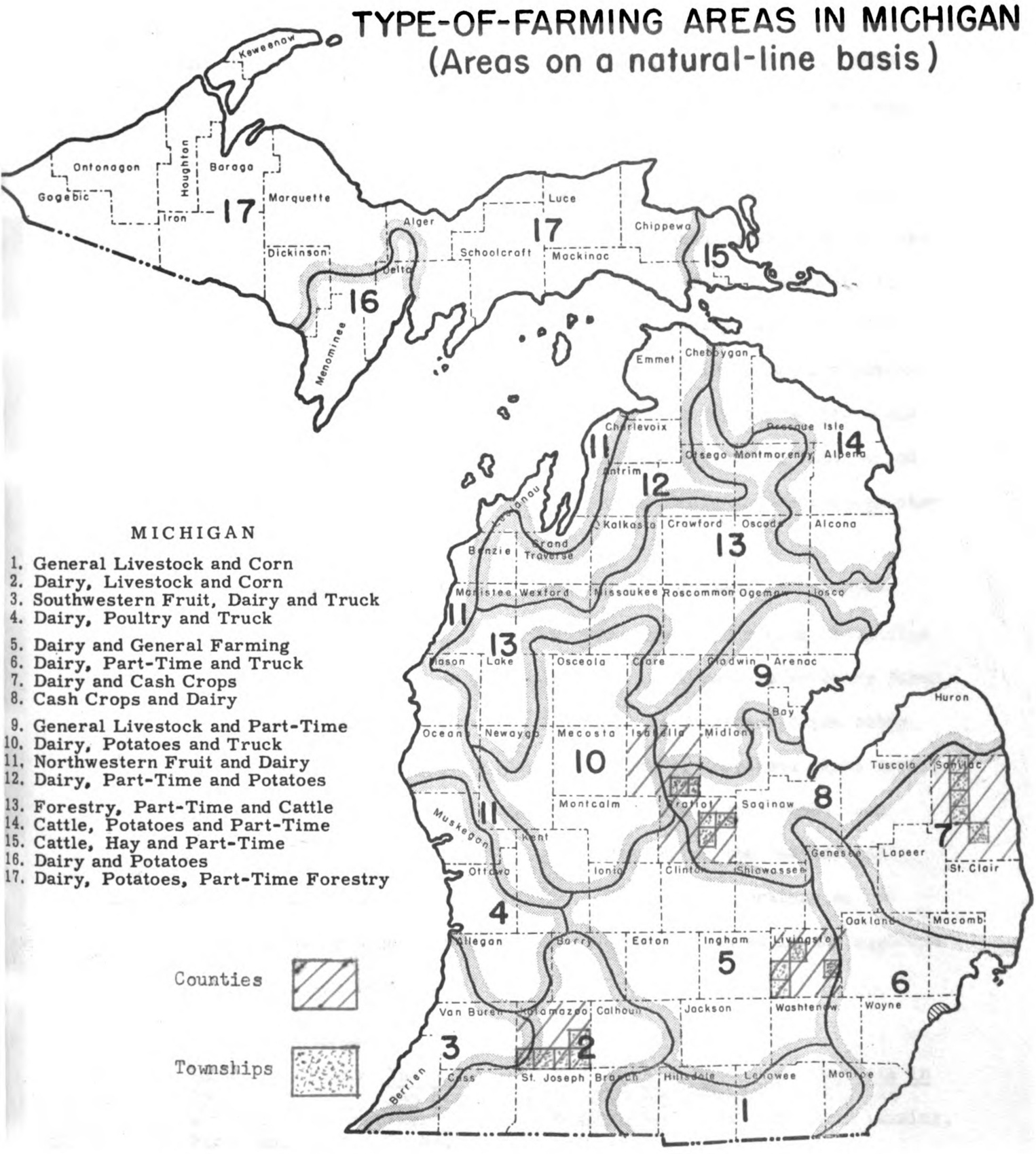
[1] Census definition of a commercial farm is one having $1200 or more of farm product sales per year.

[2] E. B. Hill, and Russell G. Mawby, Types of Farming in Michigan, Michigan State Agricultural Experiment Station, Special Bulletin 206, September 1954, p. 30.



The 83 counties in Michigan are here grouped into 17 type-of-farming areas as indicated in this map. The "natural" boundaries of these areas do not, however, follow county boundaries, but lines representing the influences of soil, climate and markets.

and 14 percent as livestock other than poultry. From 1940 to 1950 corn acreage expanded about 14 percent while wheat acreage increased about 65 percent.

The second area studied was Livingston county, considered to be a dairy and general farming area. The 1950 census classified 38 percent of the farms in this area as dairy, 15 percent as cash grain, 11 percent as livestock other than dairy or poultry, and 18 percent were classified as general farms. From 1940 to 1950 corn production in this area increased about 100 percent due to greater acreages and increased yields. Acres planted to wheat doubled during this period and in conjunction with increased yields, production made even greater gains.[3]

The third area considered in the survey was Sanilac county--classified as a dairy and cash crop area. The 1950 census classified 42 percent of the farms as cash grain farms, 28 percent as dairy farms, 22 percent as general farms, and 2 percent as livestock farms other than dairy. This area, like Livingston county, increased wheat acreage and production by about 100 percent. Dry field beans, wheat, and sugar beets are the major cash crops. Because of the heavier soil, poor drainage, and late spring frosts, the eastern portions of the county grow considerably less corn than that produced in the southern and western sections.

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[3] Dale E. Hathaway, The Effects of Agricultural Production Controls in 1954 on Four Michigan Farming Areas, Quarterly Bulletin, Michigan Agricultural Experiment Station, Michigan State College, East Lansing, Michigan, Volume 37, No. 4, May 1955, p. 567.

The fourth area sampled consisted of segments of two counties, Gratiot and Isabella, both of which represent a cash crop and dairy type of farming area. The 1950 census classified 20 percent of the farms in this area as cash grain, 30 percent as dairy, 5 percent as livestock other than dairy or poultry, and 22 percent as general farms. This area increased wheat acreage by more than two and one-half times from 1940 to 1950 and during this same period production increased by more than four times. Corn acreage declined about 20 percent with production increasing some.

Within each county, townships were selected by considering soil maps in an attempt to select townships with consistent soil types. For the fourth area, Gratiot-Isabella, it was necessary to select townships from both counties to accomplish this purpose.

Selection of townships was further restricted by eliminating all those that had been used in a similar survey in 1952 or where township agent programs were in progress. It was felt that this restriction would reduce dual enumeration by Michigan State University and possible strained relationships with farmers.

For each township a random sample was drawn from the wheat listing sheets of county Agricultural Stabilization and Conservation Committees. Farmers with less than 15-acre wheat allotments were eliminated since they were obliged to adjust acreage only if they desired to use support prices on wheat. This exclusion, however, was not serious because 80 percent of Michigan wheat is grown on farms planting greater than 15 acres.

The Questionnaire

The entire questionnaire used for the survey is seventeen pages in length. This study is concerned with the first five pages. It contains data on the characteristics of the farm and farmer and his production responses to allotments on wheat and corn. In addition, this portion of the survey contains data on cropping problems caused by the control program.

Questions concerned with cropping problems were left open-ended so that respondents were not restricted to categories in stating their answers. The remainder of the questions were more factual and for the most part did not require opinion answers. Most of these questions were precoded and the interviewer had only to check the appropriate category.

The next step was to code the open-ended questions. All coded data were then punched on IBM cards for machine sorting and tabulation.

CHAPTER IV

MICHIGAN WHEAT PRODUCTION UNDER MARKETING QUOTAS AND ACREAGE ALLOTMENTS

In 1954, for the first time since 1942, farmers harvested wheat crops under both marketing quotas and acreage allotments. It was evident for several years prior that some form of output control imposing heavy penalties for non-compliance would be necessary. In 1953 United States wheat production was 1,169 million bushels compared with the 1910-14 annual average of 724 million bushels. In the same year, domestic consumption was about 664 million bushels, a mild increase of approximately 174 million bushels over the 1910-14 average. Wheat production in 1953 was 10 percent lower than 1952 primarily because yields were 11 percent lower in 1953 than in 1952. Acreage planted, however, increased slightly from 78.0 million acres in 1952 to 78.3 million acres in 1953. From 1952 to 1953 net wheat exports dropped 29 percent and total wheat disappearance declined 12 percent, which was 21 percent below the record high disappearance of 1,288.7 million bushels in 1945. Carryover was at an all-time high of 562.5 million bushels, almost two and one-quarter times greater than 1952.[1]

Faced with increasing production, mounting carryover stocks, and a decreasing disappearance rate, the Secretary of Agriculture declared in June of 1953 that marketing quotas would be in effect on the 1954

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[1] Anonymous, Grain and Feed Statistics Through 1954, Statistical Bulletin No. 159, USDA, AMS, March 1955, p. 51.

wheat crop. Existing law required that wheat marketing quotas be proclaimed not later than July 1 whenever the total supply exceeds the normal supply by more than 20 percent. To be effected, marketing quotas must be voted on and passed by a two-thirds majority of producers. This national referendum must be held before August 15. On August 14, 1953 farmers voted 87 percent in favor of quotas on the 1954 crop, well above the necessary two-thirds majority needed to pass. In general, wheat producers with over 15 acres planted to wheat and over a 200 bushel normal production were subject to quotas and eligible to vote in the referendum. The marketing quotas of 1954 specified that farmers would be permitted to market only that quantity of wheat produced on alloted acres. Any amount produced on acres in excess of the allotment would be subject to a penalty of 45 percent of wheat parity as of May 1, 1954. Price support at 90 percent of parity was guaranteed to all those who stayed within their acreage allotment. In effect the marketing quota was an acreage allotment with severe penalties for non-compliance.

This was the wheat situation at the time the survey was taken in the summer of 1954. This chapter will analyze the survey and some secondary data with respect to (1) farmers' changes in wheat production practices which can be associated with control programs, (2) farmers estimates of wheat production potential with respect to fertilization and yields, and (3) changes in wheat production on the state level. It will also draw implications from the analysis with respect to control program effects on production, and draw tentative conclusions regarding possible success or failure of the program in 1954 with respect to Michigan.

Reduction of Wheat Acreage

Of the entire sample of 411 farms, 386 or 94 percent reduced wheat acreage from the 1953 to the 1954 harvested crop. The group that reduced wheat acreage was further subdivided into four different groups. Of these four groups, reduction because of government control accounted for 83 percent, 4 percent reduced because of rotation, 6 percent reduced because of farm operations other than rotation, and 7 percent gave a variety of reasons for reducing wheat acreage on the 1954 crop (Table I). No attempt was made to further analyze the group that did not reduce acreage. Because of the very small number involved, results would not be statistically significant.

TABLE I

REASONS REPORTED FOR REDUCING WHEAT ACREAGE FROM 1953 TO 1954

	Number	Percent
Reduced because of government controls	320	83
Reduced because of rotation	13	4
Reduced because of farm operations other than rotation	25	6
Reduced for other reasons	28	7
Total observations	386	100

The main analysis is carried through for that group which gave government controls as the reason for acreage reduction. Application to the other groups is necessarily limited because of the small number

of observations and hence questionable statistical reliability. However, when aggregated, these groups appeared to be different from those reducing because of government controls. When appropriate they are brought into the analysis for comparison.

When considering type of farms involved, the intensive livestock farm typified by the dairy farm was apparently forced to reduce wheat acreage to a lesser degree because of government controls than farms that were less intensified with respect to livestock (Table II).

TABLE II

REASONS FOR REDUCING WHEAT ACREAGE RELATED TO TYPE OF FARM

Type of Farm	Reasons for Reducing Wheat Acreage		
	Government Control (percent)	Other Reasons (percent)	Total Farms
Dairy	77	23	182
Livestock other than dairy	83	17	92
Less than five animal units per farm	93	7	112
All type of farm groups	83	17	386

Only 77 percent of dairy farms reported reducing acreage because of government control. Those classified as livestock other than dairy gave this reason about 83 percent of the time, while the group having little or no livestock gave reduction because of government controls as the reason more than 90 percent of the time.[2] Livestock intensive

[2] Differences were significant at the one percent level of chi-square.

farmers prior to 1954 may have begun to place less emphasis on wheat because they were expanding livestock enterprises. Alternatively, they may have started reducing wheat acreage in anticipation of controls but actually reported the reason for reducing as rotation or something else because they had forgotten the original reason. Cash crop farmers apparently have less flexibility with respect to crop production than do the highly intensive livestock farms. A large proportion of crops grown on livestock farms are utilized for feed. Reduction in wheat acreage can be offset insofar as feed is concerned by substituting other feed crops such as oats or corn. On the other hand, farmers raising little of no livestock depend almost solely on cash crop sales for income. Incomes of farmers in this class could be lowered seriously with the loss of price supports and even more drastically affected if penalties for non-compliance are enforced under marketing quotas. Under acreage allotments, cash crop farmers are under considerably greater pressure to reduce acreage in compliance with controls than are dairy farmers or other intensive livestock farmers who have more alternatives in choosing a cropping program.

With respect to wheat production practices, farmers who reduced because of government controls reacted differently in some cases than did those who reduced acreage for other reasons (Table III). Of the first group, only 4 percent did not use fertilizer on wheat, whereas of the group reducing for other reasons, 6 percent used no fertilizer. When questioned concerning use of nitrogen top dressing, one-quarter of those reducing because of government controls said they used nitrogen while one-fifth of the other group said they employed this

TABLE III

FARMING PRACTICES OF 386 FARMERS WHO REDUCED WHEAT ACREAGE FROM 1953 TO 1954

	Those Reducing Wheat Acreage Because of Government Controls						
	Yes		No		Some		
	Number of Farms	Percent	Number of Farms	Percent	Number of Farms	Percent	Number of Farms
Use fertilizer	305	96	12	4	--	--	317
Use nitrogen	85	27	232	73	--	--	317
Use fertilizer and nitrogen	82	27	223	73	--	--	305
Use certified seed	59	19	228	75	18	6	305
Use best land for wheat	45	15	258	85	--	--	303
	Those Reducing Wheat Acreage For Reasons Other Than Government Controls						
Use fertilizer	59	94	4	6	--	--	63
Use nitrogen	13	21	50	79	--	--	63
Use fertilizer and nitrogen	12	20	47	80	--	--	59
Use certified seed	5	8	53	85	4	7	62
Use best land for wheat	8	13	53	87	--	--	61

practice on wheat. The proportions using both fertilizer and nitrogen are also one-quarter and one-fifth, respectively. None of these, however, were significant differences. There is a fairly significant difference between groups with respect to use of certified seed.[3]

[3] Significant at 10 percent level of chi-square.

Almost one-fifth of those reducing because of government controls used certified seed, whereas only about eight percent of the other group used this practice. When asked if they used their best land for wheat, about 85 percent in each group replied that they did not. There were no significant relationships for either group between reasons for reducing wheat acreage and characteristics such as percent of income from farming, size of farm, tenure status, or age of operator.

Wheat Acreage Planted

Farmers who reduced wheat acreage because of government controls were asked what number of acres they actually planted for the 1954 crop (Table IV). Of a total of 317 planting wheat, 42 percent planted less than 20 acres, 39 percent planted from 20-39 acres, 13 percent planted between 40-59 acres, while only 6 percent planted in excess of 59 acres. To determine what planting pattern would have existed without acreage allotments, farmers were asked the following question:

> How many acres of wheat would you have planted in 1953 (for the 1954 harvest) if there had been no acreage allotment?

Answers to this question were sorted into the four acreage groups previously mentioned by the reply categories of, more than present, less than present, or same as present acreage. Without exception, no one stated that they would plant less acreage without allotments.

Taken as a group, two-thirds of the wheat growers stated that they would plant larger acreages of wheat had there been no allotment. One-third said they would make no change. Fifty-nine percent of those planting less than 20 acres would increase acreage, 61 percent of the

TABLE IV

CHANGES FARMERS WOULD HAVE MADE IN WHEAT ACREAGE WITHOUT ALLOTMENTS
(By Acreage Groups, Michigan, 1954)

Acres of Wheat Planted in 1954	Percentage of Farmers Who Would Have Planted: More Than Present Acreage	Less Than Present Acreage	Same as Present Acreage	Number of Farms
Less than 20	59	0	41	135
20-39	61	0	39	123
40-59	68	0	32	41
More than 59	100	0	0	18
All acreage groups	66	0	34	317

20-39 acre group would increase, 68 percent of the 40-59 acre group would increase, and all of those planting over 59 acres would increase acreage if there were no allotments. There is a significant difference between those planting less than 40 acres and those who grew 40 or more acres of wheat.[4] The large acreage group apparently feels the pressure of controls to a greater extent than do those planting small acreages of wheat because they would have increased acreage a substantially greater share of the time. Generally farms growing over 40 acres of wheat are not heavily livestock intensive but tend to be more reliant on cash crop sales for income.

Other characteristics of the farm and farmer were considered with respect to wheat acreage. Percentage of income from farming was the

[4] Significant at the five percent level of chi-square.

only characteristic found to be different between the low acreage and high acreage groups. Collectively for all wheat growers, 74 percent were full-time farmer, 14 percent derived 40-89 percent of their income from farming and 12 percent received less than 40 percent of their income from farming. As would be expected, those with more than 40 acres of wheat contained a larger percentage of full-time farmers than did the smaller acreage group.

Land Used in Wheat Production

When a farmers' land is rationed for certain crops, which is the case when wheat marketing quotas and allotments are in effect, we might expect, among other things, that the best land would be planted to wheat.

However this does not seem to be the case with Michigan farmers in 1954. As previously stated, only 15 percent of all wheat growers said they used their best land for wheat. The 45 farmers using their best land for wheat, were asked why they had done so (Table V). Slightly over half said the reason was to increase yields on the reduced acres, 31 percent gave rotation as the reason, 14 percent said it happened by chance, and 4 percent gave other reasons for using their best land for wheat. Since only half of this group used their best land in an effort to increase yields, they constitute only about 8 percent of all wheat growers instead of 15 percent as it appeared earlier. Use of best land by the other 7 percent of wheat growers was coincidental to acreage control. The Ohio wheat study reviewed in

TABLE V

REASONS REPORTED FOR USING BEST LAND FOR WHEAT

Reason	Number of Farms	Percentage
Increase yields on reduced acres	23	51
Because of rotation	14	31
Happened by chance	6	14
Other reasons	2	4
	45	100
Total farms using best land for wheat	45	15
Total farms not using best land for wheat	258	85

Chapter III found that of the farmers expecting higher yields, only 12 percent credited the increased yield to use of better land.[5]

When wheat acreage groups were sorted with respect to use of best land for wheat, the difference between the less than 40 acre group and the more than 40 acre group was of slight significance.[6] More farmers planting over 40 acres of wheat tended to use their best land than did the small acreage group, although this difference was not great.

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[5] M. G. Smith, F. B. McCormick and D. D. Steward, An Analysis of Ohio Farmers' Views and Responses to the Wheat Price Support and Control Programs, Ohio State Agricultural Experiment Station, Columbus, Ohio, October, 1955, p. 6.

[6] Significant at the 10 percent level of chi-square.

This would be expected since the farms with larger acreage would have more alternatives within the rotation.

There was no significant relationships between use of best land for wheat and characteristics such as tenure status, type of farm, livestock intensity, acres of cropland; nor were there any meaningful relationships with respect to other cropping practices.

Use of Commercial Fertilizer and Nitrogen on Wheat[7]

Beneficial effects of fertilizer is widely recognized by farmers. Nitrogen as a top dressing applied to wheat in the early spring is a comparatively recent development and is now in limited use. Farmers have no control over temperature and moisture conditions but as a rule some response can be obtained by the use of commercial fertilizer and nitrogen. It would be expected that under acreage restrictions farmers might attempt to raise yields by increasing fertilizer levels assuming adequate capital and labor. This section will deal with that problem.

Of the 312 wheat producers, 305 or 96 percent applied commercial fertilizer to wheat in 1954. From the 1953 to the 1954 crop, 35 percent increased fertilizer levels, 6 percent decreased, and 59 percent made no change in wheat fertilization (Table VI). Fertilizer levels in absolute amounts were sorted into five different levels from low to

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[7] Henceforth, the term fertilizer will mean commercial fertilizer containing two or more of the mixed elements N, P, and K, expressed as pounds of plant nutrients per acre. Use of the term nitrogen will mean actual pounds of the element N applied per acre supplemental to other commercial fertilizers as top dressing on wheat and as side dressing on corn.

TABLE VI

CHANGES IN FERTILIZER LEVEL FROM THE 1953 TO 1954 WHEAT CROP

Fertilizer Level Lbs. Nutrients Per Acre	Percentage			Number of Farms
	Increase	Decrease	No Change	
Less than 50	31	3	66	32
50-69	18	10	72	111
70-89	29	4	67	76
90-109	65	2	33	48
More than 109	62	8	30	37
All fertilizer groups	35	6	59	305

high. For fertilizer users who had reduced wheat acreage because of government controls, there was found to be a highly significant difference between those using less than 90 pounds and those using over 90 pounds of nutrients per acre with respect to direction of change from the previous year.[a] About 63 percent of those using 90 pounds per acre or more increased fertilization compared with only 24 percent increasing in the less than 90 pound group. Of the lower group about 70 percent made no change from the previous year, whereas only about 32 percent of the greater than 90 pound group stayed at the same level. Only a small number in each group decreased, averaging about 6 percent.

The small group of 66 farmers who gave other reasons for reducing wheat acreage were also considered with respect to fertilizer levels

[a] Significant at the one percent level of chi-square.

and changes. Results from this group were very similar with the exception that 50 percent of those using greater than 90 pounds of fertilizer per acre increased application from the previous year compared with 63 percent for that group reducing because of government controls. In the greater than 90 pound class this group also had more farmers who did not change, (50 percent), compared with 32 percent remaining at the same level for those reducing because of government controls.

To determine changes in fertilizer levels from 1953 to 1954 with respect to wheat acreage, the four acreage groups were sorted into three categories: (1) those increasing fertilizer inputs from the previous year, (2) those decreasing inputs, and (3) those who made no change in fertilizer inputs (Table VII). For all acreage groups, 35 percent increased fertilization, 59 percent made no change, and 6 percent decreased fertilizer levels on wheat. There is a decided difference between the low wheat acreage group and the high group regarding changes in fertilizer inputs.[9] About forty percent of all farmers planting less than 40 acres of wheat increased fertilizer levels, whereas only about 17 percent of those planting 40 acres or more increased. Proportionately about twice as many from the large acreage group reduced fertilization than did those with less than 40 acres in wheat.

The question immediately arises as to the relation between these two groups with respect to fertilizer levels in absolute amounts.

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[9] Significant at the 5 percent level of chi-square.

TABLE VII

WHEAT ACREAGE RELATED TO CHANGE IN FERTILIZER INPUTS FROM THE PREVIOUS YEAR

Acreage Group (Acres Planted)	Change in Fertilizer Level from 1953 Crop to 1954 Crop (Percentage)			
	Increase	Decrease	No Change	Number of Farms
Less than 20	39	5	56	128
20-39	39	6	55	118
40-59	18	10	72	40
More than 59	17	11	72	18
All acreage groups	35	6	59	304

To answer this question the four acreage groups were sorted into five absolute fertilizer levels in terms of 1954 acreage. No significant differences were found to exist between the four acreage groups; nor were there significant differences in fertilizer levels when acreage was grouped by those planting less than 40 acres and those planting 40 acres or over. Apparently the larger percentage in the less than 40 acre group who increased fertilization has raised them to an absolute level comparable to the large acreage group. Of all wheat growers taken as a group, 11 percent used less than 20 pounds of fertilizer per acre, 36 percent used 50-69 pounds per acre, 25 percent used 70-89 pounds per acre, 16 percent used 90-109 pounds per acre, and 12 percent applied more than 109 pounds of fertilizer per acre.

Fertilizer users were next asked: "What is the greatest amount of fertilizer you can profitably use on wheat?"

This question was asked for two reasons. First, to find out what wheat growers as a group thought was the most profitable fertilizer level. Secondly, to determine what farmers within different fertilizer use levels estimated the most profitable amount to be with respect to the amount they were currently using. For instance, for those in the low levels, (less than 70 pounds/acre), did they estimate the most profitable level to be higher than what they were using, lower, or at the same level? Considering all fertilizer users as a group, about 22 percent thought that less than 70 pounds per acre was the most profitable rate, 39 percent estimated the 70-109 pound level to be most profitable, and 39 percent thought applications in excess of 109 pounds per acre would be the most profitable. When considering farmers estimates of most profitable levels with respect to their current levels of usage, 64 percent of all fertilizers users estimated the optimum rate at higher than their present levels (Table VIII). About 34 percent thought that they were over the most profitable rate. These estimates did not differ significantly from low to high fertilizer level groups.

There are no significant relationships between levels of fertilizer used and farm or farmer characteristics, such as percent of income from farming, type of farm, total acres of cropland, livestock intensity or other social criteria.

Use of nitrogen on wheat is a rather recent innovation but it is now being adopted by increasing numbers of wheat growers. It is generally applied to wheat as a top dressing in the early spring; however, some applications are made at planting time.

TABLE VIII

FARMERS ESTIMATES OF MOST PROFITABLE FERTILIZER LEVEL WITH RESPECT TO LEVELS THEY WERE USING

Fertilizer Level Lbs. nutrients per acre	Percent of Farmers Estimating Most Profitable Level at: Greater than Present Level	Less than Present Level	Same as Present Level	Number of Farms
Less than 50	72	0	28	29
50-69	62	2	36	91
70-89	61	1	38	66
90-109	76	0	24	37
More than 109	55	6	39	31
All fertilizer groups	64	2	34	254

Of the 305 farmers using fertilizer on wheat, 82 or 27 percent used nitrogen top dressing.[10] Of the group using nitrogen, about 60 percent applied less than 40 pounds per acre, while approximately 40 percent used 40 pounds or more per acre (Table IX). Nitrogen users were asked what changes, if any, they made in nitrogen inputs on wheat from the 1953 to the 1954 crop. The difference between the high and low level group is not nearly as great with respect to input changes as the difference found between high and low level fertilizer groups. About 57 percent of those using greater than 40 lbs. of nitrogen per acre increased application, 51 percent of those using less than 40 pounds per acre increased levels. Twenty-three percent of the high

[10] Only two farmers used nitrogen that did not use fertilizer.

TABLE IX

CHANGES IN NITROGEN LEVELS ON WHEAT FROM THE PREVIOUS YEAR 1953 TO 1954

Nitrogen Level, 1954 Lbs. Nitrogen Per Acre	Percentage of Farmers who: Increased Level from Previous Yr.	Decreased Level from Previous Yr.	Made No Change in Level from Previous Yr.	Number of Farms
Less than 20	46	15	39	13
20-39	53	19	28	36
40-59	47	12	41	17
More than 59	94	0	6	16
All nitrogen groups	59	13	28	82

groups and 31 percent of the low group used the same nitrogen application for both the 1953 and 1954 wheat crops.

Farmers were next asked to give their estimate on the most profitable nitrogen application on wheat (Table X). Of the group using nitrogen, 32 percent were reluctant to give an answer. Fifty-nine percent of those replying estimated the optimum rate to be less than 40 pounds while 41 percent thought the most profitable rate was 40 pounds or greater per acre. When asked what they thought to be the most profitable rate with respect to their current rate, more of those using less than 40 pounds per acre thought they could profitably increase rates than did those using greater than 40 pounds per acre. This suggests the conclusion that those in the high level group more often felt they had reached optimum rates than did those using smaller amounts.

TABLE X

FARMERS ESTIMATES OF MOST PROFITABLE NITROGEN LEVEL WITH RESPECT TO LEVELS THEY WERE USING IN 1954

Nitrogen Level, 1954 Lbs. Nitrogen Per Acre	Most Profitable Level (Percent)			Number* of Farms
	Greater Than Present	Less Than Present	Same as Present	
Less than 20	90	0	10	10
20-39	32	4	64	28
40-59	27	27	46	11
More than 59	29	29	42	7
All nitrogen groups	41	11	48	56

*Of the 82 farmers using nitrogen, 26 did not answer as to the most profitable rate.

In the sample of wheat growers who use fertilizer, only about 28 percent applied nitrogen top dressing to wheat in 1954. There is substantial evidence to support the view that use of nitrogen on wheat in appropriate amounts is generally profitable.[11] Widespread adoption of this practice by farmers could conceivably cause some increases in yields thus to some degree offsetting acreage reductions by government controls.

To gain information concerning this problem farmers were asked the following question:

[11] Anonymous, Nitrogen for Wheat, Oats, Barley, Michigan State University Cooperative Extension Service, Mimeographed Bulletin NSG, November 1955, p. 1.

"Do you believe nitrogen top dressing for wheat would be profitable on your farm?"

Of the 305 who used fertilizer, 302 responded to this question. Within this group about 92 percent of those who used less than 40 pounds of nitrogen per acre thought it was profitable, 4 percent felt that it was not profitable and 4 percent said they didn't know (Table XI). The group using 40 pounds or more per acre answered somewhat differently. Only about three quarters of this group thought nitrogen was profitable on wheat, 15 percent said it was not profitable and 9 percent didn't know. The explanation may be in the fact that those using 40 pounds or greater per acre are over the economic optimum rate and therefore nitrogen use doesn't appear as profitable as it does to those using less. There is evidence to indicate that 20-40 pounds per acre is generally the most profitable rate.[12]

Of the group who did not use nitrogen, 45 percent thought it would be profitable, 24 thought nitrogen wouldn't pay, and 31 didn't know whether or not nitrogen use on wheat would be profitable. No reason could be found as to why those who thought nitrogen was profitable, did not use it. No significant difference was found to exist between this group and those who used nitrogen when sorted by all available criteria. A limitation in capital available might offer some explanation but this data was not available.

There was no correlation between direction of change in nitrogen inputs and direction of change in fertilizer inputs with respect to

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[12] Ibid., p. 1.

TABLE XI

FARMERS' ESTIMATES OF PROFITABILITY OF NITROGEN RELATED TO LEVELS OF NITROGEN THEY WERE USING

Nitrogen Level Lbs. Nitrogen Per Acre	Percentage of Farmers Who Thought Use of Nitrogen was: Profitable	Not Profitable	Didn't Know	Number of Farms
None	45	24	31	220
Less than 20	92	8	0	13
20-39	92	3	5	36
40-59	76	12	12	17
More than 59	75	19	6	16
All nitrogen groups	56	20	24	302

farmers using both nitrogen and fertilizer. In addition, no significant relationships were found to exist between use of nitrogen top dressing on wheat and the general characteristics of the farm and farmer.

No detailed analysis could be made on nitrogen use for the small group who reduced wheat acreage for reasons other than government controls. This group contained only 12 farms.

Wheat Yields

To determine what farmers' estimates were concerning future wheat yields, the following question was asked:

> Under the most favorable conditions what is the highest wheat yield you think you can get on your farm?

Of all yield groups collectively, 85 percent thought they could increase yields over their present rate, while only 15 percent felt that their present yield was about as high as they could expect (Table XII).

TABLE XII

FARMERS ESTIMATES OF HIGHEST WHEAT YIELDS POSSIBLE RELATED TO ACTUAL YIELDS OBTAINED ON 1954 CROP

1954 Wheat Yields* Bushel Per Acre	Estimate of Possible Yields** Percent Each Group Higher Than 1954	Same As 1954	Number of Farms
15-24	100	0	24
25-34	97	3	136
35-44	73	27	116
More than 44	43	57	21
All yield groups	85	15	297

* Only two farms of this group had less than 15 bushels per acre wheat yields.
** No yields were estimated lower than 1954 yield.

As might be expected, a greater percentage of those in the lower yield group thought that they could increase yields than did those who were producing high yields. Although farmers may be over optimistic with respect to possible wheat yields, the data suggests that they may be able to make some successful efforts to increase yields. It is not at all unreasonable to expect those producing less than 34 bushels per acre to raise yields by increasing fertilization and adopting other improved practices.

Crop Rotation

Farmers were asked questions to determine if acreage allotments were causing problems with respect to crop sequence or rotations.

Since wheat ground was in a sense rationed because of marketing quotas while corn acreage was much less restricted, it was decided to analyze responses to these questions with respect to wheat growers who reduced acreage because of government controls.

Out of the 320 farmers in this group, 85 percent said they followed a regular sequence of crops in a field while 15 percent said they followed no regular pattern. When asked if they had any land that was not in sequence, 60 percent said no, 7 percent said allotments had caused them to substitute other crops for alloted ones, 12 percent said weather or field conditions caused some land to be out of rotation, 8 percent had permanent pasture or hay fields, and 14 percent gave other reasons for having land out of rotation (Table XIII).

Farmers were next asked what changes, if any, were made in cropping sequence because of allotments (Table XIII). Forty-eight percent said no changes were necessary, 5 percent said it was necessary to keep more acres in legumes or grasses, 2 percent said they had to increase acreage in summer fallow, 31 percent reported that allotments caused them to substitute other crops in the rotation for alloted ones, and 14 percent gave other reasons why allotments had caused changes in crop sequence.

To determine what farmers' attitudes were concerning these changes in sequence forced by allotments, they were asked to express their

TABLE XIII

CROPPING SEQUENCE PROBLEMS RELATED TO ACREAGE ALLOTMENTS

Reasons for Cropland Not in Sequence	Percentage	Number of Farms
None, all cropland in sequence	60	176
Allotments caused substitution of other crops for alloted use	7	21
Caused by weather or field conditions	12	34
Fields used for pasture or hay	7	22
Other reasons	14	40
	100	293
Changes in crop sequence caused by allotments:		
No change necessary	48	143
Had to keep fields in legumes or grasses	5	13
Had to increase summer fallow acreage	2	7
Had to substitute other crops for alloted ones	31	92
Allotments caused changes for other reasons	14	41
	100	296
Attitudes toward making changes in sequence because of allotments:		
Makes rotation planning difficult	15	23
Don't like to make these changes	46	70
My income will be lowered	3	5
Not affected too much	24	36
Other	12	18
	100	152

feelings on the subject. Twenty-three percent said that allotments made rotation planning difficult, 46 percent said they disliked making these changes, 3 percent thought their income would be lowered, 24 percent said changes necessitated by allotments didn't affect them too much, and 12 percent expressed other attitudes concerning making changes (Table XIII).

It should be kept in mind that the results just discussed were for 1954, one year only. Prior to that wheat marketing quotas and acreage allotments were last used in 1942. There was no allotment on corn since 1950. Sudden changes in rotation is not to be expected since cropping sequences cannot be quickly shifted from year to year. For example, two to three years is the usual time period used in rotating alfalfa hay to corn, beans, or wheat. It seems likely that existence of restrictive acreage controls such as wheat marketing quotas will, over a period of years, cause considerably greater changes in cropping sequence than that found in this study.

Wheat Production at County and State Levels

The 1954 wheat crop was planted under marketing quotas and acreage allotments. A considerable decrease, both in acreage and in total production, took place from 1953 to 1954.

For the entire state of Michigan during that period acreage harvested decreased by 32 percent from 1.5 million acres to slightly over one million acres (Table XIV). The average wheat yield for the state in 1954 was 29.5 bushels per acre, the same as for 1953. With yield remaining constant, total production decreased by the same percentage as acreage, from 44.7 million bushels to 30.4 million bushels.

TABLE XIV

WHEAT PRODUCTION IN MICHIGAN AND SELECTED COUNTIES, 1953 AND 1954*

County and Area	Harvested Acreage (000 omitted)			Yields Per Acre (Bushels Per Acre)			Total Production (Bushels) (000 omitted)		
	1953	1954	**Percent Change	1953	1954	**Percent Change	1953	1954	**Percent Change
1 - Kalamazoo	37	23	-38	29.1	28.7	- 1	1076	660	-39
2 - Gratiot	44	30	-32	29.1	34.2	17	1280	1026	-20
2 - Isabella	27	18	-33	29.1	31.3	7	786	596	-25
3 - Sanilac	78	51	-35	24.8	29.8	20	1933	1519	-21
4 - Livingston	30	18	-40	26.9	26.5	-1	808	477	-41
Totals above five counties	216	140	-35	27.2	30.5	12	5883	4278	-27
State totals	1515	1030	-32	29.5	29.5	0	44692	30385	-32

* Source: Michigan Agricultural Statistics, 1954.
** Minus sign represents a percentage decrease.

Taken as a group, the five counties from which the survey was taken show wheat production changes differing somewhat from state averages. Wheat yields increased from 1953 to 1954 by 12 percent compared with no change in yields at the state level (Table XIV). Harvested acreage was reduced 35 percent, slightly more than the state aggregate decrease of 32 percent. The increase in yields in these five counties somewhat offset the larger acreage reduction and total production declined by only 27 percent, 5 percent less than the total production decrease for the state.

Primary data taken from these five counties shows that more farmers increased fertilizer and nitrogen applications from 1953 to 1954 than decreased. For fertilizer, 35 percent increased application, 6 percent decreased. For nitrogen, 59 percent increased application, 13 percent decreased. This data may explain in part why the aggregate average yield for the five counties increased by 12 percent from 1953 to 1954 while the state average yield showed no change for that period.

Another tentative conclusion that may be drawn is that in speciality areas including the five county area surveyed, efforts were made to increase wheat yields from 1953 to 1954 by adopting more improved practices while in other areas of the state, offsetting effects resulted because little or no efforts were made to increase yields or that weather conditions were less favorable in these other areas.

With reservations for a wide degree of latitude in interpretation, it does appear that weather over the state was approximately comparable for 1953 and 1954.[13]

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[13]Anonymous, Climatological Data With Comparative Data, 1954, East Lansing, Michigan, U. S. Department of Commerce Weather Bureau.

Fertilizer consumption data is not available for individual crops for Michigan, however, total state fertilizer consumption did not increase significantly greater than trend value from 1953 to 1954.[14]

Since total production for the state decreased by the same percentage as harvested acreage, with yield, weather, and fertilizer consumption remaining approximately constant, it can be tentatively concluded that for Michigan, wheat marketing quotas and acreage allotments were successful in reducing wheat production from 1953 to 1954.

This conclusion, however, does not hold for the five county area surveyed, because unlike the state average, production did not decrease in proportion to acreage reduction. This resulted because yields in the survey group increased by 12 percent while there was no change in the state average. The increase in yield in the survey area may be due to the increased use of fertilizer and possibly to more favorable weather conditions. Certainly many of the farmers interviewed in these counties were adjusting farming practices in attempts to increase yields and counteract the effects of marketing quotas.

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[14] Anonymous, Michigan Agricultural Statistics, 1954, Michigan Department of Agriculture, p. 40.

CHAPTER V

MICHIGAN CORN PRODUCTION UNDER ACREAGE ALLOTMENTS

Early in 1954 the Secretary of Agriculture announced that acreage allotments would be in effect that year for corn for the first time since 1950. The Secretary is required by law to announce not later than February 1, the acreage allotment on corn produced in the commercial corn producing areas unless the allotment is dispensed with under emergency provisions of the AAA of 1938, as amended.

Corn surpluses had not reached the critical levels found in wheat; however, increasing carryover was great enough to call for production control efforts. Corn acreage has remained very stable for the past 20 years averaging between 80 million and 90 million acres planted each year in the United States. Production for 1953 was 3,192 million bushels, about three percent lower than 1952. Yields for 1953 were down 1.3 bushels per acre from a record high in 1952 of 54.8 bushels per acre. Total corn disappearance increased about 1.5 percent from 2,998 to 3,043 million bushels for the same period. Carryover increased from 1952 to 1953 by about 20 percent from 769 million bushels to 920 million bushels.[1] A slight decrease in production and a mild increase in disappearance coupled with a moderate increase in carryover stocks resulted in total supply increasing by about 5 percent.

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[1] Anonymous, Grain and Feed Statistics Through 1954, U. S. Department of Agriculture, Agricultural Marketing Service, Washington, D. C. Statistical Bulletin No. 159, p. 14.

Corn acreage allotments were applicable only to those areas defined as "commercial corn-producing areas." Such areas are defined as (1) all counties in which the average production of corn (excluding corn used as silage) during the preceding 10 calendar years, after adjustments for abnormal weather conditions, is 450 bushels or more per farm and four bushels or more per acre in the county, and (2) all counties bordering on commercial corn-producing area which will likely produce a comparable amount. The allotment for 1954 was 46.9 million acres, a 17.4 percent reduction from the 56.8 million acres planted in 1953. The reduction by counties and farms was to vary with the trend in acreage in counties during the past 10 years.

On March 19, 1954 the United States Department of Agriculture announced the support price on the 1954 crop of corn. This price was guaranteed at $1.62 per bushel, which was 90 percent of the February 15 corn parity price and 17 cents per bushel higher than the prevailing price received in 1953 by Michigan farmers. To be eligible for the support price on corn, those in the commercial corn-producing areas were obligated to comply with their allotment. There was no provision for penalties for exceeding alloted acreage such as contained in wheat marketing quotas. Thus complying farmers might expect something like 15 to 20 cents per bushel more for the corn they sold; farmers feeding all their corn had little to gain by complying.

This was the corn situation just prior to corn planting time in 1954. The survey followed several months later in the summer. This chapter will analyze survey data on corn to determine (1) reasons why

farmers decided to comply or not comply with corn acreage allotments, and (2) whether or not differences in farming practices on corn exist between those complying with allotments and those not complying. In addition some secondary data will be analyzed with respect to corn production in Michigan on the county and state levels for 1953 and 1954.

Method of Grouping

Farms were first grouped by all those producing corn (Figure II). Of the total 411 farms surveyed, 388 or 94 percent produced corn. The 82 corn-producing farms from Sanilac county were next sorted from the corn-producing farms in the other areas of Kalamazoo, Gratiot, Isabella and Livingston counties. Sanilac county was not defined as a commercial corn-producing area in 1954 and, therefore, had no corn allotment. It was first intended to use this county as a control group for comparison with data from the other areas where allotments were in effect. Significant differences were found to exist between Sanilac county and the other areas with respect to type of farm, livestock intensity, size of farm, and percent of income from farming.[2] For example, 78 percent of the farms in Sanilac county were dairy farms whereas only 49 percent of the farms in the other areas were classified as dairy. In addition in Sanilac county 84 percent of the farmers were full-time farmers while for the other areas that figure was 61 percent. There was also a considerable difference in size of

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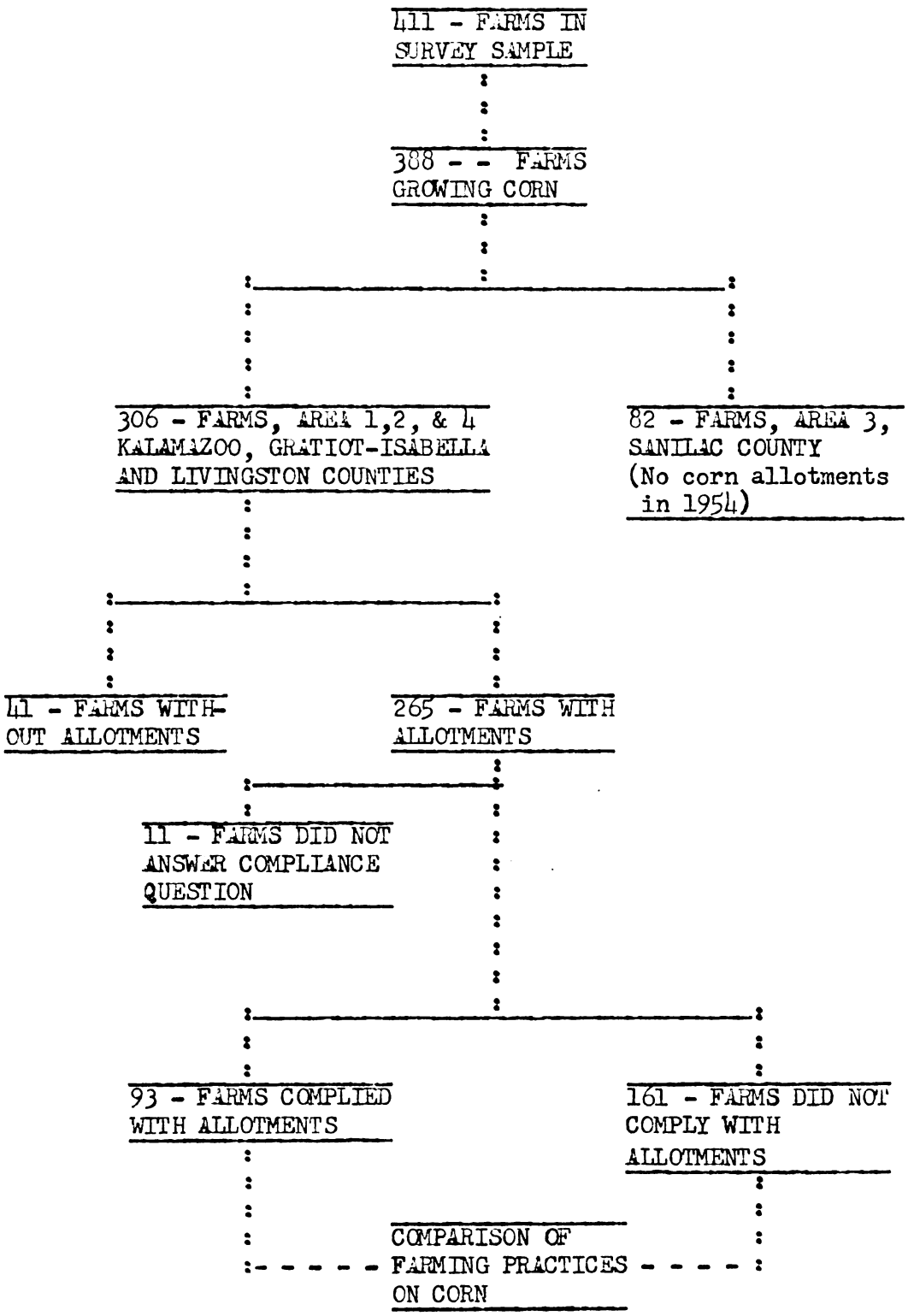
[2] Significant at the one percent level of Chi-square.

FIGURE II

METHOD OF SORTING SAMPLE FOR CORN PRODUCTION ANALYSIS - MICHIGAN, 1954



Compliance With Allotments

Of the 254 farmers who had corn allotments in 1954, 93 or 37 percent complied with allotments, while 161 or 63 percent did not. Farmers were next asked to give their reasons for complying or not complying. Of those complying, 38 percent said they wanted to be eligible for the support price, 44 percent stated that the alloted acreage was about the same as their rotation called for, 5 percent said they felt they should comply, and 13 percent gave a variety of reasons for complying (Table XV).

The 161 farmers who did not comply were also sorted into groups by reasons given for non-compliance. Reasons given were categorized into two main groups: (1) those whose compliance decision was influenced by farm organizations or practices, and (2) those whose decision was influenced primarily by income considerations (Table XV). Of course, income may have been an important consideration in the first group also but it is more pronounced in the second group. The following specific reasons discussed are expressed as a percentage of the whole group who did not comply with allotments. Of those whose decision to not comply was influenced mostly by farm organization or practices, 48 percent said they needed corn to feed livestock, 4 percent said compliance would interfere with rotation, 9 percent stated that compliance would result in split fields or idle land, and 8 percent said they would have too many beets, beans, etc., if they complied. These groups comprised 69 percent of those not complying.

Of the group who had income considerations as the main reason for non-compliance, 8 percent of the total farmers not complying said that

TABLE XV

REASONS FOR COMPLYING OR NOT COMPLYING WITH CORN ACREAGE ALLOTMENTS IN 1954

Reason	Percentage	Number of Farms
Those Complying		
Wanted to be eligible for support price	38	35
Allotment was similar to rotation acreage plan	44	41
Felt they should comply	5	5
Other reasons	13	12
Totals	100.0	93
Those Not Complying		
Decision influenced by farm organization or practices:		
Needed corn to feed livestock	48	78
Interferred with rotation	4	6
Did not want split fields or idle land	9	15
If complied, would have too many beans, beets, etc.	8	12
Sub-totals	69	111
Decision influenced by income considerations:		
Had to plant extra acreage to make up for lower prices	8	12
Allotment was too low or not fair	7	11
Because of reduction in wheat acreage	4	6
Sub-totals	19	29
Decision influenced by other reasons	12	21
Grand Totals Not Complying	100.0	161

TABLE XV

REASONS FOR COMPLYING OR NOT COMPLYING WITH CORN ACREAGE ALLOTMENTS IN 1954

Reason	Percentage	Number of Farms
Those Complying		
Wanted to be eligible for support price	38	35
Allotment was similar to rotation acreage plan	44	41
Felt they should comply	5	5
Other reasons	13	12
Totals	100.0	93
Those Not Complying		
Decision influenced by farm organization or practices:		
Needed corn to feed livestock	48	78
Interferred with rotation	4	6
Did not want split fields or idle land	9	15
If complied, would have too many beans, beets, etc.	8	12
Sub-totals	69	111
Decision influenced by income considerations:		
Had to plant extra acreage to make up for lower prices	8	12
Allotment was too low or not fair	7	11
Because of reduction in wheat acreage	4	6
Sub-totals	19	29
Decision influenced by other reasons	12	21
Grand Totals Not Complying	100.0	161

they had to plant extra acreage to make up for lower prices, 7 percent gave low or unfair allotments as the reason, and 4 percent said that the reduction in acreage alloted to wheat, (wheat is generally produced as a cash crop), caused them to decide against complying with corn acreage allotments.

When certain facts are known it is not at all surprising to find that only about 37 percent of the farmers who had allotments complied. Each year an average of almost 90 percent of the corn consumed in the United States is fed to livestock or used as seed on farms.[4] A good deal of corn produced never goes through commercial channels. It is either consumed on the farm where it is grown or is bought and sold among farmers and in these cases price support benefits are not used. Before corn planting time in 1954 it appeared as though a considerable price differential would exist at harvest time between the support level and the open market price.[5] Farmers who planned to grow large crops of corn for feed may have felt, even though a considerable price differential was apparent, that it was more profitable in their case to grow a large crop and feed it rather than produce within allotment, sell under support price, and buy additional corn for feed at a lower price on the open market. Earlier studies suggest that some farmers consider the ethics of such practices questionable. Farmers were under

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[4] Anonymous, Grain and Feed Statistics Through 1954, U. S. Department of Agriculture, Agricultural Marketing Service, Statistical Bulletin No. 159, p. 14.

[5] For 1954 price support was guaranteed at $1.62 per bushel. Market price at planting time was about $1.45 per bushel.

no real compulsion to stay within corn allotment as would be the case if cross-compliance between wheat and corn was in effect. Benefits paid for compliance with wheat marketing quotas were not affected by compliance with corn allotments. Therefore, a farmer could receive the wheat support price and still plant as much corn as he pleased, the only adverse effect being ineligibility for corn support prices.

Characteristics of the Compliance Groups

To determine whether or not compliance with allotments could be associated with farm and farmer characteristics, those complying and those not complying were sorted by different characteristics (Table XVI). For example, those complying and those not complying were sorted by type of farm. Of those complying with allotments, 33 percent were dairy farm, 30 percent were livestock other than dairy farms, and 37 percent were primarily crop farms having less than five animal units. The group not complying with corn allotments consisted of 45 percent dairy farms, 27 percent livestock other than dairy farms, and 28 percent were crop farms with less than five animal units. Chi-square tests were performed and no significant difference was found between these two groups even at the 10 percent level. Similar comparisons and tests were made for all the general characteristics available in the data including total acres of cropland, years of farming experience, age, and attendance at county agent meetings. Characteristics considered most important, such as type of farm, livestock intensity, percent of income from farming, tenure status, and economic area, are represented in Table XVI. When tested and compared by the same method

TABLE XVI

COMPLIANCE WITH CORN ALLOTMENTS RELATED TO CHARACTERISTICS OF THE FARM AND FARMER -- 1954

Characteristics of the Farm or Farmer		Compliance With Allotment Percentage of Farms	
		Did Comply	Did Not Comply
Type of Farm	Dairy	33	45
	Livestock other than dairy	30	27
	Less than five animal units	37	28
		100	100
	Total farms	93	161
Livestock Intensity	Intensive	37	50
	Extensive	26	22
	Less than five animal units	15	9
	No livestock	22	19
		100	100
	Total farms	93	161
Percent of income from farm	Less than 40	9	11
	40-89	20	16
	90-100	71	73
		100	100
	Total farms	92	159
Tenure Status	Owner	58	63
	Renter	42	37
		100	100
	Total farms	76	115
*Economic Area	1 - Kalamazoo county	38	36
	2 - Gratiot-Isabella counties	41	34
	3 - Livingston county	21	30
		100	100
	Total farms	93	101

* For a description of each area, see Chapter III.

previously discussed, none of the characteristics listed were significantly different between the group that complied and the group that did not comply with allotments.[6]

Corn Production Practices

The next step in the analysis was to determine whether or not differences exist in corn production practices between the group complying with allotments and the group who did not comply. Both groups were sorted by the various practices and comparisons made between the two groups at the different levels for each practice (Table XVII). For example, the group that did comply and the group that did not comply with corn allotments were both sorted by fertilizer application groups. Of the group that complied with allotments, 46 percent used less than 50 pounds of fertilizer per acre, and 54 percent used 50 pounds or more per acre. Of the group who did not comply, 50 percent used less than 50 pounds of fertilizer per acre, and 50 percent used 50 pounds or greater. Comparisons were made between those complying and those not complying for each fertilizer application level and no significant differences were found.[7] All production practices on which data were available such as fertilizer application, change in fertilizer application from the previous year, nitrogen application, change in nitrogen application from the previous year, corn planting

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[6] No differences were significant even at the 10 percent level of Chi-square.

[7] No differences were significant even at the 10 percent level of Chi-square.

TABLE XVII

COMPLIANCE WITH CORN ALLOTMENTS RELATED TO CORN PRODUCTION PRACTICES -- 1954

Corn Production Practices		Compliance with Allotments Percentage of Farms	
		Did Comply	Did Not Comply
Fertilizer application nutrient (lbs./acre) 1954	Less than 50	46	50
	50 or more	54	50
		100	100
	Number of farms	84	143
Change in fertilizer application from 1953 to 1954	Increase	42	45
	Decrease	11	9
	No change	47	46
		100	100
	Number of farms	83	141
Nitrogen application (lbs./acre) 1954	Less than 40	50	52
	40 or more	50	48
		100	100
	Number of farms	12	27
Change in nitrogen application from 1953 to 1954	Increase	100	87
	Decrease	0	0
	No change	0	13
		100	100
	Number of farms	12	15
*Corn planting rate - 1954 (acres/bushel)	5-7	57	65
	8-10	43	35
		100	100
	Number of farms	92	157
Plow down sod for corn 1954	Yes	68	72
	no	18	13
	Partly	14	15
		100	100
	Number of farms	88	159

* Only five farms were outside of planting rate limits used.

rate, and the practice of plowing down sod for corn were compared and tested in a like manner. No significant differences were found in practices between those complying with allotments and those not complying.[8]

These results are not surprising for when land is not, in effect, rationed as is the case of wheat, no powerful motive exists for heavy intensification of fertilizer and use of other improved practices to increase yields. If cross-compliance had been in effect between wheat and corn, quite different results might have been forthcoming.

Corn Production at the County and State Levels

In 1954 for the first time since 1950 acreage allotments were placed in effect on corn. Despite the existence of such controls, corn acreage in Michigan continued the upward trend prevalent since the end of World War II.

Apparently acreage allotments had little effect on farmers decision on how much corn to plant. For the entire state, harvested acreage increased by 7 percent from 1.7 to 1.9 million acres from 1953 to 1954. During this period, state average yields dropped off slightly from 45.5 bushel per acre to 44.0 bushels (Table XVIII). Hence, smaller yields somewhat dampened the effect of increased acreage, however, total production increased by 3 percent from 80.3 million bushels in 1953 to 83.0 million bushels in 1954 (Table XVIII).

Totals from the five counties from which the survey was taken show similar acreage increases, however yields did not decline as

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[8] No differences were significant even at the 10 percent level of Chi-square.

TABLE XVIII

CORN PRODUCTION IN MICHIGAN AND SELECTED COUNTIES, 1953 AND 1954*

County and Area	Harvested Acreage (000 omitted)			Yields Per Acre (Bushels Per Acre)			Total Production (Bushels) (000 omitted)		
	1953	1954	Percent Change	1953	1954	**Percent Change	1953	1954	**Percent Change
1 - Kalamazoo	41	42	2	29.2	40.1	37	1197	1682	40
2 - Gratiot	58	59	2	51.6	49.7	- 4	2990	2913	- 3
2 - Isabella	33	37	12	49.6	43.0	-13	1662	1579	- 5
3 - Sanilac	33	42	27	38.9	41.0	5	1284	1678	31
4 - Livingston	33	34	3	46.7	40.1	-14	1541	1361	-12
Totals above five counties	198	214	8	43.8	43.0	- 2	8674	9213	6
State totals	1764	1887	7	45.5	44.0	- 3	80262	83028	3

* Source: Michigan Agricultural Statistics 1954.
** Minus sign represents a percentage decrease.

much from 1953 to 1954 as did the state average yield. Total production for the five county area therefore increased by 6 percent compared to the 3 percent increase for the entire state.

Yield differences between counties are likely due to variation in soils and weather conditions since no significant differences were found in farming practices on corn between the survey sample areas.

It can be concluded from both the primary and secondary data presented that corn acreage allotments for Michigan in 1954, did not reduce corn production. Both acreage and production increased from 1953 to 1954. It cannot however be concluded that acreage allotments had no effect on corn production for it is entirely possible that corn production would have shown larger increases in Michigan in 1954 if no control measures had been in effect.

It appears that acreage controls on corn will not be successful unless more rigid restrictions are used. Corn marketing quotas or cross-compliance provisions between corn and wheat would probably result in more effective curtailment of production. However, the enactment of such controls may result in offsetting effects by encouraging farmers to more readily adopt new technology, increase fertilizer application, or use other improved practices to increase corn yields.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Summary

Since the early 1920's, with the exception of the War and post-war period, low agricultural income has been the paramount issue in United States agriculture.

During this period agricultural income has been considerably below income levels enjoyed by urban populations. Existence of this condition caused agitation for aid from federal government. Although a variety of plans to raise agricultural income were proposed, those enacted into law were generally designed to raise farm incomes by increasing prices farmers receive for the commodities they sell. These programs mainly emphasizing production adjustment by acreage allotment and augmented at times by marketing quotas, have been applied to the politically designated "basic crops," wheat, corn, cotton, tobacco, peanuts, and rice.

Since some form of federal farm price legislation seems to be a permanent part of United States agriculture, steps should be taken to find out whether or not implementing price programs by such measures as production controls are effective at the farm level and to find out what response can be expected to controls with respect to production practices.

Although few in number, some studies have been made which were concerned with analyzing specific actions and adjustments which farmers

have made to farm price and acreage adjustment programs. Results from these studies are somewhat similar. It appears that production has been reduced when controls are effected, at least for the first several years of operation. In the long run, however, increasing yields have offset, to a large degree, the effectiveness of controls. Improvements in farm technology have contributed to higher yields but it is also reasonable to assume that control programs have had some positive influence in this direction.

With this purpose in mind, slightly over 400 farms in important commercial farming areas of Michigan were visited during the summer of 1954. Farmers were asked questions which would answer, among other things, (1) whether or not they would comply with allotments and quotas, (2) would improved practices be used to increase yields of controlled crops, (3) what would be the pattern of diverted acre use, and (4) whether or not production controls caused cropping problems.

This study has analyzed these answers and presents conclusions that may be drawn from them.

In 1954, for the first time since 1942, marketing quotas and acreage allotments were in effect on the wheat crop. Corn acreage was under allotment in 1954 for the first time since 1950; however, no marketing quotas were announced for corn nor were cross-compliance regulations in effect between corn and wheat. Thus wheat acreage was under stringent controls involving heavy penalties for non-compliance. Controls on corn production were much less restrictive involving only loss of price support eligibility for non-compliance.

The wheat marketing quotas of 1954 specified that farmers would be permitted to market only that quantity of wheat produced on alloted acres. Any amount produced on acres in excess of the allotment would be subject to a penalty of 45 percent of wheat parity as of May 1, 1954. Price support of 90 percent of parity was guaranteed to all those complying with their acreage allotment.

Of the entire sample of 411 Michigan farms, 94 percent reduced wheat acreage from 1953 to 1954. Of the group reducing wheat acreage, 83 percent gave government controls as the reason for doing so. The main analysis on wheat is carried through for this group. Application of the other groups was necessarily limited due to the extremely small sizes; however, when aggregated these groups appeared to be different from those reducing because of government controls. When appropriate they were brought into the analysis for comparison.

Significant differences were found between those reducing wheat acreage because of government controls and those reducing for other reasons with respect to type of farm. Proportionately fewer livestock intensive farms reduced because of government control than those farms classified as crop farms. It appears that livestock farmers have more alternatives in crop production since livestock can be fed a variety of feed crops.

With respect to wheat acreage, it was found that considerably larger wheat acreage would have been planted if there had been no allotment. Sixty-six percent of this group said they would have planted more acreage, 34 percent said they would have planted the same acreage,

and no one reported that they would have planted less acreage if there had been no allotment. In addition, a significantly greater percentage of those planting less than 40 acres increased fertilizer applications on wheat from 1953 to 1954 than did those planting more than 40 acres. Absolute fertilizer levels were about the same for all acreage groups in 1954.

Farmers were also asked whether or not they had used their best land in wheat production. Fifteen percent replied that they had; and the reason most often given for doing so was to increase yields on reduced acres.

When questioned concerning fertilizer use, 35 percent of the farmers said that they had increased levels from the previous year, 6 percent said they had decreased, and the largest group--59 percent--said they had made no changes from the previous year. A significantly greater percentage of those using greater than 90 pounds of fertilizer nutrients per acre increased fertilization from 1953 to 1954 than did those using less than 90 pounds per acre. Of all farmers using fertilizer, 64 percent thought the optimum rate was higher than their present level of usage. No significant relationships were found between levels of fertilizer used and the farm or farmer characteristics.

Of the 305 farmers using fertilizer on wheat, only 82 or 27 percent used nitrogen top dressing. Fifty-nine percent increased nitrogen applications from the previous year, 13 percent decreased, and 28 percent made no change in level from the previous year. Little difference existed between absolute nitrogen level groups with respect to change

in nitrogen inputs from the previous year. When questioned as to whether or not nitrogen use is profitable on wheat, 56 percent of all fertilizer users thought it would pay; however, only 27 percent actually used nitrogen.

With respect to wheat yields, 85 percent of all wheat growers thought that they could increase yields over their present yield rates. As was expected, a greater number in the lower yield groups thought they could increase yields than did those who were producing high yields.

Wheat growers were asked questions to determine if acreage allotments were causing problems with respect to crop sequence or rotations. They were first asked if they had any cropland that was not in sequence and if so the reasons why. Sixty percent replied that they had no cropland out of sequence. Only seven percent said that allotments caused them to substitute other crops for alloted ones, and the remainder attributed land out of sequence to the existence of permanent pastures, poor weather conditions or other reasons. When asked what changes were actually made in sequence because of allotments, 48 percent replied that no changes were necessary, 31 percent said they had to substitute other crops for alloted ones, and the remainder gave a variety of changes that acreage allotments had caused them to make. In expressing their attitude toward making these changes, over 60 percent said they did not like to make these changes or that the changes caused by allotment made rotation planning difficult.

For the entire state of Michigan from 1953 to 1954, harvested acreage of wheat decreased by 32 percent. With per acre yields the

same in both years, total state production also decreased by 32 percent. The aggregate acreage planted for the five counties surveyed, decreased by 35 percent from 1953 to 1954. Because the aggregate average yield for these areas increased by 12 percent for the same period, production decreased by only 27 percent.

Corn surpluses in 1954 had not reached the critical levels found in wheat; however, increasing carryover was great enough to call for production control efforts. Allotments were applicable only to those areas defined as "commercial corn-producing" areas. Applied to these areas, the 1954 allotment for the nation was 46.9 million acres, a 17.4 percent reduction from the 56.8 million acres planted in 1953. The reduction by states, counties, and farms was to vary with the trend in acreage in counties during the past 10 years.

The corn price support announced prior to planting time in 1954 was $1.62 per bushel, about 17 cents per bushel higher than the prevailing price received in 1953 by Michigan farmers. Thus complying farmers could expect something like 15 to 20 cents per bushel more for the corn they sold; farmers feeding all their corn had little to gain by complying.

Of the 411 farms surveyed, 388 or 94 percent produced corn. At first it was intended to use Sanilac county as a control group since there were no allotments in that county in 1954. Significant differences between Sanilac county and the other three areas with respect to characteristics of the farm and farmer necessitated deleting it from the corn analysis. Subsequent sorting and testing reduced corn producing farms to a group which had corn allotments and was

homogenous by farm and farmer characteristics. Thirty-seven percent of this group complied with allotments, while 63 percent did not. Various sorts and tests of significance were made between those complying and those not complying with respect to such factors as type of farm, percent of income from farming, etc., and no significant differences were found.

Likewise, no significant differences were found between these two groups when corn production practices were compared.

Secondary data for the entire state of Michigan shows that from 1953 to 1954 corn acreage and corn production actually increased in Michigan despite the existence of acreage allotments.

It can be tentatively concluded that corn acreage allotments for Michigan in 1954 did not succeed in reducing corn production from 1953 to 1954.

Conclusions

Existence of heavy penalties for non-compliance with wheat marketing quotas in 1954 apparently was a strong enough motive to Michigan farmers to bring about compliance of 94 percent of the farmers producing wheat.

Sixty-six percent of the wheat growers indicated that they would have planted more wheat had there been no allotment assuming price conditions held.

With respect to use of commercial fertilizer, 35 percent of the wheat growers increased applications from 1953 to 1954, however, the majority maintained fertilizer levels at the same rate. Further.

increases in fertilizer use can be expected, assuming favorable price conditions, since 64 percent of those using fertilizer thought that they could profitably apply larger amounts on wheat.

It could tentatively be concluded that farmers were not generally using the best land for wheat in an attempt to increase wheat yields. Only 15 percent of the wheat growers said they used their best land for wheat and only about half of this number said they had done so to increase yield. Production under controls for several years may cause an increase in the use of best land for wheat because it takes several years to change a rotation.

Only 27 percent of fertilizer users also used nitrogen top dressing on wheat. From 1953 to 1954, 59 percent of those using nitrogen increased applications. Increases in the use of nitrogen can be expected since 41 percent of all fertilizer users thought nitrogen application would be profitable on wheat.

Some increases can be expected in wheat yields in line with long run trends. As additional evidence, 85 percent of the wheat growers thought that they could increase yields relative to the yields they were producing.

Cropping sequence or rotation problems caused by allotments did not appear serious since over half of the wheat growers reducing wheat acreage because of government controls said that allotments had not caused them any rotation problems. Over a period of a years, if controls continue, rotation adjustments could become a serious problem.

For the state of Michigan, wheat marketing quotas and acreage allotments were successful in reducing production for 1954.

Judging from past experience it is doubtful if such reductions could be maintained over a period of years since as in the past, gradual adoption of new technology and improved practices would likely increase yields.

Acreage allotments appear to have had little effect on Michigan corn producers in 1954. With only a little over one-third of the states corn growers complying with allotments, production actually increased from 1953 to 1954. Apparently the mild form of control exerted by acreage allotments alone is not sufficient under certain price relationships to induce compliance. At planting time in 1954, the expected market price was 15 to 25 cents per bushel lower than the corn support price announced for that year. This difference was apparently not great enough to constitute a strong incentive to comply with allotments. Perhaps a 40 to 50 cent per bushel differential would have caused quite a different reaction.

This study found that those complying with corn acreage allotments and those not complying did not react differently with respect to farming practices on corn in 1954. This result is consistent and logical in view of the farmers apparent indifference to acreage allotments. Since corn acreage was not in effect rationed, no strong motive was present which would encourage farmers to make greater than normal efforts to gain high yields.

Conclusions drawn from this study must be tentative since the survey data upon which they are based is for the first year of controls only. Similar data for subsequent years are needed to determine the

pattern of farmers responses to production controls under varied conditions and over time.

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APPENDICES

APPENDIX A

EXTRACT OF QUESTIONNAIRE ON WHICH THIS STUDY WAS BASED

The information obtained in this questionnaire is intended to be used only for the purpose of research. All information pertaining to individuals will remain confidential and the names of persons cooperating in this survey will not be made public.

County_____ Township_____

Interviewer	Date	Time Begun	Time Ended	Completed

1. How many total acres are in the farm or farms you are operating in 1954? (7-9) _____ How many did you farm in 1953? (7-9) _____

	1954	1953
2. How many acres of cropland (tillable acres)?	_____	_____
3. How many acres of permanent pasture (not woods)?	_____	_____
4. How many acres of woodlot?	_____	_____
5. How many acres in buildings, etc.?	_____	_____
Total	_____	_____

6. You mentioned you are farming _____ acres of tillable land. How many acres of it are idle and not being used for field crops or pasture in 1954? (13-15) _____ In 1953? (13-15) _____

7. What proportion of your total income is from farming? (16) _____%

8. a. What is your ownership or tenure status on the land you farm? (18)
   1. Own all of land you farm? _____
   2. Own some land and rent additional land? _____
   3. Rent all of land that you farm? _____
   4. Manage farm for someone else as hired manager? _____
   5. Operate land in partnership with someone else? _____
   6. Other_____

b. (IF PART OF LAND OPERATED IS RENTED,) how many acres of land is rented? (19) _____

9. a. How many acres of wheat will you harvest in 1954 _____A.
   b. How many acres of wheat did you harvest in 1953? _____A.
   c. How many acres of wheat did you harvest in 1952? _____A.

   (IF WHEAT ACREAGE WAS REDUCED FROM 1953 to 1954:)

   d. What were the reasons for your reduction in wheat acreage? (34)

   _____

   _____

   e. How many acres of wheat would you have planted in 1953 (for the 1954 harvest) if there had been no acreage allotment (36-38) _____A.

10. a. What was your wheat yield per acre in 1954? (expected)_____bu.(39-40)
    b. What was your wheat yield per acre in 1953? _____bu.
    c. What was your wheat yield per acre in 1952? _____bu.

Now I'd like to ask you about some of your production practices for wheat:

11. On the crop	(41) Use Cert. Seed?	(42-44) Fertilizer lbs./Anal. A.	(45)	(46-48) N. Top Dr. lbs./Anal. A.	(52)	(53-55)
a. Planted in 1953 Harvested 1954						
b. Planted in 1952 Harvested in 1953						
c. Planted in 1951 Harvested in 1952						

12. a. Under the most favorable conditions what is the highest wheat yield you think you can get on your farm? (56-57) _____ bu/A.

    (IN ASKING QUESTION 11b INSERT THE ANALYSIS OF FERTILIZER THAT FARMER HAS MOST RECENTLY USED ON HIS WHEAT.)

    b. What is the greatest amount of _____fertilizer that you can profitably apply on wheat on your farm? (58-60) _____lbs./A.
    c. Do you believe nitrogen top-dressing for wheat would be profitable on your farm? (61)

    Yes_____: How many pounds per acre can you profitably use? (62-64) _____lbs. of N.

    No _____.

    D.K._____.

13. a. Did you use your best field or best portion of the field for wheat this year? (65)

Yes _____; why did you choose the best land for wheat? (66) _____

_____

14. a. How many acres of corn did you plant in 1954? (31-33) _____A. How much will you harvest for grain? (57-59) _____A. For silage (60-62) _____A.

15. a. Did you receive an acreage allotment for corn this year? (34)

Yes _____; What is your corn allotment? _____
No _____.
D.K._____.

b. How many acres of corn would you have planted this year if there were no acreage allotments on corn? (36-28)_____A. For grain? (63-65) _____A. For silage? (66-68)_____A.

16. a. Why did or didn't you comply with your corn allotment? (39-40)

_____

_____

_____

Now I'd like to ask you about some of your production practices for corn:

17.	Plant. rate /A. (45)	Fertilizer lbs./Anal. A. (46-48)	Side Dr. lbs./ Anal. A. (49-51)	(52)	(53-55)	Plow down Alf. or Clov.sod (56)
a. Planted in '54						
b. Planted in '53						
c. Planted in '52						

18. a. Do you usually follow a regular sequence of crops in a field? (31)

Yes _____; What is your crop sequence? (32-34)_____

_____

No _____
D.K._____

19. a. Do you have any of your cropland that is not in your regular sequence? (35)

Yes_____; Why?_____

_____

No _____

D.K._____

20. a. Have the acreage allotments on wheat and corn caused you to make changes in your crop sequence? (36)

Yes _____; What changes? (37-38) _____

_____

No _____

21. a. Leaving aside the problem of crop sequence or rotation have the acreage allotments caused you any other problems in carrying out your cropping program? (41)

Yes _____; What are these problems? (42-43) _____

_____

_____

Do you have a problem of what to do with parts of fields? (42)

Yes _____; How do you feel about them? (43) _____

_____

_____

No _____.

APPENDIX B

TESTS OF SIGNIFICANCE USED IN THIS STUDY

Chi-square tests of significance were used throughout this study to determine whether or not various sets of attributes were related or independent. A simple 2 x 2 table is used as an example to illustrate the method of calculation.

Calculation of Chi-Square In a 2 x 2 Table Under
The Hypothesis of Independence

Sample Size -- 386 Farms

Livestock Intensity		Reason for Reducing Wheat Acreage: Government Control	Reason for Reducing Wheat Acreage: Other Reasons	Total
Less than five animal units	Observed	104	8	112
	Expected	92.8	19.2	
	Deviation	11.2	-11.2	
More than five animal units	Observed	216	58	274
	Expected	227.2	46.8	
	Deviation	-11.2	11.2	
Total		320	66	386

Expected numbers:

$$(320)(112)/386 = 92.8$$
$$(320)(274)/386 = 227.2$$
$$(66)(112)/386 = 19.2$$
$$(66)(274)/386 = 46.8$$
$$\text{Total} \quad 386.0$$

$$\text{Chi-square}^{*} = \frac{(\text{Observed frequency} - \text{expected frequency})^2}{\text{expected frequency}}$$

$$\frac{(11.2)^2}{92.8} + \frac{(-11.2)^2}{19.2} + \frac{(-11.2)^2}{227.2} + \frac{(11.2)^2}{46.8} = 11.11$$

Degrees of freedom are calculated by the formula (R-1)(C-1), where R equals the number of rows and C equals the number of columns in the table.

* For a detailed explanation of chi-square tests of significance, see George W. Snedecor, Statistical Methods, Iowa State College Press, Ames, Iowa, Fourth Edition 1950, Chapter 9.

For this table, degrees of freedom equal

$$(2-1)\ (2-1) = 1.$$

Comparison of the calculated chi-square 11.11, degrees of freedom = 1, with chi-square tables found in most statistical books, shows that less than one percent of random samples from the hypothetical population have values larger than 6.63. The hypothesis of independence can, therefore, be rejected. It then seems reasonable to conclude that those having less than five animal units, reduced acreage because of government control proportionately more than did those having more than five animal units.

APPENDIX C

CONVERSION RATES FOR LIVESTOCK TO STANDARD ANIMAL UNITS

The animal units were converted using a cow as a standard unit. It is based primarily on manure produced in one year per 1,000 pounds of live weight as follows:*

	Head of Animals Equal To One Animal Unit	Tons of Manure Produced In One Year Per 1,000 Pounds of Live Weight
Cow	1	12.0
Steer	1	8.5
Horse	1	8.0
Sheep	8	6.0
Hogs	6	16.0
Chickens	250	4.5

* Illinois Agricultural Handbook, 1949, p. 206.

When reference is made to livestock intensity, the following criteria are applicable:

Livestock intensive -- less than 10 acres per animal unit.

Livestock extensive -- 10 or more acres per animal unit.

APPENDIX D

FERTILIZER CONVERSION METHOD

Use of actual pounds per acre of fertilizer in representing fertilizer application levels does not give a completely accurate measure of fertilization. Since the analysis of fertilizer used by farmers varies greatly, total pounds of nutrients per acre is a more accurate measure. Fertilizer data in the survey contains pounds per acre of fertilizer used and the analysis. This amount was then converted to total pounds of nitrogen, available phosphoric acid, and potash applied per acre. For example, if a farmer applied 200 pounds of 4-16-16 analysis fertilizer on wheat the total pounds of plant nutrients, (N, P, and K), applied per acre would equal 2 (4 + 16 + 16) = 72 pounds.