An Analysis of Alternative Supply Controls In Grade A Milk Markets

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Robert D. Boynton, Purdue University; Glynn McBride, Agricultural Economics

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TECHNICAL Information

An Analysis of Alternative Supply Controls In Grade A Milk Markets

By Robert D. Boynton and Glynn McBride[1]

Introduction

A recent study was made of the vertical coordination process between dairy cooperatives and proprietary handlers. A basic objective of the study related to the performance of the dairy subsector as affected by the activities and relationships of the dairy cooperatives and proprietary handlers.

One of the findings of the study was that surplus milk production was a recurring and almost chronic problem. Such problems tend to be worsened by pricing and pooling provisions of most marketing orders. The price support program may also contribute to the surplus problem. In addition, cooperatives seem unable to improve quantity coordination at the farm level.

This report stems from the findings of the study. Some of the basic factors with which the problem is associated will be examined. Finally, a program which might be established under the existing framework will be advanced.

In the U.S. dairy subsector, government directly sets minimum producer prices (Grade A), supports manufacturing grade milk prices, and establishes rules for the transfer of milk between handlers. Government's role began in response to fluctuating supplies, low dairy farmer income, inequities between dairy farmers, and differences in power between farmers and processors. Government sought to ensure that dairy farmers had adequate income, some market security, and received fair and equitable treatment from processors. They also endeavored to guarantee consumers an adequate supply of fresh, wholesome milk. Their programs have been generally successful. This success, however, may have contributed to the problem of overproduction. There is general agreement that the objective to protect consumers from shortages and improve dairy farmers' welfare through legislation was appropriate but to the extent that such legislation may aggravate the surplus problem, ways to hold such a contribution to a minimum should be sought. With some of the production discipline gone from traditional market forces, devices for conveying signals to producers need to be carefully designed to minimize surpluses. The challenge for government in designing and operating their dairy programs is to provide signals to producers which are helpful in bringing forth supplies in proper economic relationships to demand.

The supply problem in the U.S. dairy subsector can be easily documented (Table 1). When government expenditures on the price support program escalate as in 1976-77, concern among policymakers and the industry grows. In the two years, the cost to the treasury was almost $1.2 billion to support the dairy surplus. In addition, costs to private processors in fluctuations in plant capacity utilization, private storage costs, product deterioration, and the like can be significant. In times of surplus, raw milk can be wasted if facilities cannot be found for its manufacture. A large transportation bill often accompanies such a condition. All subsector participants, from farmers to consumers to taxpayers are affected. When stockpiles and government expenditures shrink, attention is directed away from the problem, but the costs of the instability of supply in relation to demand remain. The potential savings from improved coordination justify significant efforts in this area.[2]

Government's price support and marketing order programs along with the action of dairy farmer cooperatives whose growth and existence is affected by government policy all have an impact on supply-demand coordination. This report discusses the nature of these impacts and recommends a change in federal order pricing provisions. It will be argued that producers' response to federal order prices offers no effective production control as long as the price they believe they receive on their last unit is at least equal to variable unit costs (and possibly less). Furthermore, despite gains in market power by some cooperatives, they have no effective way of affecting their members' production level. The price support program offers the most direct and effective

[1]Assistant Professor of Agricultural Economics, Purdue University; Professor, Agricultural Economics Department, Michigan State University. The research upon which this report is based was carried out at Michigan State University with the support of the Agricultural Economics Department and the Michigan Agricultural Experiment Station.

[2]More detailed background information on the supply control situation can be found in the original report of this research [1].

Table 1. Government stockpiles, purchases, and the cost of the dairy price support program, 1965-77.

	Govt. Stocks, Milk Equiv. (million lbs.)	Govt. Removals from Commercial Market, Milk Equiv. (million lbs.)	Solids Content of Removals (as % of marketings) Milkfat	Solids-Not-Fat	Net. Govern. Expend. under Price Support Program, FY Beginning (million $)
1965	973	2,900	2.6	8.7	26.1
1966	538	2,700	2.4	4.4	283.9
1967	46	7,000	6.2	7.0	357.1
1968	3,994	4,800	4.4	6.0	268.8
1969	2,724	4,400	4.1	3.9	168.6
1970	1,477	7,200	6.6	4.9	315.4
1971	2,098	6,600	5.9	5.0	267.0
1972	1,539	5,000	4.5	2.8	135.8
1973	2,005	700	.7	.6	31.4
1974	476	2,400	2.2	4.3	485.8
1975	310	900	.9	2.9	69.6
1976	124	3,400	2.9	2.1	709.8
1977	410	3,200	2.9	3.3	446.4

Source: "Dairy Situation," USDA-ESCS, DS-372 and DS-373, October and December 1978.

production discipline but its objective of maintaining producer incomes often operates at cross purposes with the objectives of coordinating supply with demand.

The Impact of Marketing Orders

Federal and state marketing orders affect Grade A milk price as a source of resource allocation information. Classified pricing systems existing in all federal and state milk marketing orders, price milk on the basis of its value in various product uses. Manufactured product uses to which surplus Grade A milk is diverted return farmers the lowest milk prices. Despite this, in most orders[3] the farmer sees and responds to a blend price which masks any marginal revenue information contained in the classified pricing system. This blended price represents a weighting of the value of his product uses and appears as a constant average revenue unaffected by output levels. He is insulated from a true marginal revenue signal.

The effect of federal and state milk marketing orders on resource allocation signals received by farmers is not limited to the blunting of marginal revenue information contained in classified prices. Federal and state marketing orders also reduce individual producer response to market prices by creating pools for the sharing of high value Class I sales among producers.

While this fosters equity among producers, reduces proprietary handler discretion control over usage allocations, and promotes exchange efficiency, it does protect the producer from market conditions and isolates him from the demand for his individual output. Under marketwide pooling (which is the most prevalent) the proceeds from the sale of all dairy products in the entire order area are pooled. These pooled funds are allocated to individual producers based on some measure of overall market sales of products in each price category.[4] It does not matter to the farmer how his output was utilized by the buyer. Only the overall marketwide utilization by product classes affects him. The production discipline imposed by the needs of the individual processor for the individual producer's milk is lost.

While there are other factors to be discussed which also contribute to the lack of individual producer incentive for concern with the quantities produced, it can be seen that the order system has created a common property resource of most U.S. farm level milk markets [3]. The effect of this is to create individual incentives to overuse (overproduce) the common property resource (milk sales). The socially optimum level is exceeded as individual producers attempt to maximize their own profit or otherwise satisfy some criteria function (such as achieving optimal cash flow patterns or utilizing family labor).

The Impact of Cooperatives

Cooperatives may have worsened the production control problem by guaranteeing a market for all member milk.[5]

Cooperative principles embrace the right of farmers to a market for their product. The management of a dairy cooperative is loathe to suggest production cutbacks and won't refuse members' production. Cooperative managers are often unable to influence member production despite management's recognition of the effect of surpluses on prices, disposal costs, and the viability of the price support program.

There is evidence that many cooperatives do not attempt to influence member production levels. Most efforts made have little more than informational effect, although a small percentage of cooperatives discourage or refuse new memberships.

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[3]The federal order machinery in seven markets sets up a base-excess payment plan which has the effect of intensifying price signals [2]. The excess price communicates marginal revenue information to producers more clearly than does the payment plan in the other order plans.

[4]In federal orders with the base-excess plan, the allocation procedure is more complex than described here but the effect on the quality of price signals reaching producers in such an order and ultimately on production discipline is identical to the other type of order.

[5]Proprietary handlers whose role as first handler is being reduced as cooperatives grow, ostensibly create some production discipline by retaining their right to accept only a specified quantity of farmer milk. Evidence, however, suggests that this control is seldom realized. Today proprietary handlers are reluctant to refuse milk or drop an independent producer because of the stronger competition provided by cooperatives. Proprietary handlers know that if they take these actions, previously independent producers will be encouraged to join cooperatives, thereby decreasing the availability of non-cooperative supplies and strengthening cooperatives' control of the milk supply.

Often no individual incentive exists for the individual cooperative member to cut back. It may benefit the cooperative, the market or the individual member himself in the long run but due to the common property nature of production it cannot be argued that any individual producer should cut back output for reasons based on conditions outside the producer's farm. Cooperatives can only pass on market information to keep the members informed. If more aware of market conditions, members may make production decisions more consistent with the overall supply-demand environment.

The Impact of the Price Support Program

The purpose of the dairy price support program is to maintain an acceptable level of farm income and ensure an adequate supply of milk by guaranteeing a minimum farm level price for manufacturing grade milk. This is accomplished through the Commodity Credit Corporation which stands ready to purchase manufactured dairy products at pre-announced prices. These product prices translate into a minimum farm level price for milk of manufacturing quality (Grade B). Due to interrelationships between this program and the pricing provisions of the marketing order program for Grade A milk, the price support program places a floor under Grade A farm-level milk prices as well.

Price support levels affect milk production levels, and since support level decisions are both economic and political in nature, they cannot always be counted on to relay timely production signals to farmers. Since low farm income and surplus production can, and often do occur together, the operation of the price support system may contribute to the supply-demand situation. Although this does not always occur, it does suggest that price support levels cannot be expected to consistently provide appropriate production control signals.

The Recommended Modification to the Marketing Order Pricing Mechanism

Previous sections of this report suggest that timely and precise production adjustment signals are typically absent under the current milk marketing structure. There appear to be significant benefits gained from improving farm-level supply decisions. While many alternative solutions could be offered, most represent non-marginal changes which create at least as many undesirable performance effects as those they seek to redress.

Suggestions to eliminate classified pricing fail to recognize that price discrimination would continue but the distributional impacts would be reorganized—perhaps in less preferred ways. Opponents of marketing orders foresee a return to a perfectly competitive environment for producer-proprietary handler exchange if marketing orders for milk were abolished. While some conditions which gave rise to marketing orders have changed, some marketing discipline appears to be necessary to ensure adequate supplies, maintain equity between producers, facilitate exchange and prevent disruptive pricing practices.

A modification in the marketing order pricing system is needed to allow marginal revenue information to reach producers. This should reduce the size and frequency of surpluses. But that may not be enough. The content of that marginal revenue information also needs to be considered. The lowest classified price is the marginal revenue created by the current marketing order system. However, as already suggested, the price support program can maintain the lowest class price at a level sufficient to call forth surplus Grade A production. There may be occasions when the lowest class price (unsupported) calls forth surplus production in some markets. A producer payment plan should convey price signals to producers which call forth Grade A production needed for Class I and reserve[6] demands but discourage surplus production. The recommended plan provides a means to reduce the tendency of the lowest class price to stimulate surplus production.

As such modifications bring the system closer to the supply-demand balance point, they increase the probability of creating a shortage. Since the price support program has demonstrated its ability to quickly generate added supplies, a shortage condition could be rapidly corrected. In addition, the system modifications to be proposed here themselves offer short term, rapid, fine-tuning features capable of alleviating deficit problems.

Preliminary to a discussion of the recommended plan, a presentation of the two other common federal marketing order producer payment plans is in order. These are the blend price plan with no production base component and the base-excess plan with a production base scheme.

Figure 1 shows the operation of the blend price plan from the viewpoint of the individual producer. This is by far the most common type found in federal orders. The blend price or average revenue line represents short run, perfectly elastic demand. The producer's average and marginal cost curves are shown. The blend price (demand) line is calculated using the following price and utilization data for the market in which the producer operates. Assume that this market order defines only two classes of Grade A milk, I and II.[7]

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[6]Reserve demand is the demand for Grade A milk required to ensure that daily Class I demand is always met despite seasonal production swings, demand variation within the week and logistical problems.

[7]Some federal and state orders define more than two classes. The proposed plan would operate in the same basic manner in these markets.

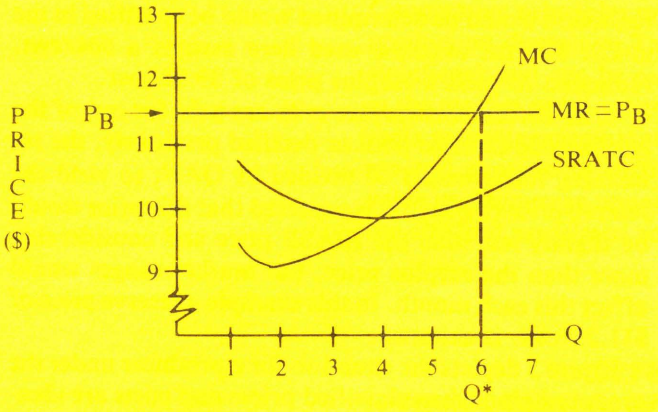

Figure 1. Blend price plan.

P_I = Class I price = \$12/cwt.
P_{II} = Class II price = \$10/cwt.
Class I utilization = 75 percent
Class II utilization = 25 percent

The blend price (P_B) would be \$11.50 (.75 * \$12 + .25 * \$10) as shown in Figure 1. The producer would produce where the *perceived* marginal revenue equals marginal cost—six units of milk in this example.

Figure 2 represents the situation faced by a producer in a federal order with a base-excess plan. The annual determination of a producer's base allotment under this plan sets a daily quantity for which the maximum producer price (the base price) is paid. All production above this base amount receives the lowest class price, called the excess price.

Individual producer's base production is based on his production level during a particular time period. The base quantity is known in advance of production. The calculation of the base price (P_{BASE}) and excess price (P_{EX}) is more difficult to explain than the blend price.

The marketwide revenues collected from all buyers paying the classified prices are allocated in turn to the excess and base milk. First, all excess milk is paid the lowest class price. Next, a detailed procedure establishes the base price which is typically less than the Class I price (depending on the level of Class I utilization in the market that month). Using the classified prices given before, P_{EX} = \$10 and assume that P_{BASE} = \$11.75.

Assume that the hypothetical producer has a production base of 4½ units. The existence of this base and the associated two price system produces a discontinuous marginal revenue curve as shown in Figure 2. For the first 4½ units sold the farmer receives the base price but all production over this receives the lower price. With identical cost curves, this figure suggests that the farmer would produce 4½ units.

The recommended producer payment plan is similar to the base-excess plan in use in seven federal order markets, but it has three major differences. It creates two separate production bases with three prices instead of one base with two prices. This is designed to convey more precise marginal revenue signals as well as to explicitly recognize the difference between reserve and surplus quantities. The second major difference involves the determination of base allotments. Under the recommended plan the two bases are computed separately for each month rather than being identical for every month. This change has the effect of creating a plan stressing year-round production control rather than seasonal adjustments. The other difference is perhaps the most important in facilitating quantity coordination. Provision is made in the proposed payment plan to pay a price for surplus milk *below* the lowest class price when the lowest class price would encourage surplus production.

The details of the recommended plan are presented below. A Class I base (IBASE) would allocate Class I sales among all qualified producers under the market order while a reserve base (RESBASE) would allocate rights to the reserve quantity. The details of base determination could be handled in several ways depending on the characteristics of the individual market, however, one possible method will be presented here to help explain the plan.

A Grade A producer selling milk in month i would receive two bases applicable for that same month one year hence. It would take one year for new producers to receive payment under this proposed plan. In the interim they could receive a specially computed blend-type price as is currently done under the base-excess plan. To form bases for month i + 12, a producer j selling Grade A milk in month i would have a share computed as

$$SHARE^j_{i+12} = QAA^j_i / QAA_i$$

where QAA^j_i is defined as actual Grade A production in month i by producer j and QAA_i is total marketwide Grade A production in the same month. Actual Class I

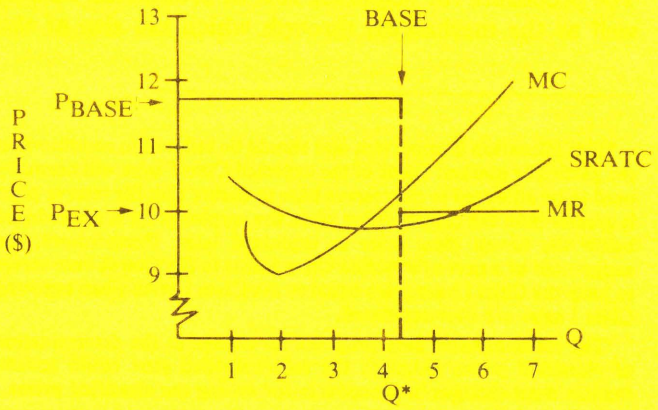

Figure 2. Base-excess plan.

sales in the market in month i (QCI_i) could be used as an estimate of sales for the same month one year hence or a different estimate could be made by the Market Administrator using procedures provided in the order. The chosen quantity of expected Class I sales in month $i+12$ ($EQCI_{i+12}$) could then be allocated between the Class I and reserve bases.[8] Assume 80 percent of $EQCI_{i+12}$ is allocated to IBASE, then producer j's IBASE in month $i+12$ ($IBASE^j_{i+12}$) would be calculated as $SHARE^j_{i+12} * (EQCI_{i+12} * .80)$ and disclosed to him 10-11 months before it becomes effective. The Class I price, when determined for month $i+12$ by the present scheme,[9] would become the IBASE price (P_{IBASE}).[10] In the example carried through this section, P_{IBASE} would equal $12/cwt.

The quantity, $\overline{QA}_i$, the expected necessary quantity of Grade A milk in a designated market in month i to meet Class I demand *and* necessary reserves, would be calculated each month by the Market Administrator according to automatic procedures specified in the order. It would be announced 6-12 months in advance. It would be based on historical usage data and anticipated market conditions. It might best be determined by a carefully designed formula.

An expected quantity of milk for reserve purposes (QAN) will be calculated next as $\overline{QA}_i - QCI_i$ where QCI was actual Class I sales. $QAN_i * SHARE^j_{i+12}$ gives producer j's reserve base (REBASE) for month $i+12$ but again known to the producer several months in advance.

Any milk produced by farmer j in excess of IBASE + RESBASE would be surplus milk. The price paid for surplus milk would be the lowest class price in that order less a per hundredweight amount designed to reduce the surplus price below average cost of production. The amount by which the lowest class price would be reduced should be large enough to discourage surplus production. It may be necessary in some cases to set the surplus price below average variable cost in that order. The procedure for acquiring cost of production data as well as the mechanism through which the size of the reduction would be determined would be specified in the order. For the example used here assume a 50¢/cwt. reduction to yield a surplus price of $9.50/cwt.

After IBASE and surplus milk are paid for out of the marketwide revenue pool as detailed previously, the remaining funds would be divided by QAN_i to yield the reserve price (P_{RES}). It is expected that this price would be slightly less than the IBASE price and considerably more than the surplus price, but market usages would affect this each month. In this example a reserve price of $11.25/cwt. is assumed.

Figure 3 depicts the situation for a producer under the proposed plan when classified prices and costs are identical to those used in the two other plans. In the proposed plan, assume the producer has an IBASE of four units and a RESBASE of one unit. A quantity of five units would be produced which, in this example, is intermediate between the case presented in Figures 1 and 2.

With the proposed plan the the producer has a marginal revenue function composed of three linear segments. This should improve the information carried by the pricing system over either of the two other plans. Its effectiveness will be improved by the inclusion of the three prices and the producers' volume in each category on producer statements from proprietary handlers or cooperatives. In addition, by allowing a surplus price, when necessary, below the lowest class price, the capability to discourage surplus production is enhanced over either of the other plans.

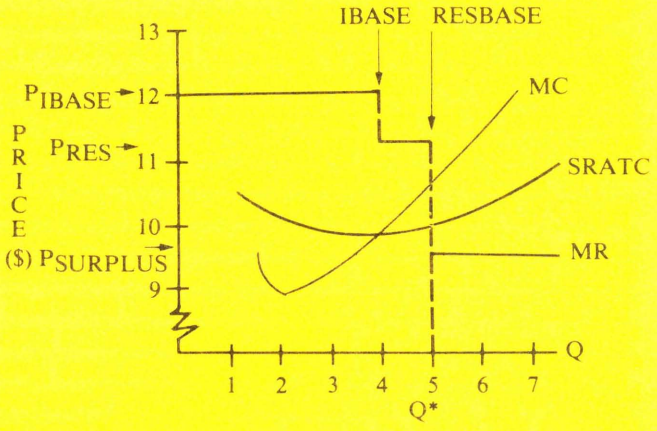

Figure 3. Proposed plan.

SUMMARY

The current milk marketing system has a tendency to stimulate surplus Grade A production. Marketing orders create a common property resource of Grade A markets while the price support program cannot be relied on to transmit supply control signals consistently.

[8]This allocation is important and should be tailored to conditions in the particular market. Some of the expected Class I sales will normally need to be allocated to the reserve base to ensure that the reserve price is greater than the surplus price when the surplus price is not reduced below the lowest class price as explained later. Furthermore, the assignment of a part of expected Class I sales to the reserve base serves to keep the Class I base price equal to the Class I price when expected Class I sales are over-estimated.

[9]The recommended plan proposes no change in the determination of classified prices although the recommended plan could accommodate most changes in procedures for setting the classified prices.

[10]Unless the actual Class I usage in month $i+12$ was less than total $IBASE_{i+12}$, in which case P_{IBASE} would be less than the Class I price by virtue of the Class II milk needed to fill out the IBASE quantity.

Cooperative principles preclude cooperative exertion of production discipline. The costs of overproduction are significant and can be reduced by minor modifications in the market order program. A payment plan that presents accurate marginal revenue information to producers and provides a sufficiently low marginal revenue value to discourage unneeded production should reduce the size and associated costs of the Grade A surplus.

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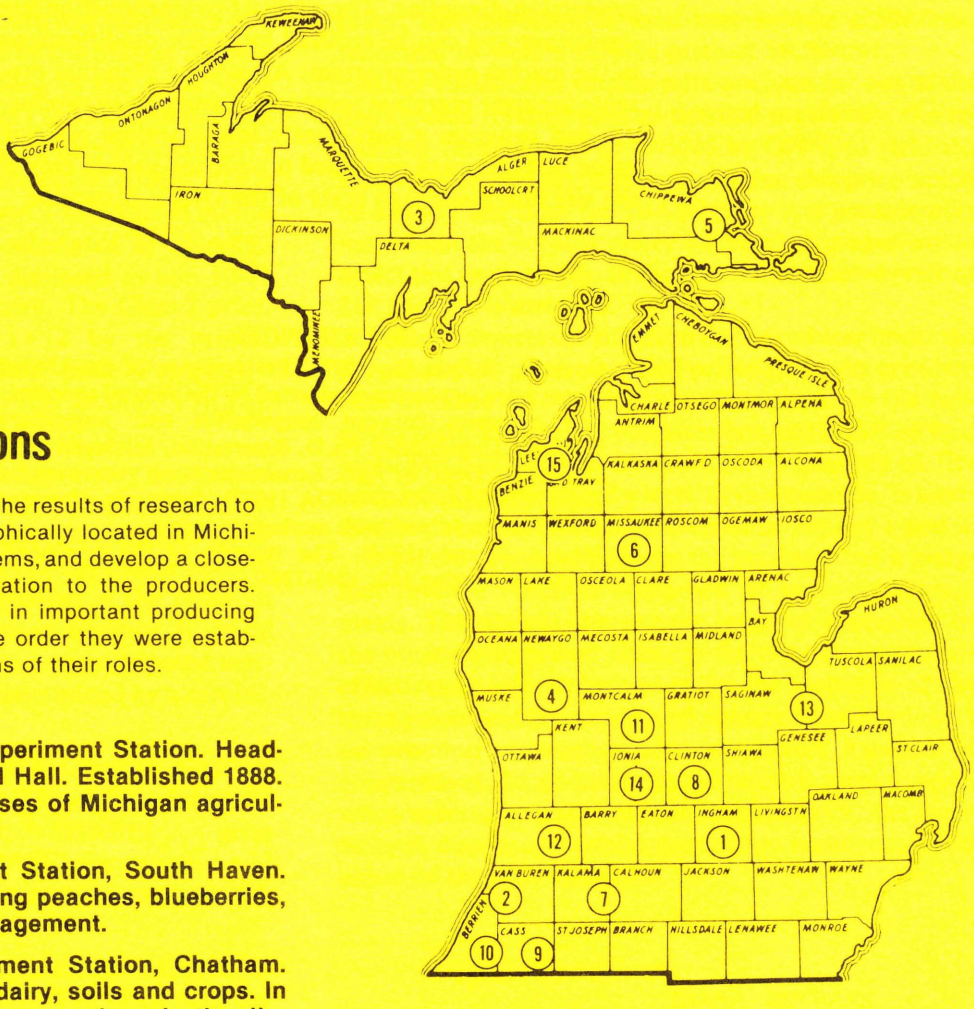

Outlying Field Research Stations

These research units bring the results of research to the users. They are geographically located in Michigan to help solve local problems, and develop a closeness of science and education to the producers. These 15 units are located in important producing areas, and are listed in the order they were established with brief descriptions of their roles.

(1) **Michigan Agricultural Experiment Station. Headquarters, 101 Agricultural Hall. Established 1888. Research work in all phases of Michigan agriculture and related fields.**

(2) **South Haven Experiment Station, South Haven. Established 1890. Breeding peaches, blueberries, apricots. Small fruit management.**

(3) **Upper Peninsula Experiment Station, Chatham. Established 1907. Beef, dairy, soils and crops. In addition to the station proper, there is the Jim Wells Forest.**

(4) **Graham Horticultural Experiment Station, Grand Rapids. Established 1919. Varieties, orchard soil management, spray methods.**

(5) **Dunbar Forest Experiment Station, Sault Ste. Marie. Established 1925. Forest management.**

(6) **Lake City Experiment Station, Lake City. Established 1928. Breeding, feeding and management of beef cattle and fish pond production studies.**

(7) **W. K. Kellogg Biological Station Complex, Hickory Corners. Established 1928. Natural and managed systems: agricultural production, forestry and wildlife resources. Research, academic and public service programs.**

(8) **Muck Soils Research Farm, Laingsburg. Plots established 1941. Crop production practices on organic soils.**

(9) **Fred Russ Forest, Cassopolis. Established 1942. Hardwood forest management.**

(10) **Sodus Horticultural Experiment Station, Sodus. Established 1954. Production of small fruit and vegetable crops. (land leased)**

(11) **Montcalm Experimental Farm, Entrican. Established 1966. Research on crops for processing, with special emphasis on potatoes. (land leased)**

(12) **Trevor Nichols Research Complex, Fennville. Established 1967. Studies related to fruit crop production with emphasis on pesticides research.**

(13) **Saginaw Valley Bean and Sugar Beet Research Farm, Saginaw. Established 1971, the farm is owned by the beet and bean industries and leased to MSU. Studies related to production of sugar beets and dry edible beans in rotation programs.**

(14) **Clarksville Horticultural Experiment Station, Clarksville. Purchased 1974. Plots established 1978. Research on all types of tree fruits, small fruits, vegetable crops and ornamental plants.**

(15) **Northwest Michigan Horticultural Research Station, Traverse City. Established 1979. Research and education for cherry and other horticultural crops in northwest Michigan.**

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