QUANTIFYING MANAGEMENT AS A PRODUCTION COST

by

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ABSTRACT

Congress has directed that cost of production figures be
established for selected agricultural commodities. Pricing of
management is required in these cost estimates. Five alternative
calculations for estimating management costs are presented to
illustrate the wide variation in cost of production that can
result from only this one item.

Key words: Management, Cost of Production

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Quantifying Management as a Production Cost

I. Introduction and Objectives

The Agriculture and Consumer Protection Act of 1973 established target prices for wheat, feed grains, and cotton which were to be adjusted annually to reflect changes in the index of prices paid by farmers for "production items, interest, taxes, and wage rates." This act also directed the Secretary of Agriculture to conduct an annual cost of production study for these specified crops and dairy commodities to establish a current national weighted average cost of production for each commodity. All typical variable costs, fixed costs, and a return to management for a farm of the size that requires one man to farm on a full time basis were to be included in the cost of production study.

Use of average production cost estimates to set target prices is a controversial issue. Ron Krenz has suggested some of the problems associated with setting target prices based on average total cost of production.[1] For example, he points out that a target price based on production cost may not be an equilibrium price and may lead to excess commodity supply. Another concern is the built-in inflationary impact. If market price is set to cover all costs including non-purchased inputs; e.g. operator's labor, management and currently owned land, the farmer may interpret profit as the difference between target price and cash costs and use this 'profit' to bid up prices of purchased inputs, e.g. machinery and additional land. Such an interpretation by farmers of the target price policy could accelerate the upward trend in cost of production, increase target prices, and have adverse effects upon our balance of payments in foreign trade.

These problems notwithstanding, congress specified in the 1973 act that target prices of selected commodities would be adjusted on the basis of average cost of production. In furtherance of the act, the Senate Committee on Agriculture and Forestry requested data on current and projected production costs from each of the State Experiment Stations in late 1974. The diversity of budget formats submitted by the various states indicates that there is no consensus as to the input components of "the" costs of production.[2] A review of other recent production cost literature confirmed this situation. Some standardization of variable cost categories exists, but there is little consistency in defining, quantifying, and pricing fixed costs. The specification of owner-operator management as a cost is particularly inconsistent.

There is, in fact, no general agreement among economists that management is a production input. Glenn Johnson, for instance, argues that management is a controller of production inputs and not a production input per se.[3] Westermarck takes the opposing view that management is a quantifiable production cost.[4] The purpose of this paper is not to argue either side of this issue. Rather, the position taken in this paper is to follow the dictate specified by Congress in the Agriculture & Consumer Protection Act of 1973 that a "...return for management comparable to the normal management fees charged by other comparable industries" be included in the estimated average total cost of production. Thus, the objectives of this paper are (1) to point out some of the problems incurred when quantifying and pricing

management, (2) to make representative total production cost estimates

using five alternative methods of management cost determination, and

(3) to discuss target price policy implications of these five methods.

II. Background

Glenn Johnson and other researchers involved in the Interstate

Managerial Survey divide management into the six interdependent functions:

problem definition, observation, analysis, decision-making, action, and

acceptance of economic responsibility.[5] Management might then be

defined as the process of controlling and directing resource use for

the attainment of specified goals.

Quantification of management time at the farm level is difficult

because there is much overlap between a farmer's management and non-

management time. For example, a farmer may ponder where to obtain the

best buy on fertilizer, a management activity, while driving his tractor,

a non-managment activity. Even where management activities are

clearly separated from non-management activities, quantification is

difficult due to a farmer's spending very short periods of time on

individual activities. For example, a farmer might write a short

letter to the bank, oil a rusty gate hinge, answer a phone call from

his marketing agent, and unload a pickup truck full of hybrid seed,

all in the space of less than an hour. Thus it would be difficult

for an observer to record a farmer's management and non-management time,

and it is highly unlikely that a farmer could accurately record these

times without disturbing his normal busy routine and thus biasing

his results.

Pricing of management is also difficult as the market price for

owner-operator management time is not well established. This situation

arises because management time for the owner-operator is not a purchased

input such as fertilizer or diesel fuel. Using the opportunity cost

approach, this time has been priced on the high side at the rate

charged by private management advisors and on the low side at the

wage rate for hired farm workers. There is little agreement as to

the true opportunity cost for the average owner-operator.

In previous studies where management costs have been determined,

five alternative methods have been employed (1) management as a

residual claimant, (2) management fee as a percent of gross income,

(3) management fee as a flat rate per acre, (4) management as a

percent of all other costs and (5) management prices as specialized labor.

The residual claimant method (1) determines management cost by

subtracting the total of all other variable and fixed costs, including

operator's labor, from gross income.[6] Using this method, management

costs typically exhibit large annual variations due to wide gross income

variations with relatively constant costs. Method (2) calculates

management fee as a percent of gross income. The management charge

is determined by multiplying gross income by a fixed percentage rate.

This method yields management costs which vary directly with gross

income. A flat rate per acre may also be specified as the management

fee, as in method (3). This procedure is used by some commercial farm

management firms. On a per acre basis this method exhibits less

annual fluctuation than either methods (1) or (2); method (4) calculates

management fee by multiplying the total of all other variable and fixed

costs by a fixed percentage rate (about 12% in 1959).[9] Because of the

stability of costs relative to gross income, management cost estimates

from this method typically show less annual variation than estimates

from methods which treat management cost as a function of gross income.

Method (5) calculates management cost by multiplying estimated management hours by a specialized labor wage rate. [10] This method depends heavily on empirical estimates of farmer-operator's management time and on the determination of a reasonable wage rate to assign to this time. Two previous studies found that 26% (or 780 hours of a 3000 hour working year) of an owner-operator's working time is spent on management of an average size farm. [11]

III. Methods of Study.

A representative farm was initially defined to provide a structure within which to make total cost of production estimates. Of primary interest is the variance in the estimated total cost of production due to five alternative methods of calculating a management cost.

Total production costs for a 475 acre Michigan corn farm were estimated for the period 1960-1974. Variable cost estimates, excluding management, were obtained from 1975 Michigan State University enterprise budgets which were then indexed back to 1960. Wage rates for Michigan were from Farm Labor. Fixed cost estimates for property tax and land charge were based on average annual land values estimated by the Michigan Agriucltural Extension Service. Property tax rates were obtained from the Michigan Tax Commission, and interest rates for estimating land charges were the annual averages of those established by the Federal Land Bank. Annual rate charges for depreciation and interest on machinery were estimated at 10% and the average small business loan percentage rate, respectively. Annual fixed cost for machinery was derived by multiplying this percentile times the average investment in machinery reported in the Michigan State University TELFARM records accounting project.

After these variable and fixed costs were determined for the 1960-1974 period, management costs were calculated using the five alternative methods outlined above. Specifically the formulas used for each method were:

(1) $M_t = \left[TR_t - (TC_t \text{ excluding operator's management})\right] /Y_t$

(2) $M_t = (TR_t \times 0.07)/Y_t$

(3) $M_t = FR_t/Y_t$

(4) $M_t = TC_t \text{ (excluding operator's management)} \times 0.12/Y_t$

(5) $M_t = \dfrac{780 \text{ hours management time per year}}{475 \text{ acres} \times Y_t} \times SL_t$

where M_t = management cost per bushel corn in year t.

TR_t = (Price per bushel in year t X Average yield in year t)

= Total Revenue/acre

TC_t = Variable costs per acre in year t + land cost per acre in year t + property tax per acre in year t + depreciation cost per acre in year t + operator's labor cost per acre in year t.

FR_t = flat rate per acre in year t

Y_t = corn yield in bushels per acre in year t

SL_t = supervisor labor wage in year t

Once M_t was determined for each method, total production cost per bushel, (PC_t), was calculated by:

$PC_t = M_t + (TC_t/Y_t)$

Target prices per bushel in year t, (TP_t), were established at 100% at production cost for each method:

$TP_t = PC_t$

Aggregate annual support program cost, (SC_t), using each method was also estimated for Michigan in years where production cost was above market price:

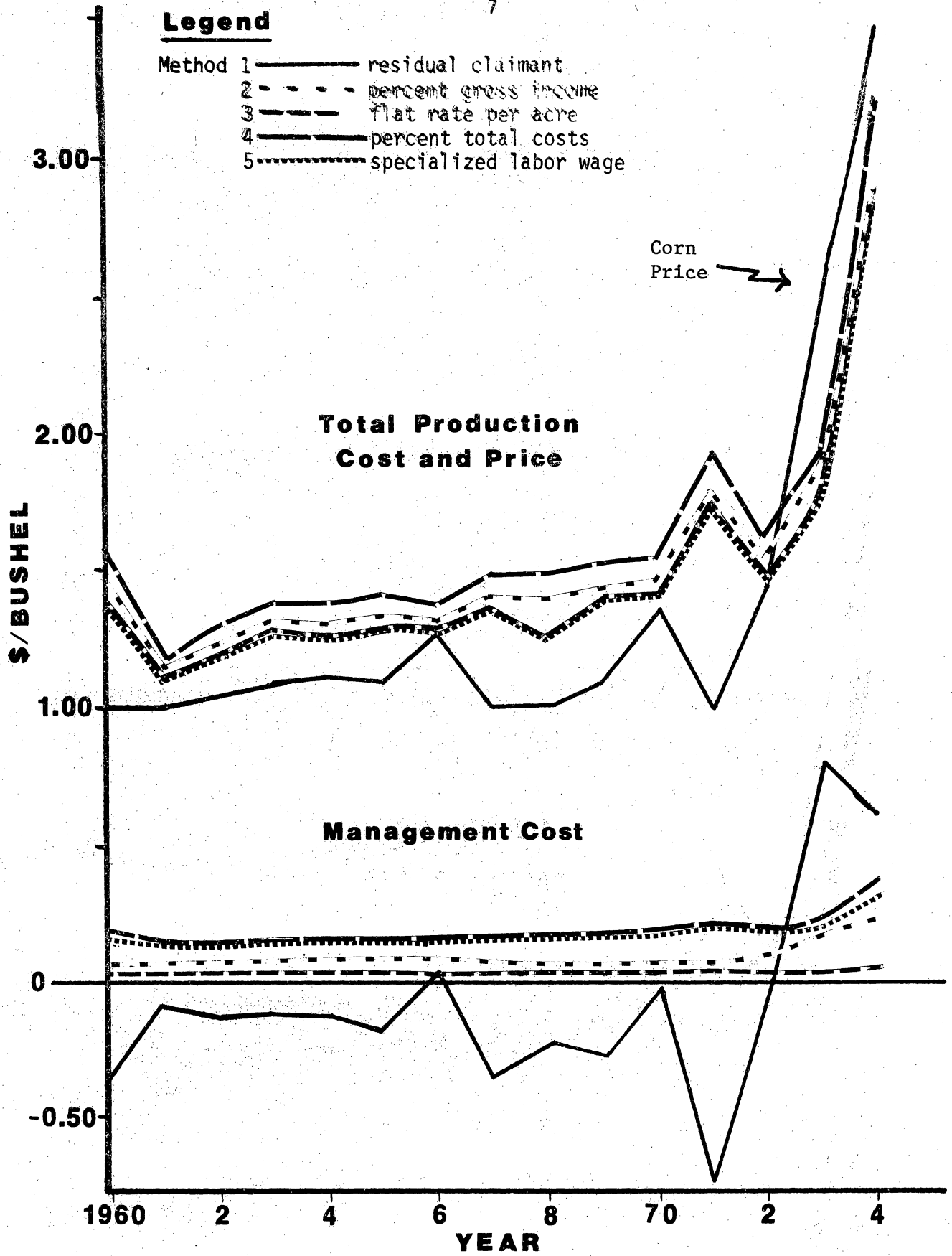$SC_t = (TP_t - \text{Market Price}) \times \text{estimated Michigan corn yield in year t.}$

Figure 1. Corn market price, total production cost and management cost during the
1960-1974 period, as determined by five alternative methods.

IV. Results

A. Management costs -- Management Cost using method (1) has the widest
annual fluctuations (fig. 1). The wide variations in management cost
result because of the residual claimant or end-of-lever effect. During
1960-1974 period, the management charge ranged from + 0.79 to - 0.71
dollars per bushel. This wide range reflected the volatility in the
corn market price relative to production costs in those years.
Estimates with this method yielded a negative management return in
most years.

Methods (2) through (5) provided management cost estimates with
smaller annual fluctuations relative to method (1). These methods
yield a positive management cost for every year, whereas the residual
claimant method yields both positive and negative charges. Method
(2) derived a management fee by charging a 7% share of gross revenue
and thus cost estimates with this method varied with the annual
corn price level and annual yields. The management cost estimates
with this method were intermediate between those of methods (4) and
(5), and method (3). Method (3), charging management cost at a
flate rate per acre per year, provided the lowest management cost
estimates and the least annual cost variation.

Methods (4) and (5) yielded approximately the same management cost
estimates and these were the highest estimates of the non-residual
methods. Method (5) treated management cost as a function of both
specialized and unskilled farm labor wages, and thus varied
directly with the annual wage index. Both method (4) and (5)
therefore showed management costs rising steadily until the high
inflation period of 1972-1974.

B. Total production costs -- Method (1) gave the lowest production cost estimates for the 1960-1972 period and the highest estimates for the 1973-1974 period. Due to the residual claimant nature of method (1) total production cost per bushel is always equal to corn market price for each year. The other methods provided higher total production cost estimates for the 1960-1972 periods, and lower estimates for the 1973-1974 period, relative to method (1). Methods (3) and (5) yielded almost equal estimates of total production cost. Method (4) consistently yielded the highest total production cost estimate, and methods (3) and (5) the lowest estimates, of the non-residual claimant methods. Method (2) provided estimates intermediate between method (4) and methods (3) and (5). All non-residual claimant methods yielded total cost estimates above the annual corn market price for the 1960-1972 period and below the market price for the 1973-1974 period.

The theoretical economic foundations of these alternative methods vary considerably. Economic theory states that for profit maximization in a purely competitive market structure, production inputs should be paid their marginal value product. Assuming that a farm owner-operator spends time on management activities because such activities increase his expected total value of production, management should earn a positive return and would then be costed out at this positive amount. Method (1) using management as a residual claimant provides both positive and negative management cost estimates, and thus does not satisfy the premise that management is employed because of its ability to increase total value of production. Method (1) in effect says that time spent on management reduces profit in years when market price is below average production cost, when possibly a manager may have been

particularly effective in those years to minimize losses. The
relevant question is how much do profits increase(losses decrease)
as a result of management over what they would be without management.
In other words, what is management's marginal value product? Method
(1) does not address this question, and thus has little basis in
economic theory.

Determining management cost as a percent of gross income as in
method (2) rewards management according to this magnitude of gross
income. THis says that a manager who obtains a higher total yield
or unit price is worth more than one with lower yields or prices.
In economic theory, however, production costs must be considered
along with income for profit maximization. Method (2) completely
ignores costs and thus lacks an adequate theoretical economic
foundation. Method (4), which estimates management cost as a percent
of all other non-management costs, ignores the income side of the
profit maximization coin and thus also lacks a complete theoretical
basis. Method (3) calculates management cost as a flat rate per
acre, which says a manager should be rewarded on the basis of the
size of the farm he manages. This method thus ignores both income
and cost performance, and has inadequate theoretical economic basis.

Method (5) calculates management on the basis of number of hours
spent managing multiplied by a management wage rrate. Method (5)
which implicitly assumes that the average farmer spends time on
management activities until his perceived management cost (e.g. time
not spent on manual labor) is equal to his expected management
returns (e.g. he expects to obtain ten more cents a bushel for his
corn by finding a better marketing channel), appears to account

for both the income and costs involved in profit maximization.
Economic theory states that a profit maximizer should equate the
marginal factor costs with marginal value product for all inputs.
By determining the amount of time a farmer spends on management
activities, and assigning a monetary value for that time which
reflects its marginal value product (MVP) or opportunity cost of the
MVP of management cannot be determined, a theoretically sound management
cost can be calculated with method (5). Method (5) thus appears
from the standpoint of economic theory, to be the most acceptable
calculation method.

V. Policy Implications

Congress' ostensible intent in tying target prices to production
costs in the 1973 Agriculture and Consumer Protection Act was to
guarantee farmers a reasonable return on their investment in order
to insure steady and increasing U.S. food and fiber production for
the U.S. and the rest of the world. This goal was to be achieved
by shifting most of the price risk-bearing function from the farmer
to the non-farmer taxpayer. The amount of risk shifted in this
manner can be adjusted by varying the target price level as a percent
of total production costs.

Production cost estimates, as demonstrated in this paper, can
vary significantly depending upon the methods and assumptions used
to calculate these costs. Calculating management cost as a residual
claimant to gross income as in method (1) of this study yields both
positive and negative cost estimates. The negative estimates arise
as an accounting phenomenon with no theoretical economic basis. From
the operational standpoint this method fails to provide congress with
meaningful production cost estimates with which to set target prices.
This occurs due to total production cost being equated to market price,

with the difference between market price and all other non-management costs being defined as management cost. Tautologically therefore, market price exactly covers total production costs using this method, and the resulting total cost estimates are of no assistance in indicating true production costs.

Estimates which may be more in line with congressional intent are provided by methods (2) through (5). All of these methods provide positive management cost estimates. The relative cost of each method can be determined by comparing the trend lines for each of these methods to the market price trend line in Figure 1. Assuming for the sake of argument that Congress sets target price at 100% of production cost during the 1960-1974 period and agreed to pay 100% of average costs over market price, the support payment for each year is indicated by the difference between market price and production cost where production cost is greater than market price. For example, in 1968 the support payments for methods (2) through (5) would have been $0.39, 0.25, 0.48, and 0.24 per bushel, respectively. The ordinal ranking of the methods in terms of increasing support payment cost was consistently (5), (3), (2), (4) for the 1960-1972 period during which estimated production costs were higher than market price. Average annual program payments during the period 1960-1974 for the State of Michigan using the assumptions of this study would have been about $25.3, 20.4, 32.6, and 19.8 million for methods (2) through (5), respectively.

The choice of method for congressional use in target pricing involves political and economic considerations of who pays the cost and who receives the benefits of the support program. Taxpayers presumably would prefer the lowest support payment to farmers, while farmers would prefer relatively higher payments. Setting prices too low could cost taxpayers less in tax money but more in food costs. Conversely, setting prices too high could stimulate production in excess of demand causing low market prices and higher support payments. Effects of target price policy on industries which use corn as an intermediate input, such as the livestock feeding industry, must also be considered.

Finally, similar consideration for other production costs, notably land costs, must be given in order to provide congress with meaningful data on which to base target prices. The same consideration must be given to the distribution of costs and benefits utilizing these methods as was given to the management cost estimation methods discussed in this paper.

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