



The benefits and costs of marketing identity preserved T.C.K. smut-free wheat in the Asian market
by Michael Earl Murphy

A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE
in Applied Economics

Montana State University

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Abstract:

The profitability of maintaining the identity of certain quality characteristics in Montana wheat has been debated and studied during recent years. This research study was developed with the primary objective of determining the benefit or loss from maintaining the identity of *Tilletia controversa* Kuhn (T.C.K.) smut-free wheat. The Peoples Republic of China (P.R.C.) has indicated that they will not accept delivery of T.C.K. smut-infected grain. Therefore, Pacific Northwest wheat marketers may find it advantageous to provide T.C.K. smut-free wheat in quantities sufficient to meet future P.R.C. export demands. Montana alone cannot supply the potential total wheat export demands of the P.R.C. However, a sufficient quantity could be made available by combining smut-free wheat from Montana and other Northwestern states.

Using a replacement cost method for estimation, total cost for the present wheat marketing system from farm truck through the port terminal facilities was \$1.49 per bushel. The expected increase in cost resulting from a T.C.K. smut-free system was estimated at approximately 1.2 cents per bushel.

Although the average Pacific Northwest export wheat price during 1973 and 1974 was 1.0 cent per bushel higher than the Gulf price, it was determined that the P.R.C. could have imported wheat for 2.8 cents per bushel less from the Pacific Northwest.

The net price advantage was due to a favorable Pacific Northwest ocean transportation cost difference of 3.8 cents per bushel.

The resulting 2.8 cents per bushel difference also represents the maximum obtainable increase in the Pacific Northwest wheat price resulting from P.R.C. purchases of smut-free wheat.

By computing the difference in the two factors (price and cost), we obtain a favorable difference of 2.8 cents minus 1.2 cents or 1.6 cents per bushel. Based on total 1973 P.R.C. wheat exportation from the U.S. of 105 million bushels, a benefit of 1.68 million dollars could be gained by the Pacific Northwest marketers. The potential benefit is feasible, but slim however, and there are a number of marketing risks involved. These risk factors may reduce or eliminate the potential benefit and make such a program unrealistic. Therefore, T.C.K. smut-free procedures should not be implemented until the P.R.C. makes known their intentions to purchase U.S. wheat from the Pacific Northwest.

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by

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A thesis submitted in partial fulfillment
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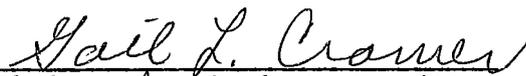
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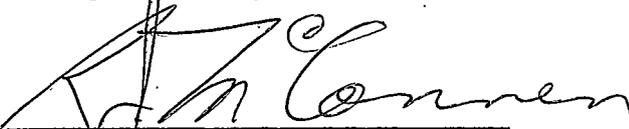
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ABSTRACT

The profitability of maintaining the identity of certain quality characteristics in Montana wheat has been debated and studied during recent years. This research study was developed with the primary objective of determining the benefit or loss from maintaining the identity of *Tilletia controversa* Kuhn (T.C.K.) smut-free wheat. The Peoples Republic of China (P.R.C.) has indicated that they will not accept delivery of T.C.K. smut-infected grain. Therefore, Pacific Northwest wheat marketers may find it advantageous to provide T.C.K. smut-free wheat in quantities sufficient to meet future P.R.C. export demands. Montana alone cannot supply the potential total wheat export demands of the P.R.C. However, a sufficient quantity could be made available by combining smut-free wheat from Montana and other Northwestern states.

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Although the average Pacific Northwest export wheat price during 1973 and 1974 was 1.0 cent per bushel higher than the Gulf price, it was determined that the P.R.C. could have imported wheat for 2.8 cents per bushel less from the Pacific Northwest. The net price advantage was due to a favorable Pacific Northwest ocean transportation cost difference of 3.8 cents per bushel. The resulting 2.8 cents per bushel difference also represents the maximum obtainable increase in the Pacific Northwest wheat price resulting from P.R.C. purchases of smut-free wheat.

By computing the difference in the two factors (price and cost), we obtain a favorable difference of 2.8 cents minus 1.2 cents or 1.6 cents per bushel. Based on total 1973 P.R.C. wheat exportation from the U.S. of 105 million bushels, a benefit of 1.68 million dollars could be gained by the Pacific Northwest marketers. The potential benefit is feasible, but slim however, and there are a number of marketing risks involved. These risk factors may reduce or eliminate the potential benefit and make such a program unrealistic. Therefore, T.C.K. smut-free procedures should not be implemented until the P.R.C. makes known their intentions to purchase U.S. wheat from the Pacific Northwest.

Chapter 1

STATEMENT OF THE PROBLEM

The Peoples Republic of China (P.R.C.) imported approximately 137.1 million bushels of wheat, including 85.4 million bushels of hard red winter (HRW) wheat from U.S. ports during fiscal 1973/74 and 1974/75 combined. Of the total, 98.2 million bushels were exported from the Gulf ports. During fiscal 1974/75 there were no exports of winter wheat from Pacific ports destined for the P.R.C. However, between July and November 1973 there were some exports from the Pacific ports. The asserted reason for this change in buying policy by the P.R.C. was the existence of *Tilletia controversa* Kuhn (T.C.K.) smut in wheat shipped from Pacific ports. The P.R.C. contends that their own wheat producing areas are not contaminated by this particular dwarf bunt smut and they wish to prevent possible contamination from foreign imports. Therefore, the P.R.C. will not accept delivery of T.C.K. smut infected grain.

Montana exports a substantial portion of its total wheat production. Wheat exports from Montana during the year 1974 amounted to over 84 million bushels or 70 percent of the total 120 million bushels produced. During the same year, approximately 78.5 million bushels of wheat that were exported from the state, or just

under 94 percent of the total exported from Montana, went to Pacific ports.

Current organization and conduct of the wheat marketing system does not provide for separate channels for marketing certain identity preserved qualities in wheat. All wheat shipped of the same protein to Pacific ports is marketed as a homogeneous product. As a result, T.C.K. smut-free wheat grown by Montana producers is contaminated and therefore, effectively excluded from a relevant portion of the total export market for wheat.

In order to regain acceptance of Montana wheat by the P.R.C. and thereby increase the demand for Montana wheat, non-contaminated wheat must be identified and the identity preserved throughout the market system. This requires a shift in P.R.C. purchases of wheat from Gulf ports to Pacific ports through maintaining the identity of T.C.K. smut-free wheat, prices paid for Montana wheat should increase. The issue, therefore, is a question of whether or not the benefits from increased prices will outweigh the resulting added costs from an identity preservation system.

Maintaining the identity of Montana's smut-free wheat will necessitate significant changes in the present market system. Once contaminated areas are identified, inter-area shipments will necessitate individual testing of wheat prior to dumping. There are

several implications associated with this process. The costs of testing as well as costs of segregating the infected grain from the non-infected grain must be determined. Continual testing of grain which is to come in by farm truck from contaminated areas will be necessary in order to classify the grains. Otherwise, all producers from T.C.K. smut-contaminated areas will be forced to sell their wheat as T.C.K. smut contaminated. Segregation needs may necessitate new building or relocating separate handling and storage facilities to prevent contamination in areas bordering the smut-infected areas. Without separation at current elevator locations, grain movement and segregation could be achieved only by making significant and costly changes in movement patterns.

T.C.K. smut occurs in fairly well isolated and geographically defined areas. Therefore, it may not be too difficult to divide the state on the basis of contamination and prevent movement between infested and non-infested areas.

The problems associated with segregation must also be faced as the wheat continues to move through the market channels from country elevator to subterminal to terminal facilities and on-board ship.

A final consideration has to do with the expected volume of T.C.K. smut-free wheat that can be supplied from Montana. Sufficient

volume must be present to make the necessary procedural changes economically feasible from the standpoint of all involved.

Objectives of the Study

The objectives of this research project are:

1. To determine the feasibility of a T.C.K. smut-free wheat identity preservation market system.
2. To interpret the economics behind product differentiation or identity maintenance.
3. To analyze T.C.K. smut and identify smut-free areas within the State of Montana.
4. To document prior wheat sales, and make projections of future sales to the P.R.C.
5. To estimate the quantity of Montana T.C.K. smut-free wheat available to move through new marketing channels.
6. To delineate the current wheat marketing process throughout the entire marketing system in order to gain a better perception of the present procedures and costs.
7. To determine the changes in costs which will be incurred in maintaining the identity of, and marketing T.C.K. smut-free wheat from the Pacific Northwest:
 - a. Estimate the changes in cost to wheat producers, grain elevators and subterminal operations within the state and

export terminal facilities that will result from the necessary segregation precautions needed to maintain a smut-free wheat system.

- b. Estimate rail transportation rates to facilitate movement of identity preserved wheat to coastal facilities.
8. To estimate ocean freight rates, export wheat prices in Gulf and Pacific ports and the change in Pacific export wheat price.
9. To summarize and compare expected benefits and expected costs to the Pacific Northwest grain markets various sectors under the alternative marketing system.

Procedures of the Study

Initially, information relevant to T.C.K. smut, product differentiation and the general wheat marketing structure will be analyzed. Delineating the present system from wheat producer to wheat importer will lead to a better understanding of the conditions under which operations take place.

A historical review of P.R.C. development as a nation and a documentation of prior sales to the P.R.C. will be used as an indicator of potential future sales. These projections of future sales to the P.R.C. will be used to predict long run effects including the difference between expected benefits and costs.

A state-wide study was conducted by the Plant Pathology Department of Montana State University and will be used to determine T.C.K. smut contaminated areas in Montana.

The second major analysis necessary to further development of a solution to the issues of this project involves determining relevant costs for marketing wheat throughout the entire market system. Current cost data will be used in order to estimate per bushel wheat storage and handling costs incurred by in-state elevators and subterminals and port terminal facilities. These storage and handling costs will be estimated and used as a basis for computing the difference in costs for maintaining T.C.K. smut-free facilities.

The third major step in the procedure of this study will show estimated changes in costs throughout the system. These changes in costs will result from the procedural changes which must be made within the system to facilitate marketing identity preserved T.C.K. smut-free HRW wheat from Northwestern ports. The information compiled for present costs will then be used as a base for determining the associated differences in costs. At the state level, these cost changes involve such factors as hauling, dumping, inspection, (which will be based on the Plant Pathology Department figures) and special handling costs. There will also be expected cost differences at both the elevators and port terminal facilities associated with

maintaining the separate facilities necessary (construction or alteration, cleaning and record keeping, etc.) for the T.C.K. smut-free wheat.

Current rail transportation and ocean freight rates from Gulf and Pacific Northwest ports will then be documented for wheat shipments to and from coastal terminal facilities. An efficient network of wheat movement will then be proposed to accommodate the T.C.K. smut-free wheat shipments.

A substantial quantity of T.C.K. smut-free wheat must be available for delivery in order for this process to be successful. Therefore, the quantity of T.C.K. smut-free wheat which can be supplied must be estimated. This estimate will be accomplished by means of data obtained from the Plant Pathology Department study as well as from production and grain stocks records from the areas where smut-free wheat exists.

The concluding section will entail a summary of the collected data and other information regarding changes made to the existing system (increased costs compared to increased price, etc.) in order to estimate actual benefits or losses to the marketing system. The expected wheat price increase from increased export demand will be estimated and compared with the increased costs to determine the benefit or losses. Average wheat price for Gulf and Pacific Northwest

ports will also be estimated to determine where the P.R.C. may have a price advantage. The net total difference will then be computed to determine total benefit or loss to both the P.R.C. and the Pacific Northwest wheat marketing system.

Based on cost-benefit comparisons, a final statement will be formulated to indicating whether or not identity preservation for smut-free wheat is advantageous. Again, the final determinant for acceptability will be judged on the basis of: 1) the margin between prices paid at the Gulf and prices paid at the Pacific ports; 2) the difference in ocean transportation costs; and, 3) the difference in total costs to the Pacific Northwest wheat market system.

Chapter 2

IDENTITY MAINTENANCE AND MONOPOLISTIC COMPETITION

The economic concept of identity maintenance is synonymous with the economic concept of product differentiation which is the major component of the economic theory of monopolistic competition. An interpretation of the concepts comprising the theory of monopolistic competition is essential to a clear understanding of the material presented within this study. The relevant aspects of the theory of imperfect markets will be explained within this chapter. Maintaining the identity of Montana T.C.K. smut-free wheat places the producers within Montana and particularly the elevator and port terminal operators in a position which is confronted by many of the implications associated with the theory of monopolistic competition.

Product Differentiation and the Theory of Monopolistic Competition

"A general class of product is differentiated if any significant basis exists for distinguishing the goods (or services) of one seller from those of another. Such a basis may be real or fancied so long as it is of any importance whatever to buyers and leads to a preference for one variety of the product over another. Where such differentiation exists, even though it be slight, buyers will be paired with sellers, not by chance and at random (as under pure competition),

but according to their preferences."¹ Differentiation may be based upon certain characteristics of the product itself such as quality and style or it may exist with respect to conditions surrounding the sale. When a seller maintains control over the supply of a product by virtue of his location, his goods are said to be differentiated spatially. Considering these aspects, it is evident that virtually all products are differentiated to some extent, which makes differentiation of considerable economic importance.

Within a market for goods which are substitutes for each other, the position and elasticity of the demand curve for the product of any particular seller depends in large part upon the availability and price of competing goods. The demand for a product is also dependent upon the other determinants of demand including; the price of the product itself, tastes, and income. Under monopolistic competition, the market for a particular product is always separated to a degree, but sales are limited by several factors: price, nature of the product and advertising outlays.

Monopolistic competition imposes a couple of different problems upon the seller of a differentiated product. First, the demand curve diverges from the horizontal position which imposes a pricing problem

¹Edward Chamberlin: The Theory of Monopolistic Competition. Cambridge Harvard University Press. Chapter IV, page 56.

which is the same as that faced by the monopolist. Second, the volume of sales depends in part upon the manner in which the product differs from that of competitors.

Individual Firm Equilibrium

Under conditions of monopolistic competition a seller may in fact adjust either price, quantity, or both depending upon conditions. If the price of a product is set by custom or imposed upon a seller by trade practices for instance, he is free to vary only the quantity. On the other hand, if the quantity is set by its nature or by a previous decision, the only variable to manipulate is price. If both may be varied, the equilibrium adjustments must involve both price and quantity.

If we allow only price to vary, the point of maximum profit can be obtained with reference to marginal cost and marginal revenue curves. As product is increased up to the point of intersection between these two curves, profits will increase because each additional unit adds more to revenue than to costs, but beyond this point the converse is true. Referencing to Figure 2.1, the total profits will be a maximum when output is at the point OQ_1 . The price at which this maximum occurs is OP_2 as shown by the demand curve DD' . The effects of monopoly elements on the individual producer adjustments may now be seen. The negative slope of the demand curve

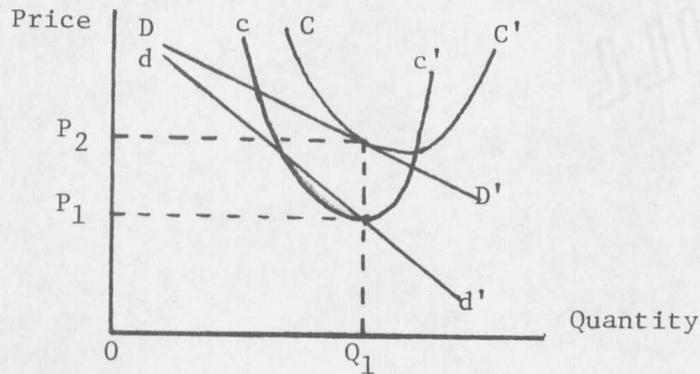


Figure 2.1. Monopolistic Competition and Individual Firm Equilibrium - Allowing only Price to Vary

defines a point of maximum profit at a point further to the left on the production scale than under a situation of perfect competition and a horizontal demand curve. This means, in general, higher production costs (due to inefficient utilization of resources as desired by society) and higher prices with less output.

When qualitative changes in the product alone are considered, the costs of producing are altered as well as the demand for the product. Therefore, the producer must select the product whose cost and market conditions allow the greatest total profits. Figure 2.2 indicates the process where price is constant at a particular point in time. The cost curves in this figure are assumed to be representative of both production and marketing costs combined as in the case of the wheat marketing system. For example, when looking at just the Montana wheat marketing procedures at a point in time, the price is

