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
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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 yeduce 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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A thesis submitted in partial fulfillment
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Approved:

Gail L. Cramer
Chairperson, Graduate Committee

J. M. Conner
Head, Major Department

Henry L. Parsons
Graduate Dean

MONTANA STATE UNIVERSITY
Bozeman, Montana

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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.

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

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[1]Edward 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

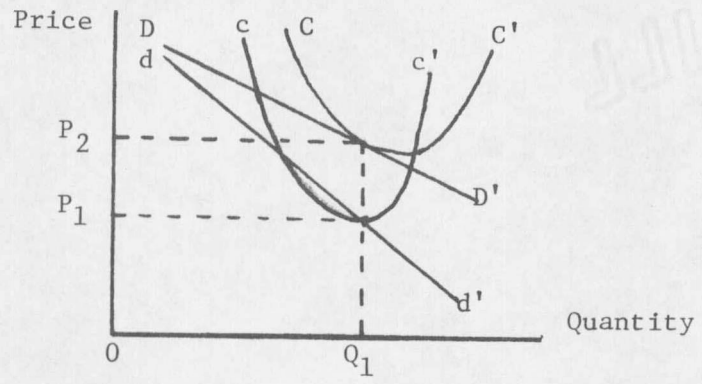

Figure 2.1. Monopolistic Competition and Individual Firm Equilibrium - Allowing only Price to Vary

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

given and the following illustration in Figure 2.2 is appropriate as we are trying to determine the change in marketing costs for quality differences.

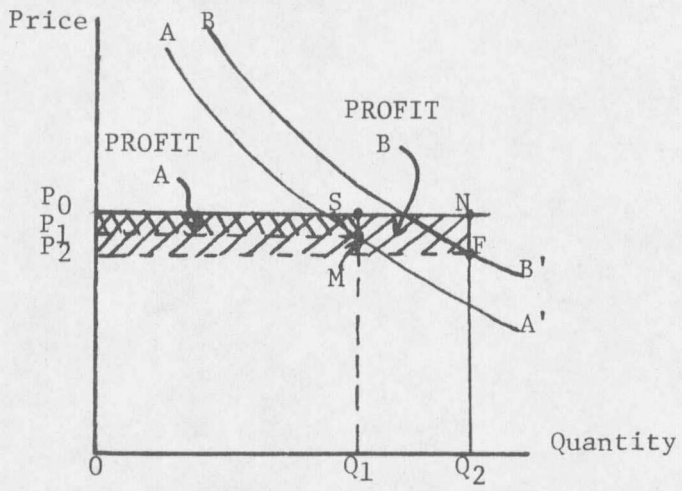

Figure 2.2. Monopolistic Competition and Individual Firm Equilibrium - Allowing Only Quality Changes

For various types of products such as A and B in this case, the amount demanded is limited and defined by the fixed conditions with respect to the nature and price of the available substitute products and the price of the sellers product. It is not possible in this case to move back and forth along the individual cost curves A and B, but rather back and forth between curves as the product changes and the amount which can be sold is then rigidly defined for each case. The product selected by a seller is not necessarily the one whose cost

is lower (AA' is lower than BB', but BB' gives the greater profit of the two; P_2FNPo compared to P_1MSPo) nor is it necessarily the one for which the demand is greatest, for cost of production must first be taken into account. Further, the output bears no relation to the most efficient scale of production, revealed by the lowest point on the average total cost curve. If constructions such as Figures 2.1 or 2.2 are drawn for every possible combination or variety of product and price, the optimum combination can be determined.

Quality differences lead to divergences in cost of production curves and buyers preferences account for a corresponding variety of demand curves, both in elasticity and position (distances from X and Y axes). The result is heterogeneity of prices and a variation over a wide range of outputs (scale of production) and in profits.

Industry or Product Group Equilibrium

Where more resources enter into use within an industry, the cost curves may rise because of an increase in the price of the factors of production or they may fall because of improvements in the group organization as a whole (external economies) or they may remain the same due to the absence of both of these tendencies or because of their cancellation of one against the other. These three correspond respectively to the familiar increasing, decreasing and constant cost

industries of perfect competition.

Changes in output by a single producer will if he is one of many such producers, have a negligible effect upon the total output and costs. Therefore, tendencies toward increasing or decreasing costs with respect to factors of production under monopolistic competition are almost always with diminished and often negligible force, as they are generally constant cost industries.

In Figure 2.3, dd' shows the amount of increased sales a particular producer can expect to realize by lowering his price providing all others will maintain their original price. DD' on the other hand shows the actual sales to be gained or lost when all firms change price simultaneously.

Large group, long-run equilibrium with price competition in a monopolistically competitive product group is attained when the anticipated demand curve (dd') is tangent to the long-run unit cost curve. With price competition if dd' lies above, the long-run average cost (LRAC) curve, price will eventually decrease to the point Pp and eliminate the profit of an individual firm.

With free entry in the absence of price competition, long-run equilibrium is attained only when enough firms have entered the industry to push the actual demand curve to DnDn'. Equilibrium is attained at En, with output OQN and price $O\bar{p}$ per unit. In

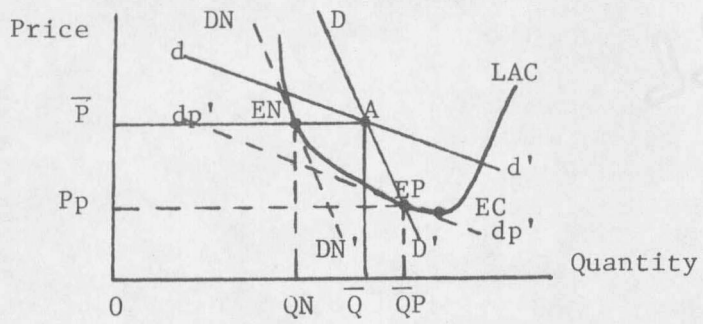

Figure 2.3. Monopolistic Competition and Industry Or Product Group Equilibrium

Chamberlin's opinion, $Qn\overline{Q}p$ represents excess capacity; it is the difference in output attributable to the absence of effective price competition.

Summary: Monopolistic Competition and Product Differentiation

Chamberlin concludes that by non-aggressive price policies sellers: "protect over short periods, their profits, but over longer periods, their numbers, since when prices do not fall costs rise, the two being equated by the development of excess productive capacity. The result is higher prices and waste attributed to the monopoly element in monopolistic competition. Chamberlin then argues that the difference between cost at Ep and Ec in Figure 2.3 is itself the cost of product differentiation. If product heterogeneity is desired per se, the cost of differentiation is a valid

social cost."[2] Hence according to Chamberlin's argument, Ep actually represents the minimum attainable average cost when all relevant social costs are included. Each firm and the product group as a whole, produce the sort of ideal output, and excess productive capacity does not appear in long-run equilibrium.

Whenever products are differentiated, the theory of monopoly seems adequate to describe their prices. Competition is not eliminated from the explanation; it is fully taken into account by the recognition that substitutes affect the elasticity of demand for each monopolistic product. Therefore, actual prices tend toward neither pure competition or pure monopoly, but towards a middle position determined with reference to the relative strength of the two forces in the individual case.

Differentiation: Case Study - Marketing High Protein Wheat[3]

Montana and North Dakota farmers are the principle producers of high-protein hard red winter and hard red spring wheat. High-protein wheat of this nature is associated with flour value and tends to have superior bread baking qualities valued by the baking

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[2] C. E. Ferguson: Microeconomic Theory Third Edition 1972. Chapter X, page 330.

[3] The majority of the following material was obtained from: Marketing High Protein Wheat by Olive R. Harston, Montana State University, Agricultural Experiment Station. Volume 41 Bulletin 527.

industry. The degree of association between protein content and baking quality is high enough to warrant the continuation of protein premiums on the market as a means of allocating the desirable wheat. The value of premiums to Montana farmers is substantial and amounts to several million dollars every year. The amount of the premium is dependent upon the amount of protein wheat available and the quantity demanded. Protein is not a grade factor, but rather it is quoted and priced separately so that the premium is paid for percentage of protein and not for protein by weight. This in essence makes protein content a differentiating aspect of wheat production. Although the supply of wheat does respond partially to the price of wheat in general, the supply of high-protein wheat produced has a limited response to a price stimulus and is more a function of climate. Weather is the factor possessing the greatest causual relationship with protein content of wheat. Although high-protein wheat is differentiated, it is almost uncontrollable by the producer. There are however, various procedures which will enhance the production of higher protein wheat such as the use of appropriate fertilizers and careful selection of seed varieties. Protein premiums are only one factor in the analysis of the long-run decision process to grow wheat. Other factors of more importance are the base price of low protein wheat, and the cost of producing alternative crops. Another factor which must be considered

is that high-protein wheat is associated with lower bushel per acre yields than low-protein wheat because higher protein is associated with a dryer climate condition.

The following is a list of techniques that wheat producers can use to increase their returns from high-protein wheat production:

1. Store wheat on farm until after harvest rush;
2. Bin wheat separately by protein as often as possible;
3. Sample and test wheat for protein prior to delivery;
4. Be very careful to use proper sampling techniques;
5. Be alert to price changes;
6. Deliver wheat when elevator can best handle it.

The elevator operator is faced with the problem of attempting to realize a balance between payment of a premium for high protein wheat because of its desirability or discounting it because of the high risks involved in handling time. But, these country elevator operators must grade and describe wheat accurately in order to serve farmers properly and in order to maintain their own operating margins. To grade down means to pay farmers less than the market dictates and to overgrade means to cut their own margins. Because of the risk involved, elevator operators generally sell high-protein wheat as quickly as possible after purchase. If they do hold high-protein wheat it will depend upon the price situation and expected prices. If premiums seem low, elevator operators hold high-protein

wheat, but if the present premiums are high, they tend to merchandise it as quickly as possible.

The following is a list of procedures which elevator operators may follow to allow them to pay the highest possible premiums to producers and still maintain their own returns:

1. Measure and sample for protein with precision;
2. Segregate by protein content as much as possible;
3. Plan elevators with sufficient segregating devices;
4. Be prepared to sell separate proteins or blends of proteins when it pays to do so;
5. Devise methods to decrease risks from protein premium changes.

Buyers not only have varying uses for wheat in general, but their requirements for specific wheat properties also change. The increased importance of commercial baking within the U.S. has increased the demand for high-protein wheat. Protein content of wheat is associated with gluten which is the property that gives flour its strength and the ability to "hold up" during processing.

The demand for a specific protein wheat is more elastic than that for all high protein spring wheat or all wheat. Since a particular spring wheat protein is only one of many spring wheat proteins desired by millers and it does have substitutes in other types

of wheat as well, changes in the amount available are associated with a less than proportional price change (elastic demand). As prices change, buyers are quick to use a different blend of wheats in order to keep costs down. Even though consumer wants tend to remain relatively fixed in the short-run and baker demand as a result is for a uniform type of flour, there still occurs a great deal of substitution of wheats because of the extensive variability of protein tests and qualities of wheat from year to year. However, wheat testing 15 percent protein, used for speciality products, has a low ratio of substitution with lower protein wheats, and thus the demand is relatively inelastic. It is here that differentiation of wheat on a protein basis becomes a matter of significance.

In summary, flour orders placed with millers constitute the major demand for high-protein wheat. Wheat from certain areas of Montana and North Dakota has commanded extra premiums because of its reputation established for good milling wheat. Although this wheat is initially a differentiated product, it is seldom milled straight, because it is in short supply and wheat from other areas needs to be blended up to a higher milling quality. But, by establishing good marketing and handling practices on the part of the producer and the elevator operator these premiums for high-protein will continue and the farmer will be paid in accordance with the differentiated product which he produces.

Chapter 3

DESCRIPTION AND EFFECTS OF T.C.K. SMUT

Tilletia controversa Kuhn (T.C.K.) or dwarf bunt smut has been a problem for a considerable period of time. Research has been done on a regional basis since 1954 and in localized areas prior to that time.

T.C.K. smut is a fungus and is primarily a problem in winter wheat. T.C.K. is believed to have originated long ago in Europe on related grasses and is associated with areas of long snow cover (mountain valleys, etc.). The earliest incidence of dwarf bunt in the U.S. was reported in about 1880. In winter wheat, T.C.K. attacks the heads and usually causes one hundred percent destruction of the head. Infection occurs during the winter months (December-March). This smut is soil borne for 10 or more years, and therefore can infect future crops for many years once contamination occurs. The plant must be infected very early in its growth. In other words, spores from a contaminated head, blown by wind to a healthy head for example does not infect the healthy head that season. But, if seed from the previously healthy head is planted in contaminated soil, the resulting plant the following season will be infected and completely destroyed by the smut. It has been found that early or

late seeding can reduce the chance that contamination will occur.

Although dwarf bunt does not infect barley or spring wheat, it does have implications which makes it deleterious to these grains as well. Barley or spring wheat will become contaminated if transported or stored in contaminated facilities. Although these grains will not be infected if planted, they will deposit the viable spores in the soil which may then contaminate future winter wheat seedings.

T.C.K. smut has a number of other grass hosts, which makes its eradication even more difficult although resistant varieties can and are being used. Another factor which accentuates the problem stems from the fact that dead or alive, some smut spores look the same, and there are also a number of other spore types that look very similar to the T.C.K. spore. One infected head of winter wheat can contain as many as 300-600 million spores, which gives an indication of the potential magnitude for contamination.

There seems to be no effective seed treatment which controls dwarf bunt completely. Therefore, the best means of control at the present time involves the use of T.C.K. smut-resistant varieties of winter wheat. Tests at Kalispell, Montana and other areas have determined that particular varieties of hard red winter (HRW) wheat were highly resistant to T.C.K. smut and appropriate for Montana climatic conditions. By using resistant varieties of HRW wheat,

losses in areas where previously 50 percent losses were recorded have been reduced to as low as one percent. This percentage loss continues to decrease in subsequent years as the number of viable spores in the soil decreases. Several varieties of resistant winter wheat have been developed and are being tested under various climatic conditions.

Bunt diseases have been one of the most important wheat production problems in the Northwest for many years. Common bunt is now almost totally under control through the combined use of chemical seed treatments and resistant varieties. Recently, losses from common bunt have not been significant, but in some localized areas of Idaho and Utah the losses have been quite high from T.C.K. smut. In Montana, losses are not significant and estimates are that only one half of one percent of the total wheat acres in the state may be infected and only 785,000 bushels or less than eight tenths of one percent of the nearly 99 million bushels from the 1972 production year was infected. The importance of these figures are also reduced by the fact that 1972 was a heavy smut year and not typical of average conditions.

Market Implications and Results

T.C.K. smut is almost completely removed in the milling process and is not harmful to humans in any way. The P.R.C. still will not

accept smut-laden shipments as they fear contamination will occur within their own production areas which they contend, are free of T.C.K. smut. The P.R.C. initially wanted white and HRW wheat from Pacific ports, but they discontinued purchases from the Pacific ports when T.C.K. smut was found in incoming shipments. After that they obtained almost all their U.S. purchases from the Gulf ports where T.C.K. is almost non-existent.

Although the P.R.C. still will not accept T.C.K. smut contaminated shipments, they did lift their embargo against U.S. grain and will accept grain which has been tested and found to be free of T.C.K. smut.

In view of the importance of the marketing developments pertaining to the P.R.C., a meeting was held in Spokane, Washington between the Western Wheat Associates and the Pacific Northwest Grain Standards and Quality Committee. As a result of this meeting, the Grain Standards and Quality Committee was designated as a clearing house for a regional effort to put Northwestern wheat back into the Chinese market. The number one priority of this measure regarded T.C.K. smut and its long term effects.

A subcommittee was also established at this time for both research and marketing purposes. Sanitation, negotiation and eradication programs are planned with both short and long-run goals. The

costs of the long-run program are to be borne jointly by the U.S.D.A., wheat growers organizations, various state departments of agriculture, exporters and land grant colleges.

The short-run objectives include:[4]

1. Development of commercially applicable methods of killing or removing dwarf bunt spores from grain. (Researchers see little hope for a method to kill the spores, as these spores seem to be virtually unaffected by seed treatment.) Recently, however, a seed treatment chemical has been identified which though not entirely adequate, indicates the potential for control by this means.
2. Development of methods for accurate and positive identification for dwarf bunt spores, as there are a number of similar appearing spores.
3. Determine distribution of dwarf bunt in the field and sources of dwarf bunt contamination of grain.

It has been found that dwarf bunt is not controlled by currently used treatments. Therefore, the remainder of this chapter will deal with the latter two short-run objectives and the long-run objective

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[4]Inter-Industry T.C.K. Research Proposal, by Dale W. Stuart, Western Wheat Associates, USA Inc., 1976. Pages 1-4.

which calls for the elimination or control of dwarf bunt in the field.[5]

Although difficult and costly, grain storage, handling and transportation facilities can be sanitized. There must be technical improvements in both sanitation and inspection procedures. Inspection is particularly difficult as it is hard to inspect a shipload of grain.

Eradication is believed to be the only sure means of alleviating this problem. Therefore, resistant varieties must be developed and used as a means of control in the long-run.

Test for T.C.K. Smut

The procedures involved in determining the presence of T.C.K. smut spores are as follows:

1. Collect samples (samples were collected by ASCS field men at random from elevators and farm bins from the State of Montana). Several samples are obtained from each site.
2. Measure each sample into one pint proportions which is approximately one pound.
3. Remove 50 grams from sample and place in sterile cup.
4. Place sample kernels in Erlenmeyer flask with 100

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[5]Ibid., page 1.

milliletérs of water.

5. Add one drop of Tween 20. (Surfactant which causes oily materials to go into suspension.)
6. Shake this mixture for one minute.
7. Strain through 2 layers of cheesecloth.
8. Centrifuge this filtrate at 1000 x g for 2 minutes.
9. Place precipitate (including spores) on a glass microscope slide.
10. Add two drops of Shears solution (glycerin and water).
11. Examine under microscope for spores at 100 power and verify for suspected presence of T.C.K. spores at 450 power.

This test is extremely sensitive to the existence of T.C.K. smut. On the basis of an approximated 2,000,000 heads of HRW wheat per acre, one head containing T.C.K. spores in that acre can be detected when grain is stored. This means that the test can detect infected grain where as little as .00005 percent of the total heads per acre were contaminated.[6]

The P.R.C. is presently using a similar, if not identical, process for testing incoming shipments of wheat and other grains for T.C.K. smut. Under this test procedure, if two or three spores

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[6]Don Mathre - Plant and Soil Science Department, Montana State University. Plant Disease Reporter 60:580-583, 1976.

are found on a microscope slide from a sample, that sample and the shipment it was obtained from are considered to contain trace amounts of T.C.K. by U.S. standards. The P.R.C. though, has a zero tolerance level for T.C.K. smut and will turn down a shipment where one spore is found on the microscope slide.

T.C.K. Classification of Designated Areas Within Montana

Based on samples collected from elevators, rail cars, and farm bins, the state has been portioned off into T.C.K. smut-free and T.C.K. smut-infected regions. T.C.K. smut is a wheat disease related to mountain valleys and long snow cover which is indigenous to the locations where T.C.K. has been found. The regions found to be free of T.C.K. smut contamination include the Southeastern, Northeastern and Eastern half of the North Central districts of the state. Smaller isolated areas have also been found to be free of T.C.K. smut, but these areas are surrounded by contaminated areas thus necessitating special transporting, testing and storage technique in order to maintain the T.C.K. smut-free identity.

The following map of the State of Montana shows the approximate boundary line between infested and noninfected regions.

Figure 3.1. T.C.K. Smut-Free and Smut-Infected Areas of Montana

Chapter 4

UNITED STATES AND PEOPLES REPUBLIC OF CHINA GRAIN TRADE - STRUCTURE AND PROJECTIONS

Analysis of the Existing Chinese Agricultural System

Prior to 1953, almost all of the farming in the Peoples Republic of China (P.R.C.) was accomplished by individual land owners and tenant farmers. Presently however, only a small percentage of farmers living in isolated areas are permitted to carry on private agriculture. All other farmers have been organized into what are called, government controlled farm units. Individual workers are paid according to a fixed work rate based on work done with payment in cash and grain. In 1973, private farms of independent farmers, land in private plots and state farms accounted for an estimated 10 percent of the cultivated land. The remaining 90 percent was cultivated by communes.[7]

Chinese farmers are organized into communes and sell their output to the state at a fixed price. Although the communes and brigades continuously coordinate various activities, production teams constitute the most important unit in Chinese agricultural activities, as they are the basic production unit. These production

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[7]The Agricultural Situation in the Peoples Republic of China, Review of 1973 and outlook for 1974. U.S.D.A. E.R.S. - Foreign 362, page 6.

teams number in the millions. On average, they contain 20 to 40 households or 88 to 176 people and each team cultivates 20 to 95 acres. Chinese farm units are small on average and range from 30 to 60 acres.[8]

Structure and Policies of Chinese Agriculture

The P.R.C. has recently been promoting a transformation of their agricultural practices which has been advanced by such developments as increasing socialization of Chinese farms. The technological transformation of Chinese agriculture is being made viable through the allocation of more state investment in agricultural areas than had been practiced in previous years. Industry has also been supporting agricultural production by producing modern inputs for agriculture including such things as chemical fertilizer. Another new policy was also adopted between 1966-69 which called for production units to provide as much of their own capital as possible.

A new policy of crop diversification was also announced in 1971 along with the statement that the P.R.C. was then basically self-sufficient in grain production. But, because of poor weather conditions and resulting reductions in 1972 crop yields, changes

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[8]Ibid., page 6.

were made in crop sowing plans. In 1973 the P.R.C. responded to this problem and again changed the direction of their crop diversification policy and again paid particular attention to grain production and production units were encouraged to diversify their production according to their individual capabilities.

Chinese leaders have been continually trying to centrally plan their agricultural production, but several factors have made this policy difficult to coordinate. The large number of basic production units or production teams are scattered throughout the subcontinent. This makes coordination difficult and leads to some management inefficiencies. There are many variations in local conditions making data collection for central planning difficult. There are also problems originating from the food self sufficiency policy.[9]

Production and Trade

Per capita, there are only 4/10 of an acre of cultivated land in the P.R.C. compared with 2 acres in the United States. Therefore, it is imperative that the land available for cultivation be put to its highest potential use. Nearly all the land that can be farmed is under intensive cultivation.

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[9]Ibid., page 8.

Wheat is the P.R.C.'s second most important crop after rice. During the past several years acreages planted to wheat have been expanded. Grain acreage in the United States and the P.R.C. is about the same, but in the P.R.C. the emphasis is on food grain rather than on feed grains as it is in the U.S. Because Chinese labor is not combined with the comparable amounts of capital inputs (use of fertilizer, etc.), yields have been substantially below U.S. yields. Generally, U.S. yields have been twice as high as Chinese yields, and it is primarily because of the high technological production and capital intensive nature of U.S. agriculture compared with the labor intensive nature of Chinese agriculture.

A net increase of 10-15 million people per year in the P.R.C. puts considerable strain on their domestic production. Therefore, farm commodities are important to international trade, accounting for 35 percent of the countries imports and 52 percent of its exports. For the U.S. the figures are about 15 and 18 percent respectively. Grains make up a sizable percentage of the total imports received by the P.R.C. In fact, the P.R.C. was the world's largest wheat importer during the 1973-74 season.

Present Conditions and Future Prospects for Winter Wheat Exports to the P.R.C.

After a lapse of more than two decades, trade between the

United States and the P.R.C. resumed in 1971. The U.S. began importing minor amounts of agricultural goods during 1971, but the P.R.C. did not begin importing from the U.S. until the fall of 1972. During fall 1972, agricultural commodities accounted for virtually all U.S. exports to the P.R.C. and for half of the U.S. imports from that country. 1973 was the first full year of two way agricultural trade between the U.S. and the P.R.C. Total U.S. agricultural exports to the P.R.C. reached 575 million dollars while imports totaled 21 million dollars. On a value basis, the P.R.C. obtained 3 percent of total U.S. farm commodity exports which made up about one half of their wheat imports in 1973.

Termination of grain contracts for purchase by the P.R.C. substantially reduced their exports from the U.S. in fiscal 1975. As of June 1975, grain imports by the P.R.C. from U.S. ports were reduced to zero.

In 1975 the P.R.C. stopped importing from the western nations at the high level began in 1974. However, total wheat imports during fiscal 1975 were approximately 100,000 tons higher than for fiscal 1974 which were at 4.6 million tons. Imports for fiscal 1976 are expected to be somewhat lower.

There are several reasons for this expected decrease in imports by the P.R.C. The official Chinese evaluation indicated good

weather conditions and corresponding good crops for 1975 including winter wheat. These good crop prospects had been predicted for several other reasons. Recently, special attention has been paid to such factors as water conservation, reclamation, land improvement and increased use of fertilizers and management forces. The P.R.C. has also been continuing its efforts to increase domestic grain production.

In summary, it appears that the P.R.C. may regard the U.S. as one of many suppliers in normal times, but an important or major source during hard times. Substantiated by the data in Table 4.1, the P.R.C. actually did import grain from the U.S. during a period when their import needs were the greatest. Although the P.R.C. has discontinued purchasing wheat from the U.S., it does not mean they have abandoned U.S. wheat trade indefinitely. Therefore, we should be prepared for the eventual return of this nation as a major importer of U.S. wheat. It is essential that the Northwest region be prepared for this trade by providing a product that will meet their requirements.

Tables 4.2 through 4.10 show the quantities of hard red winter wheat and other wheat purchases made by the P.R.C. from Pacific and Gulf Ports and the month of delivery. These tables indicate the exact quantities of wheat exported to the P.R.C. by class and port. They also indicate P.R.C. exports as a percentage of the total

amount exported by export region during a particular time period.

During the months of June 1973 through December 1974, the P.R.C. imported an average of 8.6 percent of the total HRW wheat exported from Gulf and Pacific ports combined. During this same time period the P.R.C. imported an average of 7.8 percent of the total U.S. wheat exports for all classes of wheat. Also during these same months, the P.R.C. imported an average of 7.3 percent of the total HRW wheat exports from Gulf ports. The statistic of most interest to the Pacific Northwest region relates to the short period during which the P.R.C. accepted exports from the Pacific ports. During this period which began in July 1973 and continued through October 1973, the P.R.C. imported an average of 30.0 percent of the total HRW wheat exports from the Pacific Northwest ports.

These statistics add evidence to support the conjecture that the purchases made by the P.R.C. were and may once again be significant and that they do warrant special attention from the Pacific Northwestern ports. The P.R.C. did discontinue its purchases of winter wheat from the Northwest prior to its complete withdrawal from the American market. Therefore, we may assume that the reason for discontinuance of purchases from the Pacific ports did originate as a result of the presence of T.C.K. smut as was indicated by the P.R.C. We should therefore be prepared with a system to supply

sufficient smut-free winter wheat. Any purchases made by the P.R.C. for U.S. wheat will inevitably be dependent upon crop conditions, population growth and changes in diets, etc. Over the long run it is probable that the P.R.C. will return to the U.S. as an important food source.

TABLE 4.1

Chinese Wheat Production, Consumption, and Net Export by Fiscal Year

	Production	Consumption	Net Exports[1]
		(1000 Metric Tons)	
1971/72	27,837	31,752	-3,915
1972/73	31,600	36,885	-5,285
1973/74	30,150	35,790	-5,640
1974/75	31,200	36,895	-5,695
1975/76	31,200	34,195	-2,995

[1]Indicates approximate total wheat (includes wheat flour equivalents) import needs by the P.R.C.

Source: World Agricultural Situation. Economic Research Service U.S.D.A. Bulletin WAS-7, June 1975, page 26.

TABLE 4.2

Wheat Exports to the P.R.C. from Gulf Ports

(1000 Bushels)

Month and Year	Total Exports[1]	P.R.C. Exports[1]	P.R.C. Exports as a percentage of total
May 1973	75,402	------	------
June 1973	61,431	1,306	2.126
July 1973	65,494	8,778	13.403
Aug. 1973	79,781	12,736	15.964
Sept. 1973	72,833	15,047	20.660
Oct. 1973	76,581	6,683	8.727
Nov. 1973	67,278	3,948	5.868
Dec. 1973	52,389	4,052	7.734
Jan. 1974	62,211	8,900	14.306
Feb. 1974	42,007	3,228	7.684
March 1974	39,755	1,019	2.563
April 1974	26,225	1,398	5.331
May 1974	24,045	------	------
June 1974	36,313	------	------
July 1974	46,245	8,236	17.809
Aug. 1974	46,415	12,663	27.282
Sept. 1974	39,937	4,559	11.415
Oct. 1974	38,758	3,705	9.559
Nov. 1974	35,755	1,446	4.044
Dec. 1974	49,206	513	1.042
Jan. 1975	58,566	------	------
TOTALS	1,096,447	98,217	8.958

[1]Total exports from Gulf ports (all wheat classes). Includes P.L.480 and CCC exports.

Source: United States Department of Agriculture. Grain Division-Agricultural Marketing Service. Grain Market News (various weekly summaries).

TABLE 4.3

Wheat Exports to the P.R.C. from Pacific Northwest Ports

(1000 bushels)

Month and Year	Total Exports[1]	P.R.C. Exports[1]	P.R.C. Exports as a percentage of total
May 1973	29,245	------	------
June 1973	27,960	975	3.487
July 1973	26,456	8,295	31.354
Aug. 1973	33,557	7,590	22.618
Sept. 1973	35,636	10,684	29.981
Oct. 1973	32,193	2,784	8.648
Nov. 1973	34,917	3,309	9.477
Dec. 1973	33,255	4,123	12,398
Jan. 1974	19,638	720	3.666
Feb. 1974	26,945	461	1.710
March 1974	20,847	------	------
April 1974	24,697	------	------
May 1974	20,631	------	------
June 1974	18,219	------	------
July 1974	21,359	------	------
Aug. 1974	26,554	------	------
Sept. 1974	35,503	------	------
Oct. 1974	31,431	------	------
Nov. 1974	35,975	------	------
Dec. 1974	32,275	------	------
Jan. 1975	37,038	------	------
TOTALS	604,331	38,941	6.444

[1]Total exports from Pacific Northwest ports (all wheat classes). Includes P.L. 480 and C.C.C. exports.

Source: United States Department of Agriculture. Grain Division-Agricultural Marketing Service. Grain Market News (various weekly summaries).

TABLE 4.4

Hard Red Winter Wheat Exports to the P.R.C. from Gulf Ports

(1000 bushels)

Month and Year	Total Exports[1]	P.R.C. Exports[1]	P.R.C. Exports as a percentage of total HRW
May 1973	70,212	------	------
June 1973	57,800	1,306	2.260
July 1973	59,223	7,932	13.393
Aug. 1973	71,005	12,140	17,097
Sept. 1973	68,685	13,793	20.082
Oct. 1973	68,276	5,479	8.025
Nov. 1973	61,918	3,948	6.376
Dec. 1973	44,478	2,670	6.003
Jan. 1974	56,284	8,105	14.400
Feb. 1974	32,912	3,079	9.355
March 1974	32,259	1,019	3.159
April 1974	21,300	1,398	6.563
May 1974	17,671	------	------
June 1974	30,848	------	------
July 1974	29,138	857	2.941
Aug. 1974	31,813	3,326	10.455
Sept. 1974	28,067	855	3.046
Oct. 1974	30,059	1,315	4.375
Nov. 1974	27,237	859	3.154
Dec. 1974	43,686	513	1.174
Jan. 1975	48,579	------	------
TOTALS	931,450	68,594	7.364

[1] Includes P.L.480 and CCC exports.

Source: United States Department of Agriculture. Grain Division-Agricultural Marketing Service. Grain Market News (various weekly summaries).

TABLE 4.5

Hard Red Winter Wheat Exports to the P.R.C.
From Pacific Northwest Ports

(1000 bushels)

Month and Year	Total Exports[1]	P.R.C. Exports	P.R.C. Exports as a percentage of total HRW[1]
May 1973	10,382	------	------
June 1973	7,266	------	------
July 1973	11,786	5,724	48.566
Aug. 1973	14,536	4,491	30.896
Sept. 1973	17,466	5,961	34.129
Oct. 1973	11,053	689	6.234
Nov. 1973	13,275	------	------
Dec. 1973	10,529	------	------
Jan. 1974	6,648	------	------
Feb. 1974	9,846	------	------
March 1974	8,108	------	------
April 1974	6,650	------	------
May 1974	7,028	------	------
June 1974	6,776	------	------
July 1974	9,986	------	------
Aug. 1974	7,106	------	------
Sept. 1974	9,777	------	------
Oct. 1974	8,284	------	------
Nov. 1974	7,279	------	------
Dec. 1974	10,773	------	------
Jan. 1975	9,096	------	------
TOTALS	203,650	16,865	8.281

[1]Includes P.L. 480 and CCC exports.

Source: United States Department of Agriculture. Grain Division-Agricultural Marketing Service. Grain Market News (various weekly summaries).

TABLE 4.6

Hard Red Winter Wheat Exports to P.R.C.
From Gulf and Pacific Northwest Ports

(1000 Bushels)

Month and Year	Total H.R.W. Exports[1]	Total P.R.C. Exports	P.R.C. Exports as a percentage of total
May 1973	40,690	------	------
June 1973	37,832	1,306	3.452
July 1973	58,169	13,565	23.476
Aug. 1973	77,824	16,631	21.370
Sept. 1973	70,777	19,754	27.910
Oct. 1973	70,800	6,168	8.712
Nov. 1973	70,690	3,948	5.585
Dec. 1973	50,743	2,670	5.262
Jan. 1974	58,955	8,105	13.748
Feb. 1974	41,524	3,079	7.415
March 1974	40,098	1,019	2.541
April 1974	27,950	1,398	5.001
May 1974	22,782	------	------
June 1974	33,858	------	------
July 1974	38,737	857	2.212
Aug. 1974	38,919	3,326	8.546
Sept. 1974	37,844	855	2.259
Oct. 1974	35,498	1,315	3.704
Nov. 1974	34,446	859	2.494
Dec. 1974	44,314	513	1.158
Jan. 1975	51,719	------	------
TOTALS	984,169	85,459	8.679

[1] Excludes P.L. 480 and CCC exports.

Source: United States Department of Agriculture. Grain Division-Agricultural Marketing Service. Grain Market News (various weekly summaries).

TABLE 4.7

Hard Red Spring Wheat Exports to the P.R.C. from Gulf Ports

(1000 bushels)

Month and Year	Total Exports[1]	P.R.C. Exports	P.R.C. exports as a percentage of total H.R.S.
July 1973	2,279	------	------
Aug. 1973	4,202	------	------
Sept. 1973	2,895	758	26.183
Oct. 1973	5,226	581	11.117
Nov. 1973	3,384	------	------
Dec. 1973	7,575	1,382	18.244
Jan. 1974	5,680	795	13.996
Feb. 1974	7,190	149	2.072
March 1974	7,271	------	------
April 1974	3,946	------	------
May 1974	5,038	------	------
June 1974	3,140	------	------
TOTALS	57,826	3,665	6.338

[1] Includes P.L. 480 and C.C.C. exports.

Source: United States Department of Agriculture. Grain Division - Agricultural Marketing Service. Grain Market News (various weekly summaries).

TABLE 4.8

Hard Red Spring Wheat Exports to P.R.C.
From Pacific Northwest Ports

(1000 bushels)

Month and Year	Total Exports[1]	P.R.C. Exports	P.R.C. exports as a percentage of total H.R.S.
July 1973	5,804	1,102	18.987
Aug. 1973	6,626	1,177	17.763
Sept. 1973	7,692	2,974	38.664
Oct. 1973	8,265	2,095	25.348
Nov. 1973	10,136	4,284	42.265
Dec. 1973	8,773	4,123	46.996
Jan. 1974	4,609	720	15.622
Feb. 1974	7,444	461	6.193
March 1974	6,327	-----	------
April 1974	6,373	-----	------
May 1974	4,180	-----	------
June 1974	2,893	-----	------
TOTALS	79,122	16,936	21.405

[1] Includes P.L. 480 and C.C.C. exports.

Source: United States Department of Agriculture. Grain Division-Agricultural Marketing Service. Grain Market News (various weekly summaries).

TABLE 4.9

Hard Red Spring Wheat Exports to P.R.C.
From Gulf and Pacific Northwest Ports

(1000 Bushels)

Month and Year	Total H.R.S. Exports[1]	Total P.R.C. Exports	P.R.C. exports as a percentage of total
July 1973	7,627	1,102	14.449
Aug. 1973	9,118	1,177	12.908
Sept. 1973	9,674	3,732	38.578
Oct. 1973	12,725	2,676	21.029
Nov. 1973	13,520	4,284	31.686
Dec. 1973	15,821	5,505	34.796
Jan. 1974	8,711	1,515	17.392
Feb. 1974	13,909	610	4.386
March 1974	13,029	-----	------
April 1974	10,172	-----	------
May 1974	8,446	-----	------
June 1974	6,033	-----	------
TOTALS	128,785	20,601	15.996

[1]Excludes P.L. 480 and C.C.C. exports

Source: United States Department of Agriculture. Grain Division-Agricultural Marketing Service. Grain Market News (various weekly summaries).

TABLE 4.10

Total Wheat Exports and Wheat Exports to the P.R.C. from the U.S.

(1000 bushels)

Month and Year	Total U.S. Wheat Exports[1]	Total P.R.C. Exports[2]	P.R.C. Exports as a percentage of total
May 1973	78,521	------	------
June 1973	73,128	2,281	3.119
July 1973	91,340	17,073	18.692
Aug. 1973	122,845	20,326	16.546
Sept. 1973	110,622	25,731	23.260
Oct. 1973	112,768	9,467	8.397
Nov. 1973	112,767	7,257	6.435
Dec. 1973	86,390	8,175	9.463
Jan. 1974	81,780	9,620	11.763
Feb. 1974	67,817	3,689	5.440
March 1974	64,268	1,019	1.585
April 1974	53,744	1,398	2.601
May 1974	51,121	------	------
June 1974	54,967	------	------
July 1974	84,482	8,236	9,749
Aug. 1974	91,718	12,663	13.806
Sept. 1974	85,583	4,559	5.327
Oct. 1974	81,495	3,705	4.546
Nov. 1974	79,951	1,446	1.809
Dec. 1974	85,667	513	.599
Jan. 1975	91,079	------	------
TOTALS	1,762,053	137,158	7.784

[1]Total U.S. wheat exports from all U.S. ports (all wheat classes), excluding P.L. 480 and CCC exports.

[2]P.R.C. exports from Pacific and Gulf ports only (all wheat classes).

Source: United States Department of Agriculture. Grain Division-Agricultural Marketing Service. Grain Market News (various weekly summaries.

Chapter 5

ESTIMATED POTENTIAL VOLUMES OF T.C.K. SMUT-FREE HARD WINTER AND HARD RED SPRING WHEAT THAT IS AVAILABLE TO BE SHIPPED OUT OF MONTANA TO NORTHWEST EXPORT FACILITIES

It is essential to determine the quantity of wheat that can be expected to move through the marketing channels from smut-free areas within Montana. If it is not possible to supply a sufficient quantity of T.C.K. smut-free wheat to the West Coast from Montana and other western states to fill the potential demand from the Peoples Republic of China, then it may not be realistic to maintain the necessary policies for a T.C.K. smut-free system until they are needed. When the P.R.C. does respond with import intentions, the Northwest export market should be ready to implement such processes.

Production Within Smut-Free Counties of Montana and Total Montana Production

Production figures vary from year to year, however these data for 1973 and 1974 should give a close indication of production trends in future years. Not only has the quantity of wheat produced and harvested been indicated, but also the amount of wheat leaving Montana for various regions by various modes of transportation by district. In certain cases where only a portion of a county or district is free of T.C.K., the quantities were estimated on a percentage basis.

Tables 5.1 and 5.2 show the acreage and production figures of HRW and HRS wheat during 1973 and 1974 by county or portions of a county which are free of T.C.K. contamination.

Table 5.3 indicates the total production of wheat by classes in Montana during 1973, 1974, and 1975.

The potential quantities of wheat which the P.R.C. may import from the Pacific Northwest have been indicated here, derived from the data presented in Chapter 3. Total export figures to the P.R.C. from Gulf and Pacific Northwest ports during fiscal year 1973/74 amounted to just over 77.7 million bushels of HRW and the remaining 28.3 million bushels was comprised of HRS and other wheat and the sum of these will be used as an estimation of potential P.R.C. purchases. This time period was selected because it represents the only period in which the P.R.C. bought grain from the U.S. for an entire year. Actual purchases depend on crop and weather conditions within the P.R.C. and will inevitably differ from these figures from year to year. Therefore, potential long run total purchases will most likely range between zero and 100 million bushels.

Estimated Total Quantities of Smut-Free Wheat Leaving Montana for West Coast Export Facilities

According to the 1974 S.R.S. data as shown in Table 5.4, Montana can supply 20 million and 25 million bushels of smut-free HRW and HRS wheat respectively to the West coast. This is

Table 5.1

Wheat Acreage and Production, Smut-Free
Montana Counties, 1973

County	Acres Harvested			Bushels Harvested		
	Total[1]	H.R.W.[2]	H.R.S.[3]	Total[1]	H.R.W.[2]	H.R.S.[3]
	(1000 Bushels)[7]			(1000 Bushels)[7]		
Toole	128	34	94	1,586	550	1,034
Liberty	160	86	73	2,456	1,720	730
Hill	435	285	149	8,547	6,442	2,091
Blaine	94	66	28	2,207	1,717	488
Phillips	100	29	71	2,147	842	1,303
Valley	274	12	259	6,718	403	6,244
Daniels	207	1	201	4,352	25	4,235
Dawson	113	74	37	4,014	2,720	1,225
Sheridan	268	6	135	5,816	117	2,970
Roosevelt	314	9	283	7,617	259	6,795
Richland	107	54	52	3,608	1,995	1,597
McCone	160	54	101	4,502	1,630	2,728
Garfield	40	28	12	1,131	896	235
Prairie	39	37	1	1,271	1,236	35
Wibaux	38	5	31	946	194	724
Fallon	48	26	22	1,398	845	543
Custer	13	8	5	390	243	147
Powder River	27	25	2	956	912	44
Carter	22	13	8	548	364	176
Rosebud[4]	17	14	3	543	446	97
Treasure[5]	4	3	1	122	97	25
Chouteau[6]	86	81	4	2,318	2,233	82
TOTAL	2,694	950	1,572	63,193	25,886	33,548

[1]Includes all wheat classes.

[2]Hard Red Winter Wheat.

[3]Hard Red Spring Wheat, does not include Durum.

[4]Includes 3/4 of total county production.

[5]Includes 7/8 of total county production.

[6]Includes 1/5 of total county production.

[7]Figures have been rounded to the nearest thousand from original data.

Source: Montana Department of Agriculture and the Statistical Reporting Service (U.S.D.A.). Montana Agricultural Statistics - Volume XV.

Table 5.2

Wheat Acreage and Production, Smut-Free
Montana Counties, 1974

County	Acres Harvested			Bushels Harvested		
	Total[1]	H.R.W.[2]	H.R.S.[3]	Total[1]	H.R.W.[2]	H.R.S.[3]
	(1000 Bushels)[7]			(1000 Bushels)[7]		
Toole	153	10	141	1,694	200	1,462
Liberty	176	72	103	2,447	1,194	1,235
Hill	503	413	87	11,893	10,206	1,612
Blaine	130	83	45	3,233	2,127	1,062
Phillips	112	48	63	2,818	1,223	1,591
Valley	284	27	254	5,923	752	5,115
Daniels	227	1	216	3,896	2,807	3,744
Dawson	152	88	59	3,929	2,807	1,065
Sheridan	300	9	110	5,837	175	2,100
Roosevelt	296	19	253	5,869	514	4,918
Richland	139	46	91	3,502	1,432	2,038
McCone	185	98	82	4,862	2,961	1,738
Garfield	64	41	22	1,418	1,064	340
Prairie	48	46	2	1,459	1,406	53
Wibaux	60	9	49	1,665	324	1,281
Fallon	83	37	45	2,291	1,243	1,042
Custer	22	15	7	561	393	168
Powder River	31	28	2	1,019	978	33
Carter[4]	36	22	13	746	548	191
Rosebud[5]	27	22	4	754	663	86
Treasure[6]	7	5	1	256	214	41
Chouteau	106	99	6	3,451	3,300	148
TOTAL	3,141	1,238	1,655	69,523	33,748	31,063

[1]Includes all wheat classes.

[2]Hard Red Winter Wheat.

[3]Hard Red Spring Wheat, does not include durum.

[4]Includes 3/4 of total county production.

[5]Includes 7/8 of total county production.

[6]Includes 1/5 of total county production.

[7]Figures have been rounded to the nearest thousand from original data.

Source: Montana Department of Agriculture and the Statistical Reporting Service (U.S.D.A.). Montana Agricultural Statistics - Volume XV.

TABLE 5.3

Total Wheat Production in Montana

Harvested for Grain - 1973

Class of Wheat	Acres Harvested	Yield	Bushels Harvested
Winter	2,080,000	26.5	55,120,000
Spring	1,790,000	21.0	37,590,000
Durum	182,000	22.0	4,004,000
Total	4,052,000	23.9	96,714,000

Harvested for Grain - 1974

Class of Wheat	Acres Harvested	Yield	Bushels Harvested
Winter	2,650,000	29.5	78,175,000
Spring	1,940,000	19.0	36,860,000
Durum	267,000	19.0	5,073,000
Total	4,857,000	24.7	120,108,000

Harvested for Grain - 1975

Class of Wheat	Acres Harvested	Yield	Bushels Harvested
Winter	3,000,000	35.0	105,000,000
Spring	1,600,000	25.5	40,800,000
Durum	375,000	27.0	10,125,000
Total	4,975,000	31.3	155,925,000

Source: Montana Department of Agriculture and the Statistical Reporting Service U.S.D.A. (Various Grain Summaries).

approximately 26 percent and 100 percent respectively of the total HRW and HRS wheat purchases made by the P.R.C. during the 1973/74 period. These figures however, indicate only the amount of wheat which is shipped out-of-state to the West coast from counties which are smut-free. Therefore, these statistics have excluded smut-free wheat that can be brought into the smut-free system from other areas after proper testing of the grain. This figure is impossible to measure without the necessary testing.

Data for 1975 were not available in a break-down by counties, but the total production figures for HRW wheat and HRS wheat were 34 percent and 11 percent above the 1974 production levels respectively. Assuming that the projected demand levels are realistic, approximately 77 million bushels of winter and 25 million bushels of spring wheat would be purchased by the P.R.C. Given 1975 production levels, Montana could conceivably supply as much as 40 to 50 percent of the total HRW and 100 percent of the total HRS wheat demands from the P.R.C. These figures include smut-free wheat leaving Montana by both truck and rail. Wheat leaving by truck has been omitted however in the following figures as it is almost impossible to determine how much wheat leaving by truck actually reaches the coast. Deleting this wheat, Montana could supply by rail alone nearly 35 to 40 percent of the HRW and at least 75 percent of the HRS wheat imports respectively. As mentioned previously,

these figures are also not adjusted for smut-free wheat which could enter the market from outside the smut-free boundaries.

It becomes evident that Montana cannot supply the total projected wheat imports by the P.R.C. in fiscal 1973/74 for these two classes of wheat, however, it would appear at least on the surface, that the state can supply a sufficient quantity to make a smut-free identity maintenance program feasible. The final determinant will depend on the effect that increase exports will have on price and costs. It is also realistic to assume that smut-free wheat can be identified from other Northwestern states and made available in combination with Montana wheat in more than sufficient quantities to fill the total potential import demands of the P.R.C.

In summary, if the P.R.C. is willing to purchase U.S. grain and legally contract for it, then they should also be willing to purchase guaranteed smut-free Pacific Northwest wheat even at a premium price if that price plus transportation cost is lower than Gulf price plus shipping costs.

TABLE 5.4

Wheat Shipped out of Montana in 1974 by Class, Mode and Destination from Smut-Free Wheat Districts

District, Mode and Destination	Winter Wheat[1]	Spring Wheat[2]	Winter Wheat[3]	Spring Wheat[4]
		(1000 bushels)		
North Central				
Trucked East	1	2	1	1
Trucked West	2,888	1,840	1,451	1,262
Trucked Other	5	2	2	1
Total Trucked	2,894	1,844	1,454	1,264
Rail East	24	5	12	3
Rail West	19,111	5,908	9,605	4,051
Rail Other	253	37	127	26
Total Rail	19,388	5,950	9,744	4,080
Total Shipped	22,282	7,794	11,198	5,344
Northeast				
Trucked East	200	117	200	117
Trucked West	280	1,375	280	1,375
Trucked Other	43	34	43	34
Total Trucked	523	1,526	523	1,526
Rail East	1,044	1,333	1,044	1,333
Rail West	4,931	16,621	4,931	16,621
Rail Other	18	16	18	16
Total Rail	5,993	17,970	5,993	17,970
Total Shipped	6,516	19,496	6,516	19,496
South Central				
Trucked East	18	--	1	--
Trucked West	1,322	796	30	76
Trucked Other	--	--	--	--
Total Trucked	1,340	796	31	76
Rail East	86	6	2	1
Rail West	3,782	1,057	86	101
Rail Other	38	--	1	--
Total Rail	3,906	1,063	89	102
Total Shipped	5,246	1,859	120	178

TABLE 5.4 (Continued)

District, Mode and Destination	Winter Wheat[1]	Spring Wheat[2]	Winter Wheat[3]	Spring Wheat[4]
		(1000 bushels)		
Southeast				
Trucked East	503	65	484	64
Trucked West	319	425	307	421
Trucked Other	112	1	107	1
Total Trucked	934	491	898	486
Rail East	1,155	109	1,111	108
Rail West	3,256	970	3,132	961
Rail Other	16	--	15	--
Total Rail	4,427	1,079	4,258	1,069
Total Shipped	5,361	1,570	5,156	1,555
Total Truck West[5]	4,809	4,436	2,068	3,134
Total Rail West[6]	31,080	24,556	17,754	21,734
Total West[7]	35,889	28,992	19,822	24,868

[1]Includes all winter wheat from districts containing smut-free counties.

[2]Includes all spring wheat as well as durum from districts containing smut-free counties.

[3]Estimated from county statistics by allocating the appropriate percentages. Excludes winter wheat from smut-infected counties within the district.

[4]Estimation the same as [3], and also excludes all durum wheat and spring wheat from smut-infected counties within the district.

[5]Summation of the Trucked West figures from all four districts.

[6]Summation of the Rail West figures from all four districts.

[7]Summation of all wheat by class going West by truck and rail from all 4 districts.

Source: Montana Department of Agriculture and the Statistical Reporting Service U.S.D.A. Montana Wheat Movement Summary.

Chapter 6

DELINEATION OF THE PRESENT WHEAT MARKETING PROCEDURES AND COSTS

Summary and Review of Present System

To develop the necessary cost-benefit analysis which is fundamental to a valid conclusion to this research, it is essential to delineate the current wheat marketing system.

The present wheat marketing system is not extremely complicated, but it does involve several factors. Initially, the farmer determines what crop or crops he will produce on the basis of technical capabilities and resource availability, etc. The wheat producer then makes a decision regarding the sale of his product based on price and expectations about future prices. The price of wheat is determined by the interaction of the supply and demand for wheat. Increasing the quantity of wheat exported has the affect of reducing domestic stocks and driving up prices assuming constant wheat production. Although the expansion in export demand for wheat will (ceterus paribus), with a decrease in stocks, cause a rise in the price of wheat and wheat by-products, the two way trade relations established with the P.R.C. will inevitably benefit society as a whole as well.

When the wheat leaves the farm it goes to one of many local

storage elevators or subterminal locations within the state which are controlled by one of several entities including farmer owned organizations and private grain companies.

Although a substantial percentage of wheat acquired from the farmer is initially obtained by a farmer owned entity (cooperative), these cooperatives do not maintain control of this percentage to the final destinations. In fact, only a small percent of wheat leaving Montana destined for coastal export facilities is cooperatively owned.

After the initial relocation of wheat off the farm to the local elevators, which is accomplished almost entirely by truck (either hired or farmer owned), the wheat is moved via rail or truck to either a subterminal facility or to a coastal terminal facility.

Rail shipments amount to over 75 percent of the total wheat transported out-of-state. Truck shipments may increase in the near future as a result of the newly constructed barge facilities at Lewiston, Idaho.

After the wheat reaches the west coast port facility it is either exported to foreign nations or used for domestic purposes. Wheat leaving the U.S. export facility by way of ocean ship constitutes the final leg in the relevant market system.

Currently, throughout the wheat marketing system no attention

is paid to the separation of T.C.K. smut-free and smut-infected grains. Given that T.C.K. contamination does occur throughout the present system, an effective solution to the problem must begin at the farm and continue throughout the entire marketing process. A smut-free system could be incorporated into the wheat marketing system in a manner perhaps closely resembling the current process by which hard red spring wheat is kept separate from winter and durum wheat.

To determine the feasibility of a system capable of maintaining the identity of smut-free wheat, the costs of the present wheat marketing system must be determined in order to estimate the expected increase or change in costs associated with an alternative marketing procedure.

Farm Truck Transportation Costs for Present Wheat Marketing System

The initial cost to be analyzed is the expense the farmer incurs for moving harvested grain to a local elevator. This factor must be estimated so that each individual farmer can make an estimate of the increase in costs which may accrue as a result of the need to change routes to different storage locations. This factor will primarily affect farmers in those areas where T.C.K. is present, but whom have non-contaminated wheat which they wish to market. This cost will vary by individual operations and the type of truck used.

Most wheat deliveries made to local in-state elevators are made by farmer owned and operated trucks, therefore, costs of a 2 1/2 ton farm truck with a 275-300 bushel capacity will be estimated. Total fixed and transfer costs will not change as a result of changes in hauling distances. Only variable costs and the changes in variable costs per mile need to be estimated. Variable cost per mile is calculated as the sum of fuel, labor, tire and maintenance cost.[10]

Fuel cost per mile is equal to the cost per gallon of gas divided by the average miles per gallon of a farm truck. An average of 7 miles per gallon for a 2 1/2 ton farm truck and an average cost of bulk gas at 55 cents per gallon were used to determine this cost. Thus the approximate fuel cost per mile is equal to $.078.

Labor cost per mile is equal to the average hourly wage rate of farm labor divided by the estimated average speed of a farm truck. Using an average wage rate of $2.20 per hour and an average speed of 30 miles per hour, the labor cost per mile is equal to $.073.

Tire cost per mile is equal to the cost of a new tire divided by the expected total miles traveled per tire, times the number of tires per truck. Using an estimated new cost per tire of $100.00

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[10]An Efficient Organization of the Montana Wheat Marketing System, by Dr. Gail Cramer and Dr. Michael Copeland, Montana Agricultural Experiment Station, Montana State University, Bulletin 667, page 16.

and an expected tire life of approximately 30,000 miles, and an average of six tires per truck we obtained a tire cost per mile of $.02.

Maintenance cost is assumed to be approximately 5 percent of the new truck cost per year. Using an average truck cost of $7,500.00, the maintenance cost is $375.00 per year. The maintenance cost per mile is equal to the maintenance cost per year divided by the miles per year traveled which was estimated at 3,000 miles per year. The maintenance cost per mile therefore, is equal to $1.25.

By combining these component costs per mile we obtain the variable cost per mile which is equal to $.078 + $0.73 + $.020 + $1.25 = $2.96. Unloading or transfer cost for labor is equal to about $.37 for 10 minutes or .0014 per mile. Thus, assuming an average of 30 miles round trip to elevator and a 300 bushel capacity the cost per bushel is equal to $.37 + .296 x 30/300 or $.031 per bushel.

Present Storage and Handling Costs for Country Grain Elevators

After wheat leaves the farm or farm storage facilities it is transported to a local elevator or subterminal facility and is stored until an arrangement is made for sale and shipment to a coastal terminal facility, etc. The cost of the local in-state

elevator must be estimated in order to determine the difference in costs which will accrue to these elevators associated with storage and handling requirements for T.C.K. smut-free wheat. Costs will be estimated using two procedures, an estimated weighted average replacement and an estimated book value cost per bushel. The replacement cost method which represents the present construction or replacement costs will be used because it represents the actual costs which are incurred by someone presently trying to enter the industry. The book value cost method was also used as well, because it shows the costs incurred by those currently operating within the industry. The procedures involved in handling and storage of wheat are almost identical among the various classes, therefore, these two methods should give a close estimate of the actual costs for both assumptions. Data from cost studies conducted by the Economic Research Service (E.R.S.) were used as a base to determine the relevant current cost figures adjusted for inflation.[11]

A summarization of the total costs for both local elevators and port terminals is presented in Table 6.4 for fiscal 1973/74 and 1974/75.

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[11]Cost of Storing and Handling Grain in Commercial Elevators, Studies for 1970/71, 1971/72, 1972/73, 1973/74 and 1974/75. U.S.D.A. E.R.S. 475, 501 and 513.

Because there is little or no receiving or loading out from country-elevators by water in the western region, particularly in Montana, the total elevator cost for the region was estimated using only truck and truck and rail for receiving and loading out expenses respectively.

The average handling and storage costs per bushel for country elevators in the western region during fiscal 1974/75 was estimated to be 26.5 cents according to the E.R.S. study. The western states were slightly more than ten percent higher than the national average. The national percentage increase in total costs for country elevators from fiscal 1973/74 to fiscal 1974/75 was 6.1 percent, but the Western region was 10 percent higher or approximately 6.7 percent which was due to the added use of trucks in loading out procedures. Table 6.1 shows the estimated cost figures for fiscal 1975/76 assuming a 6 percent rate of cost increases from fiscal 1974/75, which is down slightly as a result of both a decrease in the inflation rate and an increased volume of grain handled. This estimated percentage increase in costs is somewhat insignificant because for example, the difference in total costs as the percentage changes from 6 to 7 percent is only a quarter of a cent. These figures will also vary depending upon the quantity of grain handled and the cost determining method used. If less grain is marketed than predicted, the average cost figures will be higher and if more grain is marketed the average

cost figures will be lower. This effect is due to the presence of certain economics of size and decreases in excess storage capacities etc. It is important to note that although these costs will vary from projected costs over a range of different volumes handled, they are close approximations and may be used to show the estimated changes in costs resulting from T.C.K. smut controls. Given that there has been increased production from previous years, these costs will probably be slightly lower than estimated as a result of the increased flow of grain during fiscal 1975/76. Although the volume handled is expected to be higher, it will probably not be sufficient to offset the increased costs due to rising costs of inputs.

The table indicating costs is representative of average present costs associated with the operation of a country elevator for the Western region of the U.S. and may vary slightly from actual Montana elevator costs. Montana elevator costs may also vary slightly from these cost figures as a result of increased volumes handled which was higher than fiscal 1974/75.

Summarizing Table 6.1, using the replacement cost method, the total cost per bushel for fiscal 1975/76 is 27.946 cents while using the book value to estimate the costs results in a total cost per bushel of 19.115 cents. The total cost per bushel using the replacement cost method is just over 30 percent higher than the

Table 6.1

Country Elevators: Weighted Average Book and Replacement Costs per Bushel for Storing and Handling Grain In the Western States, Fiscal 1975/76

Cost Item	Received by--	Loaded out by--		
	Truck	Truck	Rail	Storage
		Cents		
Fixed costs				
Building & equipment				
Insurance	.022	.032	.038	.820
Taxes	.033	.051	.055	1.379
Leases	.018	.024	.023	.664
Depreciation[1]				
Book	.153	.220	.201	2.098
Replacement	.234	.340	.394	5.191
Interest on investment				
Book	.028	.036	.030	.984
Replacement[2]	.140	.198	.226	6.587
Licenses & bonds				.174
Total fixed cost				
Book[3]	.254	.363	.347	6.119
Replacement[4]	.429	.621	.713	14.151
Variable costs				
Direct Labor	.808	.765	1.056	1.660
Administrative Overhead	.604	.587	.563	1.247
Electricity, heat, etc.	.096	.143	.149	.087
Truck expenses	.140	.228	.125	--
Building repairs	.004	.006	.005	.677
Equipment repairs	.131	.185	.215	.103
Insurance on grain	--	--	--	.654
Taxes on grain	--	--	--	.154
Fumigation	--	--	--	.163
Other[5]	.276	.341	.343	.217
Interest on working capital[6]	.039	.049	.055	.157
Total variable cost	2.098	2.304	2.511	5.119
Total cost per bushel				
Book	2.352	2.667	2.858	11.238
Replacement	2.527	2.925	3.224	19.270

[1] Standardized depreciation rates applied to book acquisition cost of capital assets and to the 1974/75 replacement cost of elevator assets.

[2] Calculated at 8.0 percent of one half of the 1974/75 replacement value of buildings and equipment.

[3] Includes all fixed cost items.

[4] Excludes lease costs.

[5] Includes such items as supplies, audit, legal, and protective services, dues, subscriptions, travel, advertising and donations.

[6] Calculated at 7.0 percent of one-fourth of the total out-of-pocket cost.

Source: Cost of Storing and Handling Grain in Commercial Elevators, U.S.D.A., E.R.S. - 513.

book value method.

Present Costs for Transporting Wheat Between Montana Country Elevators and West Coast Port Terminal Facilities

A study conducted by the U.S.D.A., Statistical Reporting Service (S.R.S.) indicated that a substantial percentage of the wheat shipments out of Montana are made by rail, (amounting to over 75 percent of the total) and that only a small percentage of those made by truck go all the way to the West Coast.[12] Therefore, the cost per bushel for transporting wheat will be estimated for rail only. A certain percentage of wheat leaving Montana is delivered by truck to the barge facilities at Lewiston, Idaho, but this percentage is still much lower than the percentage rail shipments. Assuming that the differential between truck-barge rates and rail rates will remain small, it is assumed that only rail transportation will be used to market Montana wheat. Rail cars have an advantage in that the wheat loaded into a rail car all comes from the same relatively small area and can be identified at the loading point. Therefore, if grain is free of T.C.K. smut when loaded, it will be clean when it arrives at the terminal if the cars are initially clean. In the previously mentioned Pathology Department

[12]Montana Department of Agriculture and S.R.S., U.S.D.A., Montana Wheat Movement Summary - 1975.

study some rail cars were analyzed. Little T.C.K. contamination was found. This may indicate that rail cars are not difficult to clean adequately, particularly, the metal hopper cars.

Cleaning cost is the most crucial cost to be analyzed because other rail costs should not change significantly in response to T.C.K. smut controlling procedures. These cleaning costs will be included with elevator costs as cars have to be cleaned at the elevator. Minor rerouting of cars and some changes in handling techniques may be necessary, but these procedures should be no different than those already used for handling various types of small grain classes.

Table 6.2 gives an estimated cost per cwt and per bushel to ship wheat via railroad from various smut-free locations in Montana to the Pacific Northwest.

Present Storage and Handling Costs for West Coast Port Terminals

Port terminal costs were estimated in the same manner as the country facilities, by using the relevant E.R.S. studies. According to the E.R.S. study for fiscal 1974/75, estimated average handling and storage costs per bushel for West Coast port terminals was 35.4 cents, approximately 20 percent higher than the U.S. average. Western area costs were estimated using truck, rail and water receiving costs and rail and water loading out costs where as the

TABLE 6.2

Rail Rates in Cents per cwt. for Shipping Wheat to Pacific Northwest ports from Various Montana Cities[1]

Location	Cents per Bushel	Cents per cwt.
Sunburst	70.5	117.5
Shelby	67.0	112.0
Chester	69.0	115.0
Hingham	70.5	117.5
Havre	70.5	117.5
Big Sandy	69.0	115.0
Chinook	72.5	121.0
Harlem	74.5	124.0
Hodgeland	83.5	139.0
Loring	83.5	139.0
Malta	78.5	131.0
Saco	81.0	135.0
Glasgow	85.5	142.5
Wolf Point	87.5	146.0
Scobey	90.0	150.0
Opheim	90.0	150.0

[1]Includes only those cities where freight rates to the Pacific Northwest are less than to the East.

Source: Railroad Export Freight Rates - Montana Department of Agriculture: Rate Book number 2.

U.S. figure excluded the use of water in receiving and the use of rail for loading out. Although a small percentage of grain shipments are delivered by truck to the terminals from local coastal areas, the greatest percentage of shipments particularly from Montana are made by rail. Most of the truck shipments originating in Montana come from Western and North Central areas which are contaminated with T.C.K.

Estimated total terminal costs for fiscal 1975/76 were adjusted using a 6 percent rate of increase from the 1974/75 E.R.S. study. Table 6.3 shows the estimated cost for fiscal 1975/76. This table is representative of the weighted average book value and replacement costs associated with the operations of a West coast export terminal facility. These costs are dependent upon the same forces as the costs of the country elevators including volumes handled. Again, as indicated, these costs were estimated using both replacement cost and book value cost methods. The appropriate changes in costs will be added to the figures to determine the total cost changes.

Using the replacement cost method, the total cost per bushel is 37.595 cents while total cost per bushel using the book value method is 19.896 cents. Here again, the total cost using the replacement method is approximately 47 percent higher than the total cost under the book value method.

Table 6.3

Port Terminals: Weighted Average Book and Replacement Costs per Bushel for Storing and Handling Grain In the Western States, Fiscal 1975/76

Cost Item	Received by--			Loaded out by--		
	Truck	Rail	Water	Rail	Water	Storage
	cents					
Fixed costs						
Building & equipment						
Insurance	.016	.015	.016	.020	.007	.615
Taxes	.037	.028	.010	.040	.010	1.146
Leases	.105	.071	.130	.055	.060	3.969
Depreciation[1]						
Book	.066	.069	.046	.064	.030	1.221
Replacement	.839	.568	.233	.851	.218	8.656
Interest on investment						
Book	.019	.022	.014	.015	.008	.665
Replacement[2]	.442	.313	.135	.467	.133	11.473
Licenses & bonds	--	--	--	--	--	.077
Total fixed cost						
Book[3]	.243	.205	.216	.194	.115	7.693
Replacement[4]	1.334	.924	.394	1.378	.368	21.967
Variable costs						
Direct labor	.713	.800	.714	.898	.415	2.125
Administrative overhead	.208	.150	.099	.250	.141	.776
Electricity, heat, etc.	.120	.071	.059	.087	.035	.106
Truck expenses	.008	.006	.004	.006	.006	--
Building repairs	.004	.002	.001	.003	.002	.582
equipment repairs	.141	.076	.087	.094	.050	.117
Insurance on grain	--	--	--	--	--	.536
Taxes on grain	--	--	--	--	--	.040
Fumigation	--	--	--	--	.032	.043
Other[5]	.094	.270	.502	.265	.137	.140
Interest on working capital[6]	.022	.023	.025	.028	.014	.103
Total variable cost	1.310	1.398	1.491	1.631	.832	4.568
Total cost per bushel						
Book	1.553	1.603	1.707	1.825	.947	12.261
Replacement	2.644	2.322	1.885	3.009	1.200	26.535

[1]Standardized depreciation rates applied to book acquisition cost of capital assets and to the 1974/75 replacement cost of elevator assets.

[2]Calculated at 8.0 percent of one half of the 1974/75 replacement value of buildings and equipment.

[3]Includes all fixed cost items.

[4]Exclude lease sosts.

[5]Includes such items as supplies, audit, legal, and protective services, dues, subscriptions, travel, advertising and donations.

[6]Calculated at 7.0 percent of one-fourth of the total out-of-pocket cost.

Source: Cost of Storing and Handling Grain in Commercial Elevators, U.S.D.A., E.R.S. - 513.

TABLE 6.4

Weighted Average Total Costs per Bushel for
Storing and Handling Grain in Western County Elevators

	Received by--		Loaded out by--	
Year	Truck	Truck	Rail	Storage
		cents		
1973/74[1]	2.308	2.677	2.951	16.814
1974/75[2]	2.385	2.761	3.043	18.179

Weighted Average Total Costs per Bushel for
Storing and Handling Grain in Western Port Terminals

	Received by--			Loaded out by--		
Year	Truck	Rail	Water	Rail	Water	Storage
			cents			
1973/74[1]	2.422	2.122	1.711	2.759	1.092	24.028
1974/75[2]	2.495	2.192	1.788	2.840	1.131	25.034

[1]Cost of Storing and Handling Grain in Commercial Elevators, Projections for 1973/74. U.S.D.A. E.R.S.

[2]Cost of Storing and Handling Grain in Commercial Elevators, Projections for 1974/75. U.S.D.A. E.R.S.

Summarization of the Cost of the Present Wheat Marketing System from Farm Truck to Export Terminal

Total costs for the present system were computed by summing the component costs throughout the system.

The total cost per bushel from farm truck to port terminal is equal to:

Truck cost	+ Elevator	+ Rail	+ Port Terminal	= Total
$.031	+ $.279	+ $.80	+ $.376	= $1.486 Replacement
$.031	+ $1.91	+ $.80	+ $.199	= $1.221 Book Value

Estimated Cost Changes in Present Grain Marketing System Resulting from T.C.K. Smut-Free Wheat Identity Maintenance

Determination of the present costs was essential to be compared with the expected benefits which will occur as a result of maintaining a smut-free system.

One change in cost to farmers will result from varying transportation routes from farm bins to country elevators or other unloading facilities. The change in cost will be dependent upon the extent of the change in distance traveled. The total change in cost can be determined by multiplying the average cost per mile per bushel for a farm truck as developed earlier in this chapter times the change in the number of miles necessary to transport grain to smut-free facilities. This cost will vary among producers depending upon their location, ranging from no change to those within

the smut-free area to a change close to the net benefit for others farther from smut-free storage and shipping locations. This cost increase must be determined by each individual producer in order to decide where to deliver their wheat.

Another cost to the farmer will be a sample testing cost to analyze grain particularly grain from areas near the smut-free boundaries or for grain from outside these boundaries. This cost is small, amounting to approximately $1.50 to $2.00 per sample tested. At least two samples must be taken from each 2 1/2 ton farm truck (300 bushels) delivering grain from smut contaminated areas. At a cost of $2.00 per sample tested, the cost to the farmer is approximately $.013 per bushel for each truckload tested. The $2.00 cost per test includes both the cost of the labor involved in testing and the attributable portion of the original acquisition cost of the testing equipment. The initial cost of this equipment is approximately $1,000 and includes a centrifuge, microscope and other peripheral equipment. The actual time necessary to conduct the test for T.C.K. smut takes approximately 15 minutes from the time the samples are taken from the truck. To reduce congestion at the elevator, it would be better if testing were done just prior to harvest or at least prior to shipping from the farm, the time delay would be minimal this way. In areas where T.C.K. is known to exist, the pre-shipping test process will be required for farmers

to determine the possibility of selling as T.C.K. smut-free grain. For this process to be effective each boundary line elevator must purchase and use the equipment. These costs will vary by producer and will have to be analyzed by the farmer to determine whether or not he will benefit by selling smut-free wheat.

The change in cost at the country elevator will be estimated under the assumption that these facilities will not require additional building for storage, but merely adequate cleaning and more separation of existing space. Consequently, the only actual cost increases will stem from the previously determined cost for testing equipment and procedure, fumigation or cleaning (including rail cars) and separation requirements.

Most of the country elevators within the smut-free region will test only grain from locations that are known to contain T.C.K. smut. If T.C.K. smut is found in an incoming truckload, that shipment and other shipments from that area must be stored and shipped with other smut-infected grain. This problem should only occur at elevator locations near the boundary of the smut-free region. Each elevator handling T.C.K. smut-free grain must clean and maintain separate facilities if their present facilities are contaminated or if they handle both T.C.K. smut-free and infected grain. Again, this should only be necessary at elevator locations which are near the smut-free boundary. Elevators within

the smut-free region have previously been tested and found to be free of the T.C.K. contamination.

The change in costs will now be estimated and broken down into the various cost factors involved. An estimated through put of 600,000 bushels per year for Montana country elevators will be used in determining the per bushel change in costs. Costs will increase due to a need for 20 hours per week additional labor requirements at $2.50 per hour or .440 cents per bushel. Additional cleaning and separation requirements amount to .163 cents per bushel. Other incidental costs increases including testing and water amounted to .108 cents per bushel. Therefore the estimated total change in costs range from zero for non-infected locations to a maximum .711 cents per bushel for areas on or near the smut-free boundary.

It was estimated that on the average, rail cars hold 2,500 bushel of wheat each, which means an average of 240 rail cars are loaded each year at each country elevator. Again, the previously estimated total change in costs included the cost of cleaning rail cars. A thorough vacuuming or washing should be the most effective means of cleaning and removing old grain and dust from wooden box cars and metal hopper cars respectively. The labor requirements should average approximately 1/2 hour per car.

Rail transportation costs will be assumed to remain unchanged.

Rail facilities must be careful to mark rail cars to insure the identity of the smut-free grain. This may be done in the same manner as barley and spring wheat are kept separate from winter wheat.

The final cost changes will occur at the port terminal facilities. The same assumptions regarding building etc. will be made as in the case of the country elevator so that the only costs are fumigation or cleaning and separation. This cost change has also been broken down into the component changes. An annual throughput of 25 million bushels was estimated and used to determine the average per bushel change in costs. Costs were estimated to increase .100 cents per bushel due to additional labor requirements of 80 hours per week at $5.00 per hour. Cleaning and separation requirements will cause an increase of .080 cents per bushel. Other cost increases for water and testing amounted to .280 cents per bushel. Therefore, the total change in cost is estimated at approximately .460 cents per bushel.

Care must be taken when shipping from these port facilities, to use non-contaminated equipment to load non-contaminated ships. Ships may become contaminated from prior shipments and they must be tested before loading of T.C.K. smut-free wheat is permitted. If the P.R.C. contracts for its own ships (which is most likely

the case), then it will be their responsibility to insure the use of clean ships.

By summing the individual cost increases and adding them to the original replacement cost estimate the total cost estimate from farm truck to the export facility is $1.498 per bushel at the maximum and will be reflected in the price received by the farmer. Therefore, total change in cost excluding farm transportation and testing costs (which will vary among producers particularly those outside the smut-free boundary) will be approximately $1.498 - $1.486 or 1.2 cents per bushel at the maximum. This assumes the highest possible change in cost to the country elevator closest to the smut-free boundary. For the individual farmer on the boundary or within the smut-infected area where testing will be required of each producing field or truckload the resulting increase in costs will range between 1.2 cents and 3 cents per bushel. This estimate will probably be low however if additional construction is necessary to separate T.C.K. smut-free wheat.

In the final chapter, this cost change will be compared with the probable price benefits to determine if a net benefit can be achieved for the Northwest grain producers.

Chapter 7

OCEAN FREIGHT RATES, AVERAGE EXPORT WHEAT PRICE AND THE ESTIMATED CHANGE IN PACIFIC NORTHWEST EXPORT WHEAT PRICE

Three items remain to be computed prior to a conclusion regarding the profitability of Pacific Northwest T.C.K. smut-free wheat sales to the Peoples Republic of China.

Ocean transportation freight rates from both Gulf and Pacific ports will be compared to determine what difference exists between the transportation costs out of these ports to the P.R.C.

After determining the average export price of wheat for both the Pacific Northwest and Gulf regions, the resulting change in wheat price due to P.R.C. exports will be estimated. In conclusion, the expected Pacific Northwest price will be compared with the previously determined change in costs for the Northwest marketing system to determine the total benefit or loss attributable to maintaining the identity of T.C.K. smut-free wheat.

Estimated Ocean Freight Rates to the P.R.C. from Gulf and Pacific Northwest Ports

The initial factor to be estimated entails the difference in ocean transportation rates from the port of loading to the final destination in China. After determining these rates the final cost factor can be analyzed. The transportation rates from Gulf

and Pacific Northwest ports are shown in Table 7.1 for a typical one month period for two destinations, Japan and Bangladesh. Data on imports to the P.R.C. were not available, but by its position between these two destinations an estimation can be made.

TABLE 7.1

Ocean Freight Rates for Wheat on Selected Routes

To	From	U.S. Dollars/Ton[1] Oct. 5 76	Oct. 12 76	Oct. 19 76	Oct. 26 76
Japan	Gulf	14.80	14.80	14.80	14.80
	Pacific	14.00	14.00	13.80	13.80
Bangladesh	Gulf	17.00	17.00	17.00	17.00
	Pacific	14.80	14.80	14.80	14.80

[1]Converted from long ton prices.

Source: International Wheat Council (Wheat Market Report) Press Release PMR. 55 Oct. 1976 Appendix Table 7.

The estimated average ocean freight rate to the P.R.C. out of the Gulf ports is $15.75 per ton and $14.50 per ton out of the Pacific ports, a difference of $1.25 per ton. This means that the P.R.C. could save approximately $1.25 per ton or 3.8 cents per bushel by purchasing grain from the Pacific Northwest rather than from the Gulf ports.

During the 1973/74 period, China purchased over 105 million bushels of wheat from the United States Gulf and Pacific ports. Of this total, 77.7 million bushels were hard red winter wheat. If China were to purchase this entire amount from the Pacific Northwest, they would save over $3.99 million on transportation costs alone. This may lead China to purchase from the Pacific Northwest if they can obtain the desired smut-free wheat.

Average Export Wheat Price for Gulf and Pacific Ports

Average export prices for hard red winter wheat at Pacific Northwest and Gulf ports are shown in Table 7.2 for years, 1973/74 and 1974/75. Note, the difference between the average exports prices as estimated was only (.01) one cent per bushel, the Pacific Northwest price being one cent higher. This difference reduces the Pacific Northwest advantage to the P.R.C. by approximately 1.05 million dollars on the total quantity. However, the P.R.C. still receives a cost advantage of 2.94 million dollars on the total 105 million bushels.

All these variables will vary from time period to time period, but during the period 1973/74 and 1974/75, the results indicate favorable factors which would have led China to making its purchases from the Pacific Northwest had the T.C.K. smut not been important.

TABLE 7-2

Average Monthly Export Wheat Price for
U.S. No. 1 Hard Red Winter Wheat

Month and Year	Houston Exchange	Portland Exchange
	(dollars/bushel)	
July 1973	3.07	3.25
August 1973	4.79	4.84
September 1973	5.13	5.15
October 1973	4.25	4.75
November 1973	4.84	4.78
December 1973	5.48	5.27
January 1974	5.76	5.76
February 1974	5.87	6.04
March 1974	5.17	5.37
April 1974	4.18	4.21
May 1974	3.70	3.77
June 1974	4.16	4.11
July 1974	4.58	4.65
August 1974	4.54	4.55
September 1974	4.54	4.59
October 1974	5.12	5.19
November 1974	5.57	5.17
December 1974	5.43	5.02
January 1975	4.39	4.49
February 1975	4.17	4.19
March 1975	4.05	4.00
April 1975	3.87	3.90
May 1975	3.56	3.48
June 1975	3.47	3.34
Average Export Price	4.57	4.58

Source: Agricultural Marketing Service U.S.D.A., Grain Market News (various weekly summaries).

Estimated Pacific Northwest Export Wheat Price Increase Resulting from P.R.C. Exportations

An appropriate estimation of the corresponding effect on the price of wheat given a change in export demand will now be developed. The resulting Pacific port benefit or export price increase is constrained to a maximum represented by the transportation differential as estimated in Section I of this Chapter minus the exported wheat price difference or approximately 3.8 minus 1.0 or 2.8 cents per bushel. This is due to the fact that if the price goes above the Gulf price plus the transportation difference, China would then export from the Gulf ports as they would then have the price advantage. This same analysis is true of the other competing nations. Based on total world wheat export, the increase price on the world market would most likely be near zero.

It is outside the scope of this research work to estimate the individual demand curves which comprise a world demand curve for wheat. Each importing country including China has its own wheat demand curve and by summing these individual demand curves we could obtain a world demand and an equation to solve for price. It is sufficient here to state that given the P.R.C. comes into the U.S. export market it will cause a shift outward in the total demand curve for U.S. wheat. The immediate effect would be to force U.S. export price up and that price will depend on the elasticity of the

supply curve. Inevitably, supply will increase and decrease the U.S. price to the lower world price plus transportation difference. It would be an extremely rare case where U.S. export price was far out of line with world price, varying mostly by transportation cost differences.

Chapter 8

SUMMARY AND CONCLUSIONS

The purpose of this concluding chapter is to summarize and review the objectives and results obtained from this research project. Pulling the results together it is possible to gain a clearer understanding of their significance.

Summary and Conclusions

A product is differentiated if any significant basis exists for distinguishing the goods or services of one seller from those of another, making almost all products differentiated to some extent. The theory of monopolistic competition is the basic to maintaining the identity of T.C.K. smut-free wheat. By doing so, the smut-free wheat effectively becomes a differentiated product which can be sold to a particular buyer who would otherwise not purchase the particular product. Because this smut-free wheat is only differentiated to the U.S. and the Northwest region in particular and because this product can be purchased in other nations as well, price and other factors will affect actual sales. The U.S. price for smut-free wheat must be competitive with the world price or the differentiated wheat will not find a buyer for its smut-free properties.

T.C.K. smut is 100 percent destructive winter wheat disease. Although current losses from T.C.K. smut are small, this particular variety of smut is soil borne for up to 10 years, making it a long-run production problem. It appears that the most effective means of control is resistant varieties of winter wheat.

T.C.K. smut is present only at trace levels in Northwest export facilities. The P.R.C. has a zero tolerance for T.C.K. and thus the entire region is effectively excluded from this buyer.

A test which is extremely sensitive to the existence of T.C.K. smut was outlined and is presumed identical to the test used by the P.R.C. on all their incoming shipments of grain.

Production areas in the State of Montana were classified into smut-free or smut-infected areas. A large portion of the state and the facilities are free of T.C.K. smut-infestation.

An analysis of present conditions and future U.S. trade prospects was also made and it was stated that the P.R.C. may regard the U.S. as one of many suppliers in normal times, but an important or major source during hard times. This statement was substantiated by P.R.C. production, consumption and import statistics. U.S. exports to the P.R.C. and percentage of total exports were also documented for the period during which the P.R.C. imported from the U.S. It was found that the P.R.C. actually did discontinue purchases from the Northwest ports prior to their complete withdrawal from U.S.

markets which reflects the T.C.K. problem. During the one and a half year period that the P.R.C. imported from the U.S., their purchases amounted to 7.78 percent of the total U.S. wheat exports.

Future timing of purchases by the P.R.C. are uncertain and will depend upon internal conditions of that nation. However, over the long-run, it seems inevitable that the P.R.C. will return to the U.S. as an important import source.

Based on 1975 production statistics, it was estimated that Montana could supply approximately 35-40 percent and 75 percent of the potential Chinese import demands for hard red winter and hard red spring smut-free wheat respectively. These percentages were based on the quantity of wheat shipped out of Montana by rail. These figures show that Montana alone cannot supply the total potential purchases made by the P.R.C. Smut-free wheat from other states must be identified and combined to meet the total requirements.

The current wheat marketing system was described, then the costs involved with the storage and handling of wheat throughout the present system were estimated. Costs per bushel were analyzed for the farm truck, country elevators, rail transportation and export terminal facilities. The derived total cost per bushel from farm truck to port terminal facility using replacement and book value methods for estimation was equal to $1.49 per bushel and $1.22 per bushel respectively.

Cost estimation was one of the most important objectives of this study. The estimated change in total costs to the Northwest marketing system (due to smut-free wheat identity maintenance) was equally important. This increase was estimated to be approximately 1.2 cents per bushel. It is this increase in costs that must be compared to the resulting price increase from Chinese export demands.

Ocean freight rates to the P.R.C. were estimated from Gulf and Pacific Northwest ports. It was determined that the P.R.C. could have gained a total cost advantage of 3.99 million dollars on 105 million bushels of wheat had it been purchased from the Pacific Northwest ports.

Average export wheat prices were also determined for a two year period and it was established that the difference between Gulf and Pacific Northwest prices was only 1 cent per bushel, the Pacific port price being the higher of the two. This meant a higher purchase cost to the P.R.C. of $1.05 million on the total quantity if purchased from the Northwest. However, when compared with the savings in transportation costs, the P.R.C. could still have saved a total of $3.99 million minus $1.05 million or $2.94 million in total cost if they purchased the entire 105 million bushels from Pacific ports. This factor in itself leads to the assumption that the P.R.C. would make their purchases from the Pacific Northwest given these ports can supply a sufficient quantity of the smut-free grain.

It was also estimated that the increase in price resulting from potential Chinese export demands of 105 million bushels was approximately 2.8 cents per bushel. This price increase will be affected by several factors including the aggregate demand function and the relationship between world and U.S. export prices and the transportation difference between Gulf and Pacific ports.

It was determined earlier that the cost increase to the Pacific Northwest marketing system (due to smut-free wheat identity maintenance) would be approximately 1.2 cents per bushel. It was also determined that price would increase by approximately 2.8 cents per bushel given a 105 million bushel increase in Pacific Northwest wheat export demands.

By comparing the difference in the two factors (price and costs) we obtain a favorable difference for the Pacific Northwest market of 1.6 cents per bushel which leads to the final conclusion that benefits could be achieved by the Pacific Northwest grain marketers if such an identity program were implemented in anticipation of P.R.C. purchases from the Northwest. It was also shown earlier that the P.R.C. would realize an initial cost advantage by purchasing from the Pacific Northwest market.

In conclusion, if the Pacific Northwest wheat marketers were to implement a marketing program to maintain the identity of T.C.K. smut-free wheat, a benefit of 1.68 million dollars could be realized

on the basis of a 105 million bushel increase in exportation to the P.R.C. To the individual producer the advantage is minimal, but to the market as a whole it is more substantial. A potential benefit is feasible, but slim however, and there are a number of marketing risks involved, including possible contamination of the wheat or a lower wheat price from competing countries. These factors may reduce or possibly eliminate the potential benefits and make such a program unrealistic. Therefore, these procedures should not be implemented until the P.R.C. makes known their intentions to purchase wheat from the U.S.

The results of this study do indicate potential benefits to be gained and may suggest other benefits could be attributable to the Northwest grain producer through identity maintenance in this and other aspects of grain marketing as well and may merit further research.

REFERENCES

REFERENCES

The Agricultural Situation in the People's Republic of China, Review of 1973 and Outlook for 1974. USDA-ERS, foreign 362, pages 6-8.

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

Cramer, Gail and Michael Copeland. An Efficient Organization of the Montana Wheat Marketing System, 1973. Agricultural Experiment Station, Montana State University, Bulletin 667, page 16.

Ferguson, C.E. Microeconomic Theory, 3rd ed. 1972. Chapter X, page 330.

Grain Market News. USDA - Grain Division, Weekly Publications, 1973-1974.

Harston, Clive R. Marketing High Protein Wheat. Montana State University, Agricultural Experiment Station, Volume 41, Bulletin 527.

International Wheat Council. Wheat Market Report, 1976. Press Release PMR 55, Appendix Table 7.

Mathre, Donald E. Presence of Dwarf and Common Smut in Montana Wheat, 1976. Department of Plant Pathology, Montana State University.

Montana Agricultural Statistics, 1974. Montana Department of Agriculture and Statistical Reporting Service USDA, Volume VX.

Montana Department of Agriculture. Railroad Export Freight Rates. Book 2, 1976.

Montana Wheat Movement Summary, 1975. Montana Department of Agriculture and Statistical Reporting Service USDA.

Schienbein, Allen G. and Carl J. Vosloh. Cost of Storing and Handling Grain in Commercial Elevators, 1971-1975. USDA-ERS, Bulletin 475, 501 and 513.

Stuart, Dale W. Inter Industry T.C.K. Research Proposal. Western Wheat Associates, U.S.A. Inc., 1976, pages 1-4.

World Agricultural Situation. USDA-ERS, Bulletin WAS-7, June 1975, page 26.

Murphy, Michael E
The benefits and costs of marketing identity preserved T.C.K. smut-free wheat ...

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