

FEASIBILITY OF AN OKLAHOMA
WHEAT MARKETING CENTER

By

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Bachelor of Business Administration

Oklahoma Baptist University

Shawnee, Oklahoma

2002

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
May, 2004

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ACKNOWLEDGMENTS

There are many people that I need to thank for helping and supporting me in all my educational endeavors. First of all, my parents, Mom, Dad, thanks for all your prayers, your worries, your encouragement, and your unconditional love. Thanks for all the good advice and for always taking the time to listen to me. I also want to thank my grandparents. Grandma and Grandpa Sager, thanks for everything. Grandma, thanks for the prayers in the middle of the night and for bragging about me to all your friends and any stranger you might have met. Grandpa, thanks for your unsuccessful efforts to get me “married off” and for the ebbing flow of “coke money”. Grandma and Grandpa Regnier, I know that you did not live to see me graduate, but the desire to honor your memory by completing this task was part of the drive that kept me going. Also, my sisters, Sarah and Shayla, thanks for all that you did for me, all pep talks, the encouragement, and feigned interest in a project that you probably don’t find nearly as fascinating as I do. And finally, my brother-in-laws and nephews. Jeremy, Brandy, Dannie, and Johnathan, thanks for your friendship and advice, your interest and your support, and for your baby talk and innocent smiles.

Dr. Holcomb, thank you for all that you did as my major advisor. Thanks for answering every question, for all your encouraging words, for your kind and patient attitude, and for all the things you taught me. Dr. Anderson and Dr. Kenkel, thanks for serving on my committee and for giving of your time to give suggestions, information,

and interest. Your help and cooperation are really appreciated. I want to say a special thanks to Gracie. Gracie, I'm sure you'll never know how many computers you've saved from certain destruction over the years by sharing your expertise in computers and formatting. Thank you to all the faculty and staff in the Department of Agriculture. Your willingness to help in anyway makes the journey a lot smoother and more enjoyable.

I wish I could take the time to thank each of my friends, both new and old. Your friendship, even if it only lasts for a time, was a gift from God. He answered many prayers for my happiness and success by sending you.

And finally, I thank God, who gave me the opportunity to do this and all of you to help me along the way. Your support and friendship is proof of His love for me and that He blesses me well beyond what I deserve. Thank you all again.

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CHAPTER 1

INTRODUCTION

The agricultural industry is part of the foundation of the United States (U.S.) economy. Not only does it employ thousands of Americans and help to feed the U.S. population, it also provides products for export. Currently, the U.S. is the world's leading agricultural exporter, with one out of every three acres planted to commodities being used for export (USDA-FAS). Wheat is the leading export crop, as well as the fourth largest field crop. The U.S. has eight classes of wheat, including soft and hard white, durum, soft red winter, hard red winter, hard red spring, unclassified, and mixed wheats (Herrman and Reed). The U. S. dominant wheat crop is hard red winter (HRW) wheat, with Kansas, Oklahoma, Texas, Colorado, and Nebraska being the leading producers (Montana Wheat and Barley Committee).

Problem Statement

The U.S. is the largest wheat exporter in the world, but the export industry is very competitive. The U. S. major competitors are Canada and Australia; however, Argentina, the European Union (EU), and the Former Soviet Union (FSU) are growing contenders for market share (USDA-FAS). To stay competitive, the U.S. must find a way to improve the current wheat marketing system in order to better satisfy the diverse needs of its end-use customers.

Since most wheat is used to produce flour, the baker is often considered the end user. Before flour is delivered to the baker, it must first pass through the hands of the producer and the miller. Unfortunately, the producer, miller, and baker may base wheat quality on different characteristics. Producers are concerned with characteristics that effect how many bushels an acre they will be able to harvest, including yield, yield stability, and disease resistant characteristics. They select the varieties to plant based on grazing and yield potential, thus producing the highest quantity to sell on the market. The miller, on the other hand, is concerned about physical characteristics such as test weight, kernel weight, kernel size, hardness, and flour yield, all of which impact the return a miller gets for each bushel of wheat milled. Finally, the baker is concerned with baking characteristic such as protein, water absorption, stability, starch damage, mixing time and tolerance, and loaf volume. These are the characteristics that will affect the quality and quantity of the final product and it is these characteristics that the baker is concerned with when buying flour. Characteristics defining quality vary greatly between the producer and the baker, which adds to the problem of delivering an end product with consistent quality (Baker, Herrman, and Loughin).

The producer is primarily concerned with wheat yield and the baker is more concerned with flour quality, which leaves the miller in the middle trying to bridge the gap. In order for millers to satisfy the baker, they cannot overlook the quality characteristics that are the most important in wheat flour products. To serve both the domestic and foreign millers, HRW wheat handlers need to be able to predict the end-use characteristics of the wheat in their bins. At this time, Oklahoma's producers and country elevators do not have the capability to quickly assess and provide information about what

kind of flour their wheat will produce (i.e. baking quality). Another obstacle for producers wanting to market wheat based on functionality is providing enough quantity to fill a contract. If an elevator manager lacks the critical mass specified in a contract, the contract cannot be taken.

Delivering the specified quality and quantity of wheat are not problems unique to the HRW wheat producing region. Producers in the Pacific Northwest (PNW) were faced with similar circumstances as they strove to market more white wheat to Pacific Rim countries. In order to add value to their product, Pacific Northwest producers developed the Wheat Marketing Center (WMC) in Portland, Oregon to focus on quality related issues. The WMC facilities are equipped to test wheat for flour and baking characteristics. Although the WMC never takes possession of the wheat, it has the resources necessary to provide buyers with information about the specific quality attributes of available wheat. This information provides millers with the assurance that the grain they are buying is the product they need. The WMC also educates current and potential customers about the advantages of the PNW wheat in hopes that this education will increase trade.

Oklahoma has not traditionally marketed its wheat based on end-use characteristics; therefore a need for a private wheat marketing center has not been evaluated. Interest has been expressed in developing a marketing center for this region if it would help the Oklahoma wheat producers and handlers. In order to have a successful center, grain companies, elevator owners, and producers would need to be convinced of its feasibility and benefits.

This research will try to determine the appropriate structure, costs, and benefits of an Oklahoma-based marketing center in order to increase the price and volume of Oklahoma wheat traded domestically and abroad.

Objectives

The general objective of this study is to develop a feasibility model for increasing the amount of quality-specific Oklahoma wheat traded domestically and abroad through a wheat marketing center. The specific objectives are to:

1. Research the business structures and operational characteristics of other U. S. wheat marketing entities.
2. Determine the most appropriate business structure for the proposed wheat marketing center.
3. Estimate the start-up and operating costs of a marketing center, including quality testing, renting facilities, maintaining a schedule of educational workshops, and staffing cost.
4. Assess the possibility of elevator managers using test grade and non-grade quality characteristics to segregate incoming wheat by flour and dough properties by determining correlation between quality characteristics and flour and dough properties.

Literature Review

U. S. Wheat Market

The U. S. is the largest individual country that exports wheat, followed by Canada and Australia. Other major wheat exporters include the EU and the FSU, as well as Argentina. Figure 1 illustrates how total world exports increased from nearly 44 million metric tons in the 1960/61 marketing year to over 108 million metric tons in the

2001/2002 marketing year. Figure 2 shows how the market share for the U. S., Canada, the EU, the FSU, and Argentina has varied over the last four decades. Both worldwide wheat consumption and U. S. wheat exports showed an increase during the first two decades of the data. As wheat consumption increased, so did U. S. wheat exports. Total quantity of U. S. wheat exported peaked in the 1981/82 marketing year, with just over 48 million metric tons exported, which was 45% of the market at that time. However, the U. S market share had peaked at in a previous marketing year, reaching 50% of the wheat export market in 1973/74 (USDA-FAS).

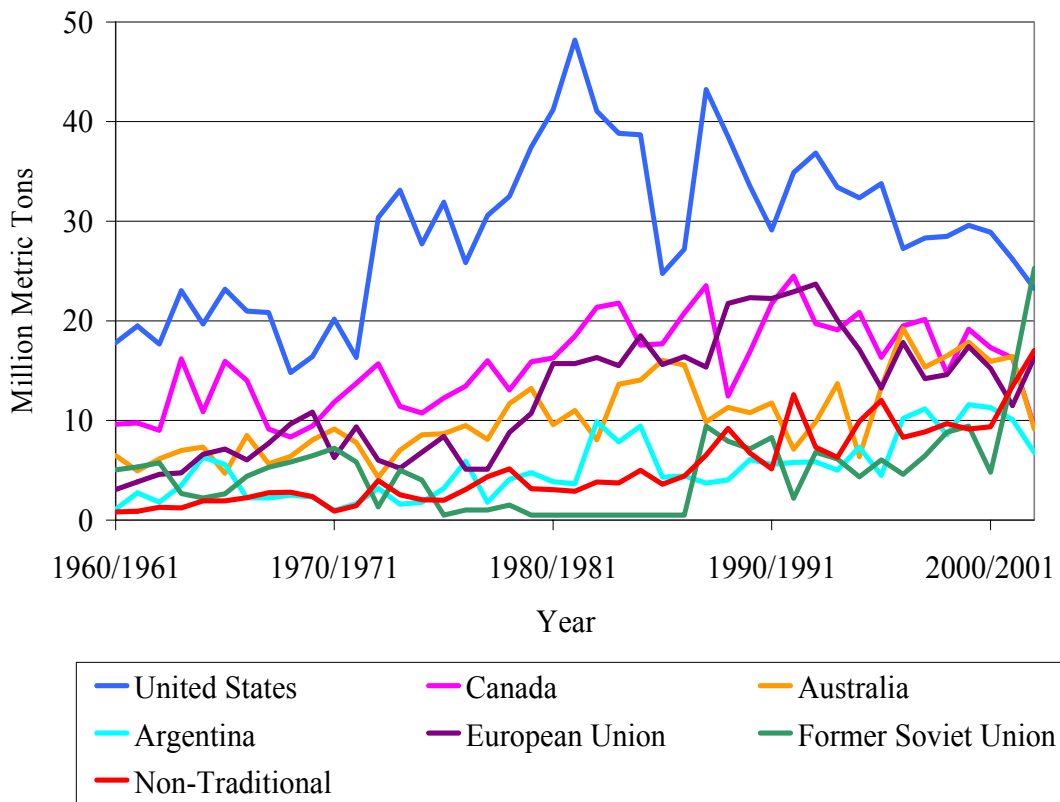


Figure 1. Wheat Export Levels by Country

Source: Production, Supply & Distribution (USDA FAS, 2003).

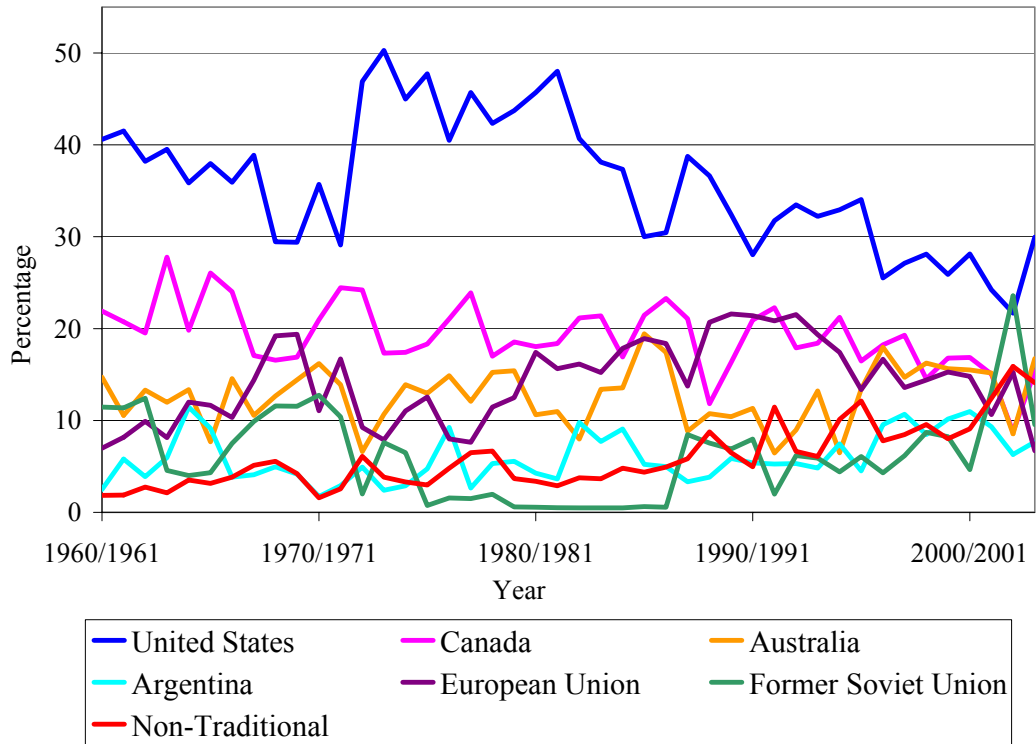


Figure 2. World Export Market Share Trends

Source: Production, Supply & Distribution (USDA FAS, 2003)

Overall, the 1980s and 1990s resulted in a decrease both in U. S. exports and market share. Although total wheat exports have more than doubled since the 1960s, the current U. S. exports level barely exceeds what it was in the 1960s and early 1970s. Table 1 takes a closer look at how the U. S. percentage of market share has declined and which countries have been absorbing the U. S. market share. In the 1960s, the U. S. averaged 36.73% of the market share. During the 1970s, the average market share increased to 42.97%. The 1980s market share declined to 37.81%, and continued to decline, resulting in 29.91% market share for the 1990s.

Table 1. Average Market Share of Wheat Exports by Decade for Leading Countries

Decade	United States	Canada	Australia	Argentina	European Union	Former Soviet Union	Other
1960s	36.73	21.04	12.38	5.58	12.02	8.86	3.40
1970s	42.97	20.12	12.95	4.24	11.41	4.19	4.11
1980s	37.81	18.99	12.33	5.77	17.56	2.66	4.89
1990s	29.91	18.61	12.44	7.16	17.39	5.99	8.51

Source: Production, Supply & Distribution (USDA FAS, 2003).

Since the 1960's, the U. S., Canada, and the FSU have lost market share, 6.82%, 2.43%, and 2.87% respectively. Australia's market share held steady, with a gain of only .06%. However, both Argentina and the EU's market share have steadily increased since the 1960s when they had 5.58% and 12.02%, respectively, to an average of 7.16% and 17.39% in the 1990s. Market share for all other countries exporting wheat also increased, from 3.40% in the 1960s to 8.51% in the 1990s.

As can be seen from Table 1, Canada and Australia are the U. S. biggest single export competitors, but they may not responsible for the decline in market share. Figure 3 depicts the steady downward trend in U. S. export market share, mirrored by a steady increase in non-traditional exporters' market share. The quantity exported by non-traditional exporters, including Russia, India, Pakistan, and China, fluctuate year by year, but are ever increasing. In 2001, Eastern Europe had one of their largest harvests on record, which allowed them to flood the market with grain, some of it at a low quality for a very low price. This trend continued through the 2002/2003 marketing year, however a change has been predictions for 2003/2004 marketing year. World wheat stocks are down, plus production is down in the EU and several of the non-traditional wheat

producing countries. With higher production and lower stocks, the U. S. has an opportunity to regain some market share this year's production (Waller, Johnston).

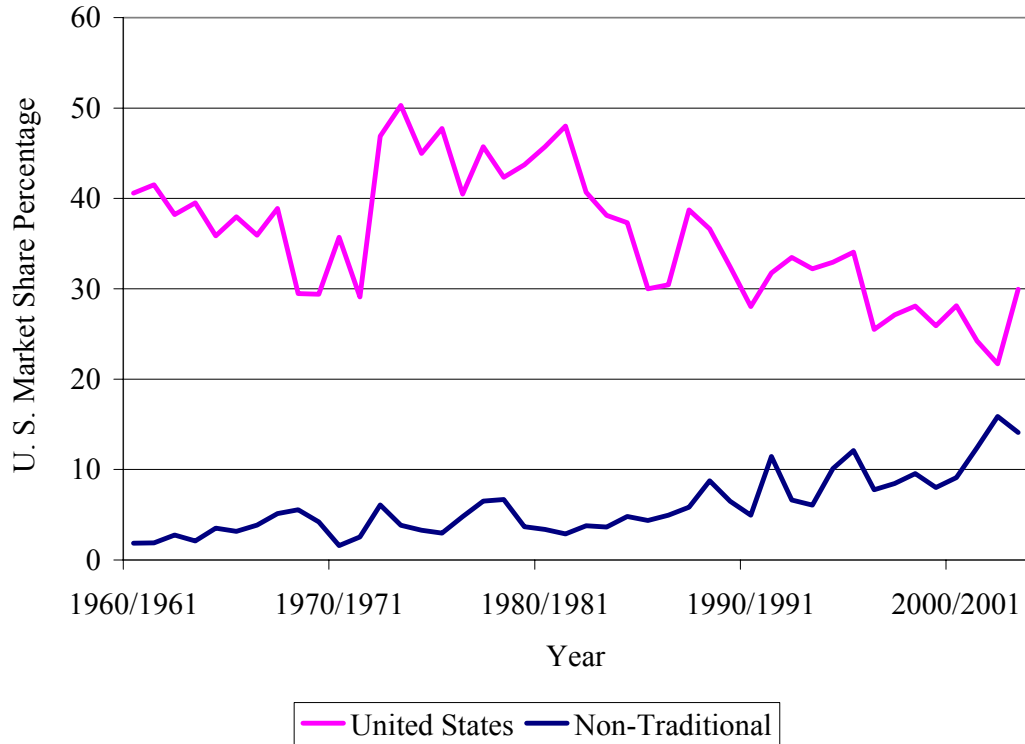


Figure 3. Comparison of U. S. and Non-traditional Exports Over Time
 Source: Production, Supply & Distribution (USDA FAS, 2003).

Increase in HRW Wheat Export

Although the U. S. market share and overall quantity of wheat exports have declined, exports of HRW wheat to sub-region of Mexico, Central America, Venezuela, and the Caribbean have increased (Figure 4). Mexico's import of HRW wheat has grown drastically, becoming the third largest importer for U.S. wheat, ranked behind Egypt and Japan for the 2001/2002 marketing year. Mexico accounted for 50.4%, or 2.21 million metric tons, of U.S. wheat imported to that sub-region in 2001/02. That is up from 1.1%,

or 21 thousand metric tons, in 1985/86. Of the 2.21 million metric tons of wheat shipped in 2001/02, 43% was hard red winter (HRW) wheat. Although Mexico's growth has been more significant than other countries, it is important to realize that both Central America and the Caribbean have had an overall increase in U. S. imports (U.S. Wheat Associates, USDA FAS).

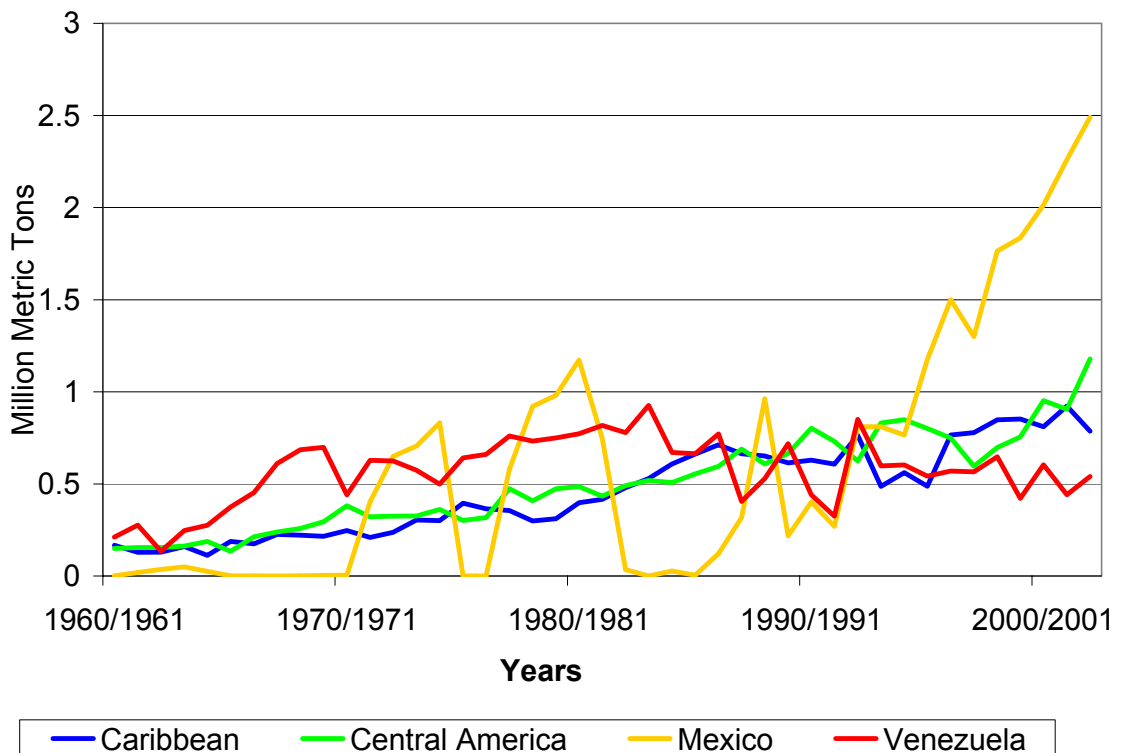


Figure 4. Import Trends

Source: Production, Supply & Distribution (USDA FAS, 2003).

Increase in exports to Mexico has been attributed to the signing of trade agreements and the decline of state trading enterprises (STE). The North America Free Trade Agreement (NAFTA) was signed in January 1994 and was designed to increase the integration of the U. S., Canadian, and Mexican economies. Whether or not NAFTA has been beneficial for the U.S. economy is debatable, but the fact is that agricultural exports have increased since its signing. U. S. agricultural exports to Mexico doubled since

NAFTA was signed, going from \$3.6 billion in 1993 to \$7.23 billion in 2002. In 2002, three product categories, including grains and feeds, animals and products, and oilseeds and products composed 75% of 2002's total agricultural exports. Grains and feeds, which includes wheat, was the largest of the three categories at 28.3% of agricultural exports (Rosson and Adcock).

STE are government agencies that saw major growth in the 1950 and 1960's. STE were designed to protect the agricultural industries of developing countries. They operate in one of two ways. The first is as an agency with exclusive rights to importing, meaning they determine the quantity and quality of grain that is imported, where it comes from, and the price paid. The second is an agency that coexists with private companies, but still makes the same decisions as if it was the exclusive importer (Young).

By the early 1970's, 90% of world wheat imports were coordinated through STE. However, the late 1980's and the 1990's brought about the decline of many STE's through the breakup of the Soviet Union, structural changes in the World Bank, and the increased interest in trade agreements. A few countries' STE remain, but most were eliminated or they lost the monopoly on importing grain. This provided private firms with the opportunity to import grain (Young).

In 1990, 70% of the responsibility for importing grain fell to the government of the importing countries. The remaining 30% was the responsibility of the millers of that country. However, by 2000, the roles had reversed, with millers and bakers purchasing 70% of grain sold worldwide and the government only buying 30% (U. S. Wheat Associates). This reversal in buying responsibility roles has caused change in the wheat industry. Government buying agencies motivation for buying grain was not to get the

best quality. Price, politics, and the protection of their own agricultural industry all influenced the buying decisions (Young). When the grain purchasing industry became more privatized and millers began buying their own grain, more specific and stringent specifications began to be included in contracts. Specifications are now included to reduce wheat variability, therefore increasing consistency in the end product.

Unfortunately, U. S. wheat is not consistent, nor does it perform well in the private markets (Wilson and Dahl).

Private markets, combined with a higher standard of living in developing countries, have resulted in a more sophisticated market. As the end use consumers in many of the U. S. foreign markets achieve a higher standard of living, they become more discriminatory in the products that they purchase. Consumers demand more consistent quality and a wider variety of products to choose from. Consequently, bakers and millers become more concerned about the quality of the wheat they buy. This concern increases the communication between buyers and sellers, resulting in a more sophisticated buyer (Dexter and Marchylo, Wilson and Dahl).

Value of Wheat Quality Specifications

There are three wheat quality characteristic categories, sanitary, physical, and intrinsic quality. Sanitary characteristics are those that concern the presence of insects, insect-damaged kernels, harmful or toxic substances, pesticide residues, fungal infection and mycotoxins, off-odor, and deleterious foreign matter (i.e. glass and metal fragments) (Herrman et al). Although sanitary characteristics are an important part of keeping the

grain supply clean and safe, this research is more concerned with the physical and intrinsic quality.

A common method of marketing U. S. wheat is by using the physical quality characteristics outlined by the U. S. Wheat Standards. These characteristics impact the price the producer will receive for his/her grain and are tested at the elevator when the grain arrives. Among these standards include dockage, moisture, test weight, damaged kernels, shrunken and broken kernels, and foreign material (Herrman et al). Definitions of these characteristics can be found in Table 2.

Table 2. Physical Quality Characteristics

Characteristic	Definition	Effect on Wheat/Milling
Dockage	All nonwheat material that can be removed from a sample using FGIS approved procedures	Wheat must be cleaned of dockage before it is milled into flour
Moisture	Total percentage of wheat that is made up of water	Moisture content has inverse relationship with test weight
Test Weight	Bulk density measure; weight of a specific volume of grain	Provides rough estimate of potential flour yield
Foreign Material	All nonwheat material that remains in a dockage and shrunken and broken kernel free sample	Wheat must be cleaned of foreign material before it is milled into flour, if not, foreign material can decrease the quality of flour
Shrunken and Broken Kernels	Kernels that are broken or shrunken enough to go through a Number 2 sieve in a Carter Day dockage tester	Must be removed before milling; sold at a reduced cost in comparison to flour
Damaged Kernels	Kernel defects, including heat, germ insect, frost, sprouting, and scab	Affects the appearance of flour, increases ash, decreases yield, or decreases sanitary quality

Source: Herrman et al.

These quality characteristics are used to grade physical characteristics of grain; however, they do not indicate end-use quality. Consequently, grain graded *only* by these standards cannot be marketed based on flour quality, because these standards have limited ability to predict flour characteristics. To insure sufficient grain quality, many buyers include intrinsic quality characteristic parameters in wheat contracts. It is the responsibility of the supplier to meet these specifications, or risk having the shipment rejected or the contract renegotiated (Slaughter, Norris, and Hruschka; Anderson and Russell).

Specifying end-use quality characteristics or buying based on intrinsic quality allow millers to take on a more active role in the wheat procuring process. Millers want wheat with a high test weight, high flour yield, and uniform kernel characteristics. Wheat with these characteristics will produce more flour, reducing unit cost per hundred weight. However, they must also have wheat that can meet the quality specifications needed by the bakers they service. Millers need to know what type of wheat will produce the appropriate kind of flour and where to find that type of wheat. Optimal grain quality is determined by the products a miller is making flour for. The optimal wheat type will not always be the highest quality wheat on the market, but rather will be wheat that has intrinsic quality characteristics that will produce a flour yield satisfactory to the customer and be consistently supplied year around (Baker, Herrman, and Loughin; Hodges).

Intrinsic quality characteristics indicate milling and end-use qualities of wheat and can impact the buying decision of the miller and baker. Some important intrinsic quality characteristics and their definitions can be found in Table 3.

Table 3. Intrinsic Quality Characteristic Definitions and Effects

Characteristic	Definition	Effect
Protein	Wheat kernel substances containing nitrogen; wheat varies in quantity and quality	Low quality or low quantity of protein can result in coarse texture and low quality bread
Gluten	High-protein food product directly related to protein content	Effects dough strength, gas retention and controlled expansion, structural enhancement, water absorption and retention, and natural flavor
Falling Number	Indicator of sprout damage and flour's ability to set up	Falling number <250 results in gummy bread and flour unable to thicken in gravies or soups
Flour Yield	Percentage of flour recovered during milling; number of bushels of wheat required to produce a hundred-weight of flour	Helps determine the economic return of a lot of wheat
Ash Content	Inorganic material left after flour is burned	Component of extraction rate; influences flour color and quality
Bread-Loaf Volume	Bread-making potential of flour	Higher loaf volumes indicate higher quantities of bread from a lot of flour
Tenacity (Denoted by P)	Peak height, maximum pressure required to produce bubble	Increasing P value causes product to be light or "fluffy"; high P values absorb large quantities of water
Extensibility (Denoted by L)	Extensibility of dough, how long it takes the bubble to burst	Impacts ability to rise
Strength (Denoted by W)	Baking strength of dough	Increasing W values indicate increasing dough strength
Configuration Ratio (Denoted by P/L)	Resistance related to time, indicates gluten behavior	Bread volume and well proportioned inside structure

Source: Call, Green, and Swanson; Herrman et al; CII, 2004b; The Artisan

Specifying intrinsic quality characteristics will also reduce variability caused by blending. When grain is bought by wheat grade standards, contract specifications are often met by blending wheat of different quality from different parts of the country. Blending can have various effects on wheat quality. When a local elevator blends all of its grain on physical quality characteristics, an average test grade can be reached, as well as relatively consistent intrinsic qualities. However, blending wheat from different regions can have an adverse effect on the consistency of flour yield and properties. Inconsistency in yield and properties can be caused by the difference in variety and growing conditions of the different regions, therefore the larger the area from which grain is pooled, the more quality variability there will be. If a contract is filled only on physical characteristics, wheat has the potential to come from several different locations and have variable end-use quality. By requiring specific intrinsic quality characteristics to be met, exporters are restricted in their blending practices (Hill, Wilson and Dahl).

Industry Organizations

There are numerous wheat commissions and associations designed to assist the wheat producer by communicating the needs of the producer to state and federal governments and by funding research and development. There are also miller and baker groups designed to address issues that concern this industry, as well as market development groups like International Grains Program (IGP) and the WMC in Portland.

The Kansas Legislature started IGP in 1978 for the purpose of educating foreign business leaders and government officials about the different grains and oilseeds grown in the U. S. Primary goals of the IGP include promoting and assisting in market

development efforts for U. S. commodities. IGP holds four annual short courses, including a course over each of the following: feed manufacturing, flour milling, risk management, and grain purchasing (International Grains Program).

In 1989, the WMC in Portland, Oregon was created to help the Pacific Northwest (PNW) producers market white wheat to Pacific Rim countries. The PNW states, Oregon, Washington, and Idaho, developed the WMC to assist producers in marketing wheat and since its founding it has become a valuable marketing tool. A total of six million dollars of Federal money was granted to the project in addition to a substantial amount of private and borrowed capital that was used to renovate the Albers Mill Building (Hodges, Shelton).

The WMC is customer focused and specializes in bringing the sellers and the buyers closer together in a way that is beneficial to both parties (Burnham). As in the WMC mission statement, “The Wheat Marketing Center is dedicated to improving the well being of present and future generations of U. S. wheat farmers and world wide consumers by conducting wheat utilization research projects and delivering dynamic educational programs in partnership with other international technical and educational organizations” (Wheat Marketing Center 2003c).

The idea of a marketing center has been suggested for the Southern Plains, or HRW wheat region. The proposed location of PGI would be in Stillwater, OK. If feasible, the Southern Plains center would have many of the same characteristics as the WMC in Oregon. This study will determine the best business structure for this region, form a budget, and then determine the feasibility of developing such a center.

CHAPTER 2

CENTER STRUCTURE AND OPERATIONAL FORMAT

Plains Grains Incorporated (PGI) is the suggested name for the proposed grain marketing center. Like other marketing groups, PGI's mission is to enhance and improve agricultural trade in the Plains region. PGI will do this through providing services such as hosting workshops, maintaining a web-based marketing system, and assisting in trade transactions. Although PGI has the same overall mission as other marketing groups, it is designed to provide more assistance to HRW wheat users, not to compete against other entities.

From a distance, IGP and PGI's goals would appear to be the same, to educate and assist in market development. However, a closer look at the two organizations will show that they are distinctly different. Both IGP and PGI will offer training courses, but they will be held at different levels. IGP offers four courses each year that brings in hundreds of participants from all over the world. PGI will hold courses as well, but these courses will be designed to handle a smaller, more intimate group and will be a hands-on learning experience for participants. PGI will focus on developing personal relationships with its attendants, something that cannot be done when there are hundreds of participants. Also, PGI workshops are small enough that seminars and activities can be tailored for that specific group. The WMC in Portland is more like the type of

organization that PGI will be, therefore the similarities and differences between PGI and the WMC will be discussed in detail.

Although the WMC wants to research wheat quality and utilization and educate people about the results of their research, their goals go beyond that. The WMC staff wants to help form partnerships between different groups within the industry and be an instrument in connecting all the different resources within the industry (Wheat Marketing Center 2003c). The Pacific Northwest soft white wheat marketing plan is one of the ways that the WMC forming partnerships. It is designed to provide end-use quality information on soft white wheat in order to assist buyers with purchasing decisions. The marketing plan would identify production areas with similar end-use quality properties and provide this information to buyers and assist them with purchasing decisions (Wheat Marketing Center 2003a).

One highlight of the WMC has been the workshops it provides for foreign millers and bakers. The WMC holds several workshops or training sessions for people from many of the Asian countries with the intention of teaching them about the value of U.S. wheat and how to best use it. Millers and bakers have one-on-one contact with people in the industry and gain a better understanding of how things work in the U.S. This one-on-one contact with foreign buyers enables industry groups (e.g. U. S. Wheat Associates, wheat breeders, wheat exporters) the opportunity to better understand the needs and wants of the customer. With this understanding, people can alter their production or operation techniques to meet customer demands (Burnham, Hodges).

When holding these workshops, the WMC will perform several test on the wheat/flour that will be used in the workshop. These test are all done by the staff of the

WMC in its Wheat Quality Lab (WQL). This lab is equipped to not only do all the standardized USDA testing, but it can also do test that are not required by U. S. standards, but are commonly requested by companies wanting to import U. S. grain (Shelton).

The WMC has made several impacts in the wheat industry. It has organized Asian Noodle Workshops for Latin America in 2001 and 2002, resulting in an Asian noodle plant being built in Guatemala and the expansion of an Asian noodle plant in Mexico. The WMC has also organized two courses for five Southeast Asian flourmills. Results of these courses include three mills increasing their purchases from the previous level and one mill increasing purchasing of U.S. wheat from 0% to 100%. The WMC and the U.S. Wheat Associates have partnered to form the Asian Products Collaborative (APC), which has also made many cost effective impacts in the market (Wheat Marketing Center 2003b).

The WMC has been invaluable to PNW exporters and can serve as an example to other regions hoping to improve the export market. Although, much of PGI's business structure was inspired by the WMC, there are some notable differences between the organizations. In this chapter, the general make up of PGI will be will be closely examined, followed by comparisons of the two marketing entities. First, however, the legal structure of PGI will be examined.

Certificate of Incorporation and By-Laws

The Certificate of Incorporation, as developed and approved by PGI's steering committee, states that PGI shall be a corporation that complies with sections 501 (c)(3)

and 509 (a)(3) of the Internal Revenue Code (IRC) of 1986. Under section 501 (c)(3), PGI will be a tax-exempt corporation. In the event that PGI should face bankruptcy or a lawsuit the assets of PGI's founding members (i.e. producer groups, agencies, associations, etc.) cannot be touched. Under these circumstances, the courts may take any assets that PGI may have accumulated, but the original contributing members are at no risk of losing their personal assets. PGI will have no capital stock, meaning that dividends will never be paid to stockholders. As stated by the IRC, PGI will be non-profit, depending on outside contributions from groups within the industry to help support its activities. PGI will ask for equal support from the wheat commissions within the region.

Membership to the corporation will not consist of individual people, but rather groups or businesses that are involved in the wheat industry. Each of these members would be allowed one representative, who would serve on the Board of Directors of PGI. The Board would be the primary governing body for PGI and would consist of seven to thirteen members. Each member would have one vote. In addition to the seven to thirteen voting members, there will be two non-voting representatives, one from the Oklahoma Department of Agriculture and the other from the College of Agricultural Science at Oklahoma State University (OSU). Each member will serve a three year term, with a third of the board of directors being elected each year.

Members of the Board will be required to attend two meetings per year, one in April and one in October. Directors and officers will be elected and the report from the previous fiscal year shall be reviewed at the April meeting. The second meeting will be held to discuss any new business, but no elections will be held. Tentatively, the first

Board of Directors will consist of eleven voting members and two non-voting members (Table 4).

Table 4. Voting and Non-Voting Members

Member Name	Voting Member	Non-voting Member
College of Agriculture OSU		X
Colorado Wheat Commission	X	
Equity Marketing Alliance	X	
Kansas Wheat Commission	X	
Mid-Oklahoma Cooperative	X	
Nebraska Wheat Commission	X	
Oklahoma Department of Agriculture		X
Oklahoma Feed and Grains Association	X	
Oklahoma Wheat Commission	X	
Texas Wheat Commission	X	
W. B. Johnston Grain Company	X	
Wheeler Brothers Grain Company	X	
Texas Wheat Commission	X	

The corporation shall have at least two officers at all times, a chairperson and a secretary. If the Board of Directors feels that additional officers are needed at any time, these officers may be elected on such an occasion. Terms of the officers will last one year. The chairperson will have general supervision and control of the business activities of the corporation and he or she will preside over the meetings of the directors and the Executive Committee. The Secretary will keep full records of the proceedings of the Board of Directors. If elected, a Vice-Chairperson shall perform the duties of the Chairperson in event that the Chairperson is unable to fulfill his or her duties, and the Treasurer will be responsible for taking care of any funds entrusted to the Board of Directors.

PGI will hire an Executive Director, which will be the chief administrative employee of the entity. His or her responsibilities will include managing the day-to-day activities and decisions of the corporation. Supporting staff for the Executive Director will include an Assistant Director and a secretary. All the former information about the formation of PGI can be found in the Certificate of Incorporation or By-laws of Southern Plains Grains Marketing Center. These documents were prepared by the law office of Gungoll, Jackson, Collins, Box, and Devoll, P.C. and can be found in Appendix 1.

Structure of the Plains Grains Marketing Center

The overall objective of PGI will be to improve the trade of all grains in the Great Plains. In order to achieve this overall objective, smaller, short-term goals must be set. The first of these is to develop a marketing system that will first improve trade of Oklahoma HRW wheat, but will eventually include all the Plains states. Once the foundation has been laid for an improved marketing system for wheat, PGI will expand to other grains (white wheat, corn, sorghum, and soybeans), making the necessary modifications as it progresses. Encompassing such a large variety of commodities will allow buyers interested in agricultural commodities produced in the Southern Plains to buy a variety of different products and have them shipped together, via the same mode of transportation. Although including other states will be necessary in order to have the critical mass needed to satisfy foreign buyers, this section of the study is focusing on PGI location, the services provided, and funding sources needed to improve HRW wheat trade in Oklahoma.

Location

The first location and the main push for PGI began in Oklahoma, but goals set for PGI do not just encompass the wheat producers of Oklahoma. Problems faced by Oklahoma wheat producers are the same as faced by producers in Kansas, Nebraska, Texas, and Colorado. Efforts to improve the market for HRW wheat will affect the entire region. Success will not be measured on how many Oklahoma producers are helped, but rather how the industry as a whole is affected. Consequently, Oklahoma may not always be the best location for PGI and growth of PGI may result in a move to either Houston, Texas or Kansas City, Kansas in the future.

Houston and Kansas City were other cities considered before Stillwater, Oklahoma for the location for PGI. Houston was considered for its seaports, from which large volumes of HRW wheat move through each year, and for the ease of travel it could provide for international visitors. Kansas City is also easily accessible to international travels and has several wheat industry organizations in or around Kansas City. Workshop attendees could visit the Kansas City Board of Trade and then travel to Manhattan, Kansas to visit other prominent wheat organizations. IGP, the American Institute of Baking, and Kansas State University, which is highly involved with wheat research, are located in Manhattan, which is 90 minutes away. Although Houston and Kansas City did have many things to offer, Stillwater was chosen as the location for PGI.

There are many factors that contributed to choosing Stillwater as the founding location of PGI, many of which concern obtaining the resources needed for operation. PGI will be more than just an office to serve as a middleman between wheat sellers and wheat buyers. PGI will provide wheat quality testing for grain handlers so that wheat can

be marketed on a quality basis. By hosting workshops, PGI will also help millers better understand the various ways HRW wheat can be used to produce the quality of flour needed for their products. Providing these services requires a substantial amount of resources that PGI will not have the funds to purchase in the beginning phases.

Necessary resources can be found in or around Stillwater and can be contracted out for a fraction of the cost if PGI was started from scratch.

One of the biggest advantages of locating in Stillwater will be the resources available at Oklahoma State University (OSU). PGI will make good use of the resources, primarily the Wes Watkins Center for International Trade Development (CITD) and the Food and Agricultural Products Research and Technology Center (FAPC). The CITD was designed to help enterprises that specialized in the development of international trade. Education about and promotion of U. S. wheat to international buyers are the primary goals of PGI. These goals are in compliance with the mission of the CITD, thus the administration is willing to lease PGI office space at a minimal cost.

FAPC's purpose is to enhance economic development for the state of Oklahoma by expanding support for the value-added food and agricultural products processing industry. One of the resources located in the FAPC is the OSU Wheat Quality Lab (WQL) with industrial equipment to test flour quality and baked products, including a cereal chemist and a complete roster of laboratory staff. The lab and staff will be vital for workshop testing and presentation. The FAPC will charge a fee (see Appendix 2 for workshop costs) for the use of the WQL and the time of its staff, but paying the fee will be more economical for PGI than trying to build, equip, and staff a WQL of its own.

A disadvantage of PGI being located in Stillwater is that it is a much smaller city than Houston or Kansas City and has few traveling or tourist amenities. Stillwater is a small city located in an agricultural production setting. It only has a small local airport, meaning visiting professionals will have to be picked up from either Will Roger's International Airport in Oklahoma City, or the Tulsa International Airport, both of which are within a 75-minute drive from Stillwater. The presence of OSU and the thousands of people that attend or visit the college each year has promoted the development of an assortment of dining establishments and hotels, although there is little else in the form of entertainment. However, due to the short length of time participants will be in Stillwater, PGI will be able to schedule plenty of activities to keep workshop participants busy.

Although locating PGI in Stillwater results in several disadvantages, they can be offset by resources found in the surrounding area. Places of interest within the proximity of Stillwater are the Oklahoma Wheat Commission (OWC), Port of Catoosa, and two rail load-out facilities. The OWC is located on the north side of Oklahoma City and is only about an hour away, which would allow for interaction between workshop participants and members of the OWC. This interaction could take place via members of the Commission traveling to Stillwater or participants making the short trip to the Commission office.

Other points of interest for workshop participants would be the truck, train, and barge load-out facilities scattered across Oklahoma. The large number of elevators is a result of Oklahoma being in the HRW wheat production region. Grain from this region, excluding direct shipments to Mexico and domestic sales to regional millers, is transported to the Gulf and then exported to foreign buyers.

Every elevator has the ability to load and ship grain by truck. Once loaded, grain can be hauled directly to buyers (feedlots, mills) or to regional terminal elevators. Wheat taken to terminal elevators will then leave the state by train or barge. Many elevators can load-out train cars, but only a few can handle unit trains (100-110 car trains). Oklahoma has five elevators with unit train load-out facilities and four ports along the Arkansas River. Two of the five rail load-out facilities are within traveling distance, one in Kingfisher and one in Enid, both about an hour away. Typically, grain transported by rail goes to Galveston or Houston, TX, but there is also a substantial amount of grain shipped by barge via the Port of Catoosa on the McClellan-Kerr Waterway, which is less than an hour and a half from Stillwater. Once grain leaves the port, it travels through Arkansas to the Mississippi River, which eventually flows into the Gulf of Mexico. Once this wheat reaches the Gulf ports at New Orleans, Louisiana, it can be shipped to any of the U. S. HRW wheat customers.

One other positive reason for locating in Stillwater is the opportunity to show workshop attendees how the wheat is grown. Since Stillwater is in the production region, PGI would be able to give a tour of an actual wheat farm. Although PGI may one day move, the benefits of being in a production region, coupled with the resources readily available at OSU, are the reason Stillwater was chosen as the initial location for the PGI.

Services Provided

Workshops will be available to millers from any country, but PGI's main focus will be on Mexican millers. Mexico has recently become one of the largest importers of U. S. wheat, most of which is HRW wheat. The U. S. geographic location to Mexico

gives it an advantage over foreign competition (Canada and Australia) and the large volume of HRW consumed by the Mexican population makes it an obvious starting point for PGI's marketing efforts.

PGI will provide two main services, educational workshops and a web-based marketing system. The workshops will be an important part of PGI's activities. Mill representatives in attendance will learn more about the value of U. S. HRW wheat and the marketing system through which wheat is sold. The workshops will be hosted by PGI, but the WQL in the FAPC will be responsible for presenting most of the material.

Workshops will be used to show millers how different quality characteristics affect the baking process of various goods. This information will allow millers to better specify what type of wheat they are looking for. Also, as a part of the workshop, attendees will have an opportunity to meet with producers and grain suppliers and take a tour of elevator load-out facilities. Meeting with producers and grain suppliers will help develop personal relationships between buyer and seller and tours of different types of elevators will help them understand how wheat is moved from the field where it is grown to their mill.

Another purpose of PGI workshops is to introduce buyers to a web-based marketing system. This system will have many functions. First, it will be a way to track the quality and quantity of wheat in the region. It will also provide a way for grain handlers to market their wheat based on actual quality characteristics. Finally, it will be a single source that millers can contact when interested in U. S. wheat. Currently, potential buyers must call or drive around the HRW wheat producing region to locate suitable grain. Although PGI will not own any wheat, it will maintain a database with wheat

quality and quantity information so that potential buyers can be directed to elevator managers with suitable grain.

The web page will have an interactive database that is easily accessible from the internet. Regional wheat suppliers can have wheat samples tested at the OSU WQL or any other competent lab for specifications of their choosing. Quality specifications include test grade, dockage, moisture, test weight, protein, falling number, single kernel characteristics, extraction rate, ash, farinograph, alveograph, gluten, and baking evaluations. The results of these tests can then be entered into the database, either by the wheat supplier or by personnel at PGI. Then when buyers specify the quality parameters they are looking for, an electronic search of the database will discover how much of that wheat type is available.

Once a buyer has found a sufficient amount of a specified quality, he/she will inform PGI that he/she is ready to make a purchase. PGI will then give all relevant supplier names to the purchaser or will set up the transaction for the purchaser, whichever the purchaser prefers. This web page not only allows suppliers to sell wheat based on end-use characteristics, but also provides a way for large orders to be filled by pooling like grain from all over the region by contacting just one person. PGI provides a way for producers to build a lasting business relationship with HRW wheat buyers across the globe.

Funding

The final issue to be discussed is how PGI will be funded. PGI will have minimal capital invested in leasing office space, seminar costs, and covering overhead expenses.

With seminar costs, including the price of using the WQL in the FAPC, being passed on to workshop participants, PGI will be responsible for rent, overhead, and staffing expenses. A Federal grant will be instrumental in getting PGI started, but for year-to-year operations it will depend on support from regional wheat commissions and revenue from the workshops.

Ideally, commissions will be willing to contribute equal amounts of money to PGI. Although PGI's initial location is in Oklahoma, it is not an organization designed to benefit only Oklahoma's wheat industry, but rather the wheat industry of the Southern Plains. Equal support from each state's commission will help ensure that the efforts of PGI would be in the best interest of the whole industry and not the state that is providing the most capital.

Notable Differences Between PGI and the WMC

A basic comparison of PGI and the WMC in Portland shows that they are similar in many ways. Both centers were designed to increase exports of wheat by marketing end-use quality, both are non-profit corporations, and both are focused around building long-term relationships via workshops. However, a closer look will show some differences do exist between the two.

As the title indicates, the WMC interest is only in marketing wheat, although it does not focus on just one type. The WMC primary focus is on soft white (SW) wheat, but it also branches out into hard white wheat and the different types of red wheat. White wheat has a lighter color, which for aesthetic purposes is an important factor in producing

Asian noodles, thus the WMC focuses primarily on the Pacific Rim (U.S. Wheat Associates).

Red wheat is better suited for breads and all-purpose flour, although it too is sometimes used for noodles (U.S. Wheat Associates). HRW wheat will be the focus of PGI marketing thrust, but there are plans to include white wheat and other crops in the future. PGI will primarily focus on Mexico and other Central/South American countries, however PGI will not limit its efforts to just that area.

Another difference in the two centers is the type of regions in which they are located. As mentioned earlier, PGI is situated in a production region. The Southern Plains have long-term storage facilities designed to hold grain for a year or more and most grain is shipped to the ports along the Gulf Coast.

Portland, on the other hand is not in the production region, but is one of the PNW primary exporting locations. Facilities in Portland are numerous, but they are unable to store large quantities of grain for an extended period of time. Generally, grain already has a buyer when it is delivered to the Portland elevators and is only held there for a short time while last minute testing and blending occurs. Due to the quick turn around required, there is no way to store, hold back, or segregate grain for long periods of time because that takes up valuable space that export facilities do not have. Once wheat is ready to be exported, it is loaded onto an export vessel in Portland and sent down the Willamette River to the Columbus River, and then onto the Pacific Ocean.

As far as international travel is concerned, Portland has a better location than Stillwater. Located on the West coast of the U.S., Portland is an ideally situated city for accommodating travelers who wish to attend the various workshops hosted by the WMC.

It is home to an international airport and has the environment and amenities to satisfy the tourist wishes of those flying into the city.

Not only does Portland have adequate transportation, fine dining, and entertainment accommodations, but it is also the home to some important wheat and exporting organizations that may be of interest to international travelers. These organizations include offices for U. S. Wheat Associates, Oregon Wheat Commission, and Federal Grain Inspection Service (FGIS). Also, nearby export facilities provides an interesting and educational addition to workshop itineraries for visiting professionals. Grain exporters in the region include CLD Pacific Grain, Columbia Grain International, Kalama Export, and United Harvest.

Finally, university involvement is a significant difference between the two centers. Resources on the OSU campus are a big part of PGI operations. The office space, wheat quality lab, and workshop facilities used to operate are all OSU resources that PGI will pay a minimal fee to utilize. Funds to pay these fees will come from revenues from the workshops and support from state wheat commissions. The WMC in Portland is set up in an entirely different way, having no university affiliation.

The WMC consists of three separate entities, the property owner, the for-profit WQL, and the non-profit marketing center. The office space, wheat quality lab, and workshop facilities used by the WMC are all located in the Albers Mill Building, of which the WMC is part owner. Since they have part ownership of the building, not only are they exempt from paying rent, but they also earn revenue by collecting rent from other tenants in the building. They also maintain and staff the WQL, which is used extensively in their workshops, but also does test for many companies verifying wheat

quality for export. The workshops are hosted by the non-profit WMC for a fee adequate to cover the cost of resources used. As with PGI the WMC also receives support from state wheat commissions. Similarities and differences between the two centers are summarized in Table 5.

Table 5. Similarities and Differences Between the WMC and PGI

	Portland Wheat Marketing Center	Plains Grain Incorporated
Concept	Three entities, WMC, WQL, and WMC Holdings, LLC	One marketing center
Primary Commodity	Soft White Wheat	Hard Red Winter Wheat
Expansion	No known intention of expanding interest beyond wheat	Expand to include corn, sorghum and possibly other grains and oilseeds
Customer Focus	Pacific Rim	Mexico, Central America, and Caribbean
Location	Non-production region; metropolitan; international airport; river port	Production region; 1 1/2 hours from airport; easy access to port, rail, load-out facilities and country elevators
Office	Space in building which they are part owners, Alber's Mill Building	Space in the Wes Watkins Center for International Trade Development
Wheat Quality Laboratory	In-House	Cooperative arrangement with OSU Food and Ag Products Center
Funding	Rent; wheat testing laboratory fees; support from wheat commissions; workshops	Support from wheat commissions; workshops
Web-based Marketing	N/A	Provide information about regional availability of grain quantities and qualities; serve as coordinator for pooling shipments of grain from multiple elevator sites

CHAPTER 3

FINANCIAL OUTLOOK

As a part of the feasibility study for PGI, income statements were developed for the Planning and Start-up Phases. In addition to the income statements, projected yearly budgets that can be adjusted at the rate of inflation were developed for succeeding fiscal years. These budgets are summarized in a projected annual income statement. The Planning Stage budget covers from November of 2002 to June of 2004 and includes many consulting and legal fees that day-to-day operations will not require. The Start-up budget begins in July of 2004 and extends until June of 2005. The projected yearly budget will be effective July 2005. The Planning Stage and Start-up budgets and the Projected Annual Income Statement will be discussed in this chapter.

Planning Phase

In October of 2002, the OWC went before the Oklahoma Agricultural Enhancement and Diversification Advisory Board to request funds to research the feasibility of having a HRW wheat marketing entity in Oklahoma. On December 15, 2002, the OWC received a \$28,000 loan to research the feasibility of a wheat marketing center. The funds were to be used for legal and consulting fees, as well as any other cost associated with feasibility research and start-up costs. Start-up costs include office equipment and web-page development, in addition to overhead cost such as rent,

insurance, and telephone. The PGI Planning Phase Income Statement can be seen in Table 6.

Table 6. PGI Estimated Planning Phase Income Statement

Plains Grains Incorporated	
Stillwater, Oklahoma	
Income Statement	
Planning Phase	
Nov 2002-June 2004	
Revenues	
Ag Enhancement Board Loan	28,000
	\$
Total Revenues	28,000
Expenses	
Legal Fees	1,400
Computer	2,000
Web page development	1,350
Consulting	10,000
Laboratory Supplies and Services (Wheat Quality Testing)	8,000
Marketing Materials (Development, Printing, Distribution)	1,000
Telephone	140
Insurance (Office and Board Members)	2,500
Rent	1,320
	\$
Total Expenses	27,710
Net Income	290
	\$

Start-Up Phase

By July, 2004, PGI will have moved out of the Planning Phase, however, all the business structures needed to participate in all future activities will not be in place yet. At this point, PGI will move into the Start-Up Phase, which will be a transition between the planning and full operation of PGI. Cash flow will increase during the Start-Up Phase, but not to the level that will be experienced once PGI is fully operational.

Revenues for this phase will come from a variety of sources. The most significant source of income will be from a USDA Rural Business Opportunity Grant. Other sources include OWC contracts for wheat quality testing and educational seminars, registration fees for a seminar held in the fall, and a slight carry over from the previous year.

As the Start-Up Phase is a transition period between a theoretical and an actual non-profit entity, expenditures will begin increasing as PGI becomes more operational. In addition to the same overhead cost incurred in the Start-Up Phase, PGI will have the added expenses of employee salary and benefits, legal and accounting, web-page and database maintenance, and office supplies. PGI will also begin contracting out for wheat quality testing and consulting and will begin educational activities. Workshops held during the start-up phase will include one to three workshops to educate elevator managers, millers, and bakers on the importance of marketing wheat on the basis of functionality. Workshops will also highlight PGI's role in that process. The Start-Up Phase Income Statement can be seen in Table 7.

Table 7. PGI Estimated Start-Up Phase Income Statement

Plains Grains Incorporated
Stillwater, Oklahoma

Income Statement
Start-Up Phase
July 2004 - June 2005

Revenues

Carry Over from Previous Year	290
USDA Rural Business Opportunity Grant	90,000
OWC Contracts	20,000
Workshop Registration	5,500
Total Revenues	\$ 115,790

Expenses

Rent	1,320
Telephone	1,200
Web Page Maintenance	350
Insurance (Office and Board Members)	2,500
Employee Salary	30,000
Employee Benefits	10,000
Dues and Subscriptions	3,000
Office Supplies	1,000
Legal & Accounting	3,000
Travel	4,500
Consulting	15,500
Workshop Expenses	5,000
Laboratory Supplies and Services (Wheat Quality Testing)	25,000
Marketing Materials (Development, Printing, Distribution)	7,500
Contingency Funds	5,000
Total Expenses	\$ 114,870

Net Income	\$ 920.00
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Projected Annual Income Statement

The Projected Annual Income Statement and related budgets are designed to be a basic yearly estimate of revenues and expenses. It will be easily adaptable to changing situations (e. g. increase in rent, additional funding sources) and can be adjusted for inflation.

Revenue is expected to expand once again. Carry over from previous years and the sale of assets will be minimal, workshop and quality testing income and appropriations from wheat commissions will compose most of the revenues. Revenues from the workshops and wheat quality testing will be used to offset the cost of the workshops and of testing as well as adding a little income to cover the overhead cost. However, the main source of revenues for PGI will come from wheat commissions or similar groups.

Once PGI is fully operational, the employee salaries and benefits will make up 60% of expenses and the marketing and administrative expenses will account for another 28% of the total expenses. Paid positions at PGI will have expanded from one paid employee, an assistant director, to include paid positions for a director, an assistant director, and a secretary. The marketing and administrative expenses will include many expenses that were not seen on earlier budgets because PGI had not had time to gather and process enough information on Oklahoma wheat quality to hold any workshops. Supplies, maintenance and repair, utilities, and fixed expenses combine to make up the other 12% of expenses. The PGI Projected Annual Income Statement can be seen in Table 8. Values used in Table 8 were taken from a more detailed budget that can be found in Appendix 2.

Table 8. PGI Projected Annual Income Statement.

Plains Grain Incorporated	
Stillwater, Oklahoma	
Projected Annual Income Statement	
Revenues	
Carry Over from Previous Year	-
Revenues from Workshops	120,000
Revenues from Wheat Quality Tests	3,397
Appropriations from Wheat Commissions	250,000
Other Income (sale of assets, etc.)	-
Total Revenues	<u>\$373,397</u>
Expenses	
Total Salaries	180,000
Total Benefits & Employee Related	54,000
Total Marketing and Administrative	106,826
Total Supplies	16,688
Total Maintenance & Repair	2,000
Total Utilities	9,800
Total Fixed Expenses	<u>4,010</u>
Total Expenses	\$373,324
Net Income	\$73

CHAPTER 4

VARIATION IN END-USE QUALITY CHARACTERISTICS

In 2002 wheat was the largest field crop and the fourth largest commodity for the state, totaling more than \$314 million in receipts. Wheat and wheat products were also Oklahoma's top exports in 2002, bringing in over \$242 million dollars (ERS, USDA). Although the export numbers look good, they are not a true indication of the situation facing U. S. producers. Many U. S. wheat importing countries are expressing concern about the quality and consistency of U. S. grain. The U. S. grain marketing industry, along with FGIS grades and standards, have not adequately conformed to meet the needs of these foreign buyers and it is affecting the desirability of U. S. grain.

Two major studies done in the U. S., one by the Office of Technology Assessment and one by the Economic Research Service, and a study done in Australia by the Grains Council of Australia found that millers in the export market prefer Canadian and Australian wheat over U. S. wheat. The primary reason for this assessment is because Canada and Australia have cleaner wheat of a more consistent quality. Overseas millers do not feel that the U. S. FGIS wheat grades and standards are an appropriate indicator of end-use quality. They want more information on dough and flour properties and are concerned about the variability in quality, both within and among lots. The desire for more complete quality specifications started with the decline of STE and will only

strengthen as these markets continue to develop and become more sophisticated (Wilson and Dahl).

Canada and Australia are the preferred suppliers of wheat because they supply a consistent quality of clean (i.e. low dockage) wheat. All wheat exported from Canada and Australia must be exported through the Canadian Wheat Board (CWB) and the Australian Wheat Board (AWB), respectively. The mass quantities of grain that Canada and Australia export make them the top two wheat marketing entities in the world, holding 20% and 16%, respectively, of the total wheat export market in 2002 (Wilson and Dahl, Canadian Wheat Board, and NSW Farmers).

Variations in growing conditions, combined with the different genetic make-up of different wheat varieties, can influence the functionality of wheat. Weather patterns cannot be controlled, thus variations in wheat quality must be reduced through other means, such as wheat variety. Canada and Australia regulate the number and quality of varieties released for production as a method of decreasing overall wheat variability. Tight regulation on variety release helps maintain production of varieties with only like functionality traits. This reduces the variability in wheat, thus the variability of the end-use product (Wilson and Dahl). Further regulation is implemented in Canada by including variety type as a grading standard. Any variety that does not meet regulations is not allowed into traditional commodity markets (e.g. seed or export markets) (Wilson and Dahl, Canada Wheat Board).

In the U. S., varieties undergo intense testing by breeders and industry people, both from private companies and land grant universities. However, this testing is far less regulatory than the laws imposed in competing countries, and results in more varieties,

thus increasing the likelihood of variability in U. S. wheat. The U. S. will have to find a way to compete in a market focused on end-use quality. In two different studies conducted in North Dakota, procuring grain based off of post-harvest functionality test was the most efficient way to get wheat with desired functionality. Wilson found that using functionality traits to procure grain would result in satisfaction 99% of the time. In a later study, Wilson, Dahl, and Johnson found that the desired wheat could be found with 81% probability of satisfaction using end-use functionality.

Unfortunately, there is no easy way to test functionality. Competitors try to limit variability in functionality by limiting the varieties produced, but the U. S. wheat marketing system is not designed to operate in that capacity. There are several tests that can be done to test the functionality of wheat (e.g. alveograph, farinograph, falling number, etc.) but these test take several minutes and are not practical for most country elevators.

Other testing systems are faster, but due to high cost and limited results they have not been implemented. The Single Kernel Characterization System (SKCS) takes approximately three minutes to do a 300-kernel sample and it determines the weight, size, moisture, and hardness of each kernel. A report is then generated that gives the mean and standard deviation of the sample. The whole kernel near-infrared (NIR) technology is also being utilized to some degree at the elevator level to test protein quantity (Gaines, et al, Baker, Herrman, and Loughin).

Analysis of Wheat Quality Data

The SKCS and the NIR are two testing methods that can be performed in a timely enough manner to be done at a country elevator. However, these tests result in milling and some flour characteristics, but they do not indicate all the flour, dough, and baking quality characteristics that millers and bakers want to know. In order for either of these testing methods to be useful to elevator managers in indicating wheat's dough and baking quality, elevator managers would need to know which wheat quality factors affected the different flour, dough, and baking functionalities.

To determine wheat quality's effect on functionality, an analysis was done on a data set containing wheat quality information and results of flour and dough testing and baking evaluation.

The Data

The data used for this analysis came from samples that were collected from the five wheat-producing Agricultural Statistic Districts in Oklahoma, as determined by the Oklahoma Agricultural Statistics Service. After being graded by the FGIS Grain Inspection Licensed Office, in Enid, Oklahoma, the wheat samples were then taken to the OSU WQL for quality testing. Historical data includes the 2000, 2001, 2002, and 2003 harvests. Each year, results of these tests are published by FAPC in the Wheat Quality Crop Survey.

Data consisted of seven different quality characteristic categories for each of the five districts. The categories included wheat grade data, non-grade data, flour data, flour properties, dough properties: farinograph, dough properties: alveograph, and baking

evaluation (Food and Agricultural Products Research and Technology Center). The individual quality characteristics that made up each of the seven categories can be seen in Appendix 3. Due to poor production conditions, samples were smaller in size and fewer in number in 2000. The data had missing values for wheat grade data in 2002; however the other six categories were reported. Data only included four harvest years, and the samples were not taken in a consistent fashion across the regions or over time.

The Model

Historical data for the last four years were used in a PROC MIXED model ran on the SAS software. Year and district were the class variables. Ten different models were run for the ten different dependent variables. Each model used the same fourteen explanatory (independent) variables. The SAS model, with a description of the terms, can be found in Appendix 3. Tables 9, 10, and 11 summarize the results of the models, or the results can be seen in their entirety in Appendix 3.

Table 9. Variations in Flour and Dough Functionality Traits as a Function of Production Region, Crop Year, Wheat Grade, and Non-Grade Measures (numbers represent the P-values of statistically significant correlations)

Grade, Non-grade, Kernel Uniformity Measures	Year/District Interaction	Test Weight (lb)	Shrunken and Broken			Moisture	Protein
			Dockage	Foreign Material	Damaged Kernels		
Falling Number	<.0001					0.0005	
Extraction Rate	<.0001						
Peak Mixing Time	<.0001		0.0293			<.0001	
Stability	<.0001		0.0178				
Absorption	<.0001					<.0001	
Absorption 14 %MB	<.0001	0.0028			0.0016	<.0001	
Tenacity	<.0001						
Extensibility	<.0001					<.0001	
Flour Strength	<.0001					<.0001	
Tenacity/Extensibility Ratio	<.0001						

*MB is moisture basis

Table 10. Variations in Flour and Dough Functionality Traits as a Function Single Kernel Characteristics (numbers represent the P-values of statistically significant correlations)

	Hardness	Hardness Standard Deviation	Weight	Weight Standard Deviation	Diameter	Diameter Standard Deviation
Falling Number	<.0001	0.011			0.0011	
Extraction Rate	<.0001					
Peak Mixing Time	<.0001				0.013	
Stability	<.0001					0.0054
Absorption	0.0058					0.0046
Absorption 14 % MB	<.0001					
Tenacity	<.0001		0.0002			0.0029
Extensibility						0.0063
Flour Strength	0.0008					
Tenacity/Extensibility Ratio			<.0001			0.0023

*MB is moisture basis

Table 11. Wheat Production, Grade, and Kernel Uniformity Factors and the Flour/Dough Functionality Traits They Significantly Influence

Grade and Non-Grade Characteristics	Flour and Dough Characteristics
Year and District Interaction	Falling Number, Extraction Rate, Peak Mixing Time, Stability, Absorption 14% MB*, Tenacity, Extensibility, Flour Strength, Tenacity/Extensibility Ratio
Test Weight	Absorption 14% MB*
Foreign Material	Peak Mixing Time, Stability
Moisture	Absorption 14% MB*
Protein	Falling Number, Peak Mixing Time, Absorption 14% MB*, Extensibility, Flour Strength
Hardness	Falling Number, Extraction Rate, Peak Mixing Time, Stability, Absorption 14% MB*, Tenacity, Flour Strength
Hardness Standard Deviation	Extraction Rate
Weight	Tenacity, Tenacity/Extensibility Ratio
Diameter	Falling Number, Peak Mixing Time
Diameter Standard Deviation	Stability, Tenacity, Extensibility, Tenacity/Extensibility Ratio

*MB is moisture basis

Conclusions

The data set available placed some limitations on this analysis. The data set used was only for a four-year period and had some missing values. To improve the credibility of this analysis, testing would need to be done more extensively over a lengthier amount of time. Although the data set used for this analysis is small and incomplete, it supports the theory that there are significant differences in each year's harvest, both across time and across regions, thus thorough testing must be done each year to provide accurate functionality information.

Results also indicate which wheat grade and non-grade characteristics served as limited proxies for flour and dough functionality traits. Year/District Interaction was

significant in for all functionality traits, indicating that there were differences from year to year, district to district. Table 9 showed that test weight and moisture were only indicators to absorption 14% MB while dockage was an indicator of nothing. Test weight, moisture, and dockage are measures taken at country elevators. Also in Table 9, protein was a significant indicator in six out of ten functionality traits. Although protein is not currently measured in most Oklahoma elevators, it could be possible for them to expand their testing to include protein. Table 10 shows that both hardness and diameter standard deviation were indicators in at least five out of ten functionality traits. Table 11 lists each of the significant grade and non-grade characteristics and the functionality traits that they indicate.

With a more complete data set, expanded by number of samples tested and years covered, more extensive studies could be done to learn how much the end-use qualities of HRW wheat vary from region to region and from year to year.

CHAPTER 5

SUMMARY AND CONCLUSIONS

Jimmy Dean said, "I can't change the direction of the wind, but I can adjust my sails to always reach my destination." This same concept holds true for those in the agricultural industry, where the proverbial winds of change are constantly shifting. Over the years, the wheat industry has experienced many changes in production methods, farm equipment, and government and marketing policies. Once again, change for U. S. wheat producers is underway. Grain procurement methods of the U. S. largest importers are changing, and since there is no way to stop this change, the U. S. must adjust to stay competitive in the industry.

Private buyers have become increasingly important in a market that was dominated by state trading agencies. Private buyers are more concerned with end-use quality and they want to make contracts that will provide a consistent, end-use specified quality of wheat. The U. S. wheat industry must find a way to deliver the product that the buyer is looking for, or risk losing that buyer to foreign competition. Plains Grains Incorporated (PGI) is a wheat marketing tool designed to help the industry satisfy the needs of millers and bakers without disrupting the current production system.

The structure of PGI is a non-profit organization that will operate under the direction of a Board of Directors. It will perform activities that will focus on educating the components of the wheat industry about wheat quality and wheat quality's impact on

the end-use product, determining the end-use quality of each year's crop, and marketing wheat based on this end-use information.

The financial outlook for PGI was determined by developing budgets for the planning and start-up phases and constructing a projected annual income statement. Grants from the USDA are vital to the planning and start-up phases, however, once PGI becomes fully operational, it will be free of government assistance. Revenues will be generated through wheat quality testing and educational workshops, as well as appropriations from participating wheat commissions.

This study also includes a preliminary study on using wheat grade and non-grade characteristics as limited proxies for flour and dough functionality traits. Historical data covering four years of quality testing was used in a statistical analysis to determine which wheat grade and non-grade characteristics impacted flour and dough characteristics.

Further Research

Although this study touched on using wheat grade and non-grade characteristics to determine functionality, more research is needed. As more data is collected, the effects of grade and non-grade characteristic on end-use quality can be determined with more precision. Also, more economical, precise, and faster methods of testing need to be developed so that segregation at the elevator level can be practical and efficient.

Outlook for PGI

PGI will use data similar to that used for the limited proxies study for a web-based marketing system. The web-based system will be an on-line database that will

track quality and quantity information about HRW wheat. Users of the system will use the database to search for a specific quality of wheat that is in Oklahoma. Quality information will be determined by CII Laboratory Services and quantity information will be supplied by participating elevators. The CII Lab has extensive testing capabilities and can provide rapid results for quality testing. CII has broken the HRW wheat production into twenty-one separate testing areas and conducts a Crop Quality Survey each year to determine the functionality of each production region (CII, 2004a). PGI will contract with CII for Crop Quality Survey results, as well as results for regions specified by PGI.

Although, PGI will start in Oklahoma, marketing HRW wheat, the vision for PGI is to expand beyond the borders of Oklahoma to the whole HRW wheat production area, including Colorado, Kansas, Nebraska, and Texas. Once this expansion has been successfully completed, PGI will continue to expand into other commodity groups in the Plains region (i.e. white wheat, corn, sorghum, and soybeans).

Expansion will increase the production base that PGI has access to when pooling resources to satisfy functionality needs of domestic and international buyers of Plains agricultural products. Expansion will also increase PGI's funding opportunities. Expanding into the whole HRW wheat region would encourage appropriations from wheat commissions in the surrounding states, as well as possible appropriations from U. S. Wheat Associates. Furthermore, including other commodities will expand the funding base to include those commodities producer groups.

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APPENDIXES

APPENDIX 1

LEGAL PAPER WORK

THE ARTICLES OF INCORPORATION

THE BY-LAWS.

CERTIFICATE OF INCORPORATION

OF

PLAINS GRAINS, INC.

ARTICLE I

Name and Duration: The name of the Corporation is PLAINS GRAINS, INC., and its duration shall be perpetual.

ARTICLE II

Registered Office and Agent. The address of the Corporation's registered office shall be. 308G, Wes Watkins Center for International Trade Development, OSU, Stillwater, Oklahoma, 74078 The name and address of the corporation's registered agent shall be Mark Hodges at 308G, Wes Watkins Center for International Trade Development, OSU, Stillwater, Oklahoma, 74078

ARTICLE III

A. Purposes. The Corporation is organized and shall be operated as a charitable organization, as defined in section 501(c)(3) of the Internal Revenue Code of 1986, as amended ("IRC"). In addition, the Corporation is organized and shall be operated as a supporting organization, as defined in IRC § 509(a)(3), and as such shall be operated, supervised or controlled by and for the benefit of the organizations described in Article IV, A hereof, all of which are governmental units described in IRC § 170(b)(1)(A)(v) by reason of being political subdivisions described in IRC § 170(c)(1). In furtherance of this purpose, the Corporation shall educate the public about the United States wheat add agriculture through a newsletter, exhibits, lectures, films and demonstrations as well as through research, the results of which shall be available to the general public through the newsletter.

B. Powers: Subject to the restrictions set forth in Article III, C, and solely in furtherance of the purposes set forth in Article III, A, the Corporation shall have all of the rights and powers given to corporations under the Oklahoma General Corporation Act.

C. Restrictions: This Corporation is intended to qualify as a tax exempt organization with the meaning of IRC § 501(c)(3). The affairs of the Corporation shall be conducted in such a manner as to qualify for tax exemption under that section or the corresponding provision of any future federal tax laws. No part of the net earnings of the

Corporation shall inure to the benefit of, or be distributable to, its directors, officers, or other private persons, except that the Corporation may pay reasonable compensation for services rendered. No substantial part of the activities of the Corporation shall consist of carrying on propaganda, or otherwise attempting to influence legislation. The Corporation shall not participate or intervene directly or indirectly in any political campaign on behalf of, or in opposition to, any candidate for public office.

D. Organizational Structure. The Corporation shall not be organized for profit and it shall have no capital stock and shall not be authorized to issue any capital stock.

ARTICLE IV

Members: The membership of the Corporation shall be limited to the following political subdivisions:

Oklahoma Wheat Commission
800 Northeast 63rd
Oklahoma City, Oklahoma 73105

Oklahoma State University Division of Agricultural
Sciences and Natural Resources
139 Ag Hall
Stillwater, Oklahoma 74078

Oklahoma State Department of Agriculture, Food and Forestry
2800 North Lincoln Boulevard
Oklahoma City, Oklahoma 73105;

from time to time, the Board of Directors shall have the right to increase the class of political subdivisions that have a right to be members and to elect directors, provided that such additional political subdivisions are state wheat commissions or other similar organizations.

ARTICLE V

A. Board of Directors: The governing body of the Corporation shall be a Board of Directors comprised of one individual appointed by each member political subdivision. There shall be between 7 and 13 directors, as determined by the Board of Directors from time to time. Each of the following named political subdivisions (or the successor of a named political subdivision after a mere change in name or form of such named political subdivision, however affected) as the members of the Corporation shall have the right to elect a director for a three year term, as set forth in the Bylaws. The directors thus chosen by the above described political subdivisions shall elect the

remaining directors from a list of candidates submitted to the Board of Directors by the Nominating Committee provided for in the Bylaws of the Corporation. The names and address of each director to be appointed at the first meeting are:

Joe Neal Hampton
Oklahoma Feed and Grain Association
2309 N. 10th, Suite E
Enid, OK 73701

Randy Nusz
Okeene Milling Co.
P.O. Box 1000
Okeene, OK 73763

Tom McCreight
Equity Marketing Alliance
2811 N. Van Buren
P.O. Box 947
Enid, OK 73702

Troy Rigel
W. B. Johnston
P.O. Box 1307
Enid, OK 73702

Mike Mahoney
Wheeler Bros.
P.O. Box 29
Watonga, OK 73772

Keith Kisling
Oklahoma Wheat Commission
Rt. 1, Box 65
Burlington, OK 73722

Paul Jackson
Oklahoma Wheat Commission
Rural Route 1, Box 2400
Apache, OK 73006

The directors thus chosen may from time to time increase the class of political subdivisions that have the right to be members and to elect directors, provided that such additional political subdivisions are state wheat commissions or other similar organizations. In addition, the College of Agricultural Science at Oklahoma State University and the Oklahoma Department of Agriculture shall each elect a nonvoting director, who shall serve for a three year term. All other aspects of the directorships,

including the manner of removing directors and the consequences of the resignation of directors shall be determined by the Board of Directors, from time to time, as set forth in the Bylaws of the Corporation.

B. Interest of Members, Officers, and Directors: No members, officers, or directors of the Corporation shall have any right, title or interest in or to any property or assets of the Corporation either prior to or at the liquidation or dissolution of the Corporation. The Corporation shall not afford pecuniary gain, incidentally or otherwise, to its members as such.

C. Exemption Of Private Property: The private property of the incorporators, members, directors, officers, employees and agents of the Corporation shall be forever exempt from liability for the Corporation's debts and obligations.

ARTICLE VI

Amendment of Articles: The Articles of Incorporation of the Corporation may be amended by the affirmative vote of a majority of the number of directors in office and entitled to vote.

ARTICLE VII

Bylaws: The Board of Directors shall adopt Bylaws governing the conduct of the affairs of the Corporation, establishing the officers of the Corporation and their respective duties and setting forth such other matters as they shall deem appropriate. The Board of Directors may amend such Bylaws from time to time at any meeting, the notice of which shall specify that an amendment to the Bylaws is to be considered by the affirmative vote of a majority of the number of directors in office and entitled to vote. However, no amendment shall be effective unless notice of a proposed amendment is provided all directors by mailing a copy of such proposal to each director two weeks before the Board meeting at which the proposal is to be considered. The affirmative vote of a majority of the number of directors in office and entitled to vote is required to adopt a Bylaw amendment.

ARTICLE VIII

A. Distribution on Dissolution: Upon dissolution or final liquidation, after payment or provision for payment of all of the liabilities of the Corporation, the remaining assets of the Corporation shall be distributed to the College of Agricultural Science at Oklahoma State University. In the event the College of Agricultural Science at Oklahoma State University is not a governmental entity or an organization described in IRC section 501(c)(3), then the remaining assets shall be distributed to such tax exempt organization or organizations described in IRC section 501(c)(3), or corresponding

provisions of any future federal tax laws or to the Federal government or a state or local government for a public purpose as the Board of Directors may determine.

ARTICLE IX

A. Release From Liability: To the fullest extent permitted by the Oklahoma General Corporation Act, no member, officer, or director shall be held personally liable to the Corporation for monetary damages for conduct as a director.

B. Indemnification: The following provisions shall apply regarding indemnification:

(1) The Corporation shall indemnify to the fullest extent permitted by the Oklahoma General Corporation Act, any person who has been made, or is threatened to be made, a party to an action, suit or proceeding, whether civil, criminal, administrative, investigative or otherwise (including any action, suit or proceeding by or in the right of the Corporation) by reason of the fact that the person is or was a member, director, officer, employee or agent of the Corporation, or a fiduciary within the meaning of the Employee Retirement Income Security Act of 1974 with respect to an employee benefit plan of the Corporation, or serves or served at the request of the Corporation as a member, director, officer, or as a fiduciary of an employee benefit plan, of another association, corporation, partnership, joint venture, limited liability company, trust or other enterprise. The right to and the amount of indemnification shall be determined in accordance with the provisions of the Oklahoma General Corporation Act in effect at the time of the determination.

(2) To the fullest extent permitted by the Oklahoma General Corporation Act, the Corporation shall pay for or reimburse any and all reasonable expenses incurred by a member, director, officer, committee member, employee, agent or fiduciary of the Corporation who is a party to a proceeding in advance of the final disposition of the proceeding.

(3) For the purposes of determining the right to any indemnification under this Article X, Section B, the termination of any action, suit or proceeding by judgment, order, settlement, conviction or upon a plea of nolo contendere, or its equivalent, shall not, of itself, create a presumption that the person acted in bad faith and in a manner which he or she reasonably believed to be in or not opposed to the best interest of the Corporation, and with respect to any criminal action or proceedings, had reasonable cause to believe that his or her conduct was unlawful.

(4) The right to indemnification and to the payment or reimbursement of expenses with regard to a proceeding referred to in this Article X, Section B shall not be exclusive of any other rights to which any person may be entitled or hereafter acquire under any statute, provision of the Articles of Incorporation, Bylaws, Action by the Board of Directors, or otherwise, and shall continue as to any person who has ceased to be a

member, director, officer, employee, agent or fiduciary of the Corporation, and shall inure to the benefit of the heirs, executors and administrators of such person.

Executed this ____ day of _____, 200 ____.

S:\Arlene\Corp\Plains Grains\Certificate of Incorporation - ss.doc

BYLAWS
OF
PLAINS GRAINS, INC.

ARTICLE I

The Corporation

Section A – No Special Powers. The Corporation has not been granted any special powers by a legislative act or franchise, and will only function within the powers given to nonprofit corporations under the Oklahoma General Corporation Act.

Section B – Relationship to Local Governments. The ability of the Corporation to conduct business will not alter the authority of any local government over approval of normally required plans, permits and zoning changes of development projects. The Corporation will function the same as any other corporation or person in seeking necessary approval for plans, permits and other necessary actions from local governments on its behalf and on behalf of other participants in any joint development project.

Section C – Corporation an Eligible Recipient. The Corporation shall be considered an eligible recipient of funds from any federal agency or of other federal capital and operating funds or of local funds either as a direct recipient qualified on its own as an eligible quasi-public development corporation, or as an eligible subrecipient of those federal funds passed through another eligible agency or local government. In either of these capacities, the Corporation will not be required to bid to receive federal funds or local funds due to its status as an eligible recipient or subrecipient. This status will not exempt the Corporation from bidding requirements, if any, on the expenditure of those funds.

Section D – Members. The initial members of the Corporation shall be:

Oklahoma Wheat Commission
800 Northeast 63rd
Oklahoma City, Oklahoma 73105

Oklahoma State University Division of Agricultural
Sciences and Natural Resources
139 Ag Hall
Stillwater, Oklahoma 74078

Oklahoma State Department of Agriculture, Food and Forestry

2800 North Lincoln Boulevard
Oklahoma City, Oklahoma 73105;

from time to time, the Board of Directors, as set forth in the Certificate of Incorporation of the Corporation, shall have the right to increase the class of political subdivisions that have the right to be members and to elect directors, provided that such additional political subdivisions are state wheat commissions or other similar organizations.

ARTICLE II

Rights and Liabilities of Members and Directors

Section A – Interest of Members and Directors. No member or director of the Corporation shall have any right, title or interest in or to any property or assets of the Corporation either prior to or at the time of any liquidation or dissolution of the Corporation.

Section B – Liability of Members and Directors for Debts. The private property of the members and directors shall be exempt from execution or other liability for any debts of the Corporation, and no member or director shall be liable or responsible for any debts or liabilities of the Corporation.

ARTICLE III

Directors

Section A – General Powers. The business and affairs of the Corporation shall be governed by a Board of Directors, which shall exercise all of the powers of the Corporation.

Section B – Number. The number of directors shall be a minimum of seven (7) and a maximum of thirteen (13), as determined from time to time by resolution of the Board of Directors. Each of the following named political subdivisions (or the successor of a named political subdivision after a mere change in name or form of such named political subdivision, however effected) shall have the right to elect a director for a three year term.

Section C -- Board of Directors: The governing body of the Corporation shall be a Board of Directors comprised of one individual appointed by each member political subdivision. There shall be between 7 and 13 directors, as determined by the Board of Directors from time to time. Each of the following named political subdivisions (or the successor of a named political subdivision after a mere change in name or form of such named political subdivision, however affected) as the members of the Corporation shall

have the right to elect a director for a three year term, as set forth in the Bylaws. The directors thus chosen by the above described political subdivisions shall elect the remaining directors from a list of candidates submitted to the Board of Directors by the Nominating Committee provided for in the Bylaws of the Corporation. The names and address of each director to be appointed at the first meeting are:

Joe Neal Hampton
Oklahoma Feed and Grain Association
2309 N. 10th, Suite E
Enid, OK 73701

Randy Nusz
Okeene Milling Co.
P.O. Box 1000
Okeene, OK 73763

Tom McCreight
Equity Marketing Alliance
2811 N. Van Buren
P.O. Box 947
Enid, OK 73702

Troy Rigel
W. B. Johnston
P.O. Box 1307
Enid, OK 73702

Mike Mahoney
Wheeler Bros.
P.O. Box 29
Watonga, OK 73772

Keith Kisling
Oklahoma Wheat Commission
Rt. 1, Box 65
Burlington, OK 73722

Paul Jackson
Oklahoma Wheat Commission
Rural Route 1, Box 2400
Apache, OK 73006

The directors thus chosen may from time to time increase the class of political subdivisions that have the right to be members and to elect directors, provided that such additional political subdivisions are state wheat commissions or other similar organizations. In addition, the College of Agricultural Science at Oklahoma State

University and the Oklahoma Department of Agriculture shall each elect a nonvoting director, who shall serve for a three year term. All other aspects of the directorships, including the manner of removing directors and the consequences of the resignation of directors shall be determined by the Board of Directors, from time to time, as set forth in the Bylaws of the Corporation.

Section D – Election and Tenure of Office. The Board of Directors shall be divided into three (3) classes, as nearly equal in number as may be, with one class of director elected each year for terms of a maximum of three (3) years and until their successors are elected and shall qualify; provided, that directors elected to newly created positions on the Board of Directors shall serve for the term indicated at the time of election to phase in the election of approximately one-third of the Board of Directors every year. The term of office of newly elected directors shall begin immediately following their election. Directors may be elected to succeed themselves for successive terms without limitation.

Section E – Appointment by Political Subdivision. Upon the death, resignation or removal of a director appointed by a member political subdivision or six months prior to the expiration of the term of a director appointed by a political subdivision, the Chairperson shall inform the member political subdivision that its director's term is to expire. A member political subdivision shall appoint a director by written appointment submitted to the Chairperson.

Section F – Nominating Committee and Election Procedure. At large Directors shall be elected to the Board of Directors in office at the time of the election from a list of candidates submitted to the Board of Directors by the Nominating Committee. If only one candidate for a director position is submitted by the Nominating Committee, and such candidate does not receive a majority of the votes cast by the Board of Directors, then the Nominating Committee shall submit one or more additional nominees until a candidate receives a majority of the votes cast.

Section G – Removal. A director may be removed from office at any meeting by the affirmative vote of 80% of the number of directors in office and entitled to vote whenever in the judgment of the directors the best interests of the Corporation will be served thereby; provided, that notice of the intended action shall have been given to all directors, including the director whose removal is to be considered, and such director shall have been given an opportunity to be heard at the meeting before any vote is taken on the removal. A director shall, in addition, be considered removed in the event the director is absent from three consecutive meetings of the Board of Directors and said absences are not excused by the Board of Directors.

Section H – Vacancies. A vacancy on the Board of Directors shall be declared by the Board of Directors to exist in the event of a death of any director; upon receipt of a letter of resignation from any director; or, in the event of the removal of any director. In the case of a director appointed by a member political subdivision, a vacancy shall be filled by that member political subdivision. In the case of a vacancy of an at large

director, the vacancy on the Board of Directors shall be filled by the remaining directors from a list of candidates submitted by the Nominating Committee.

Section I – Compensation. Although not prohibited by the Certificate of Incorporation, no director or close relative of any director shall receive any salary, equity position, professional fees or other compensation for services; provided, however, that such prohibition shall not prevent the Executive Director from receiving compensation for services rendered to the Corporation. The term “close relative” shall mean any brother or sister of any director, the forebears and descendants of any director or of any such brother or sister and the spouse of a director or of any other person described in this sentence. Relationships of the half-blood shall be treated as being of the whole blood, adopted children shall be treated as descendants and adoptive parents as forebears.

ARTICLE IV

Meetings

Section A – Annual Meeting. The annual meeting of the member and directors shall be held in April of each year, at such time and place as is specified in the notice of the meeting for the purpose of electing directors, electing officers and passing upon reports for the previous fiscal year and for the purpose of transacting such other business as may come before the meeting. Failure to hold the annual meeting at the designated time shall not work a forfeiture or dissolution of the Corporation and in the event of such failure, the annual meeting shall be held within a reasonable time thereafter.

Section B – Regular Meetings. A regular meeting of the members and Board of Directors shall be held in October at a time and place to be designated by the Chairperson at the annual meeting.

Section C – Special Meetings. Special meetings of the members and Board of Directors may be called by the Chairperson or by a majority of the directors or by the Executive Director, and it shall thereupon be the duty of the Secretary to cause notice of such meeting to be given as provided at Section D of this Article. The Chairperson, the directors and the Executive Director calling the meeting shall fix the time and place (which may or may not be within the metropolitan area of Stillwater, Oklahoma) for the holding of the meeting.

Section D – Notice of Meetings.

Annual and Regular Meetings. Written notice of the time and place of each annual and regular meeting shall be given at least forty-five (45) days before such meeting, either personally or by mail, by the Secretary or by the Chairperson or at the direction of either of them.

Special Meetings. Written notice of the time, place and purpose of any regular or special meeting shall be delivered to each director not less than seven (7) days previous thereto either personally or by mail, by or at the direction of the Secretary.

Date of Notice. If notice of a meeting is mailed, such notice shall be deemed to be delivered when deposited in the United States mail, postage prepaid, addressed to the director at his or her address as it appears on the records of the Corporation.

Notice of Adjourned Meetings. Notice of the time and place of an adjourned meeting need not be given if such time and place be fixed at the meeting adjourned; provided, that the Secretary shall notify any directors who did not attend the initial meeting of the time and place of such adjourned meeting.

Notice to Members. Notice to any member shall be deemed given when properly given to the Director appointed or designated by said member.

Section E – Quorum. A majority of the directors in office and entitled to vote shall constitute a quorum. Except as otherwise provided by the Certificate of Incorporation or these Bylaws, the act of a majority of the directors entitled to vote at a meeting at which a quorum is present shall be the act of the Board of Directors. No action of the Board of Directors or a committee of the Board where directors representing public agencies constitute a majority of the prevailing vote shall be effective or considered an act of the Board of Directors of this Corporation.

Section F – Consent by Directors. Any action which the law, the Certificate of Incorporation or these Bylaws require or permit the members and/or directors to take at a meeting may be taken without a meeting if a consent in writing setting forth the action so taken is signed by all of the directors entitled to vote on the matter. The consent, which shall have the same effect as a unanimous vote of the directors, shall be filed in the records of the Corporation.

Section G – Member Voting. Each member shall vote by and through the Director appointed by such member.

ARTICLE V

Officers

Section A – Officers. The officers of the Corporation shall be a Chairperson and Secretary, and the Board of Directors may from time to time elect such other officers, including a Vice-Chair-person and Treasurer, as it deems appropriate. Any two or more

offices may be held by the same person, except the offices of Chairperson and Secretary, which shall not be held by the same person. All officers shall be directors.

Section B – Election. The Board of Directors shall elect all officers of the Corporation for terms of one year, and until their successors are elected and qualified.

Section C – Vacancies. Any vacancy in any office because of the death, resignation, removal, disqualification or otherwise shall be filled by the Board of Directors.

Section D – Chairperson. Subject to the control of the Board of Directors, the Chairperson shall have general supervision, direction and control of the business and affairs of the Corporation. He or she shall preside at all meetings of the directors and the Executive Committee, and shall have such other powers and duties as may be prescribed from time to time by the Board of Directors.

Section E – Vice-Chairperson. In the absence of the Chairperson or in the event of his or her inability or refusal to act, the Vice-Chairperson, if any, shall perform the duties of the Chairperson, subject to all of the restrictions thereupon, and shall have such other powers and perform such other duties as, from time to time, may be prescribed by the Board of Directors.

Section F – Secretary. The Secretary shall keep a full and complete record of the proceedings of the Board of Directors, shall keep the seal of the Corporation and affix the same to such papers and instruments as may be required in the regular course of business, shall make service of such notices as may be necessary or proper, shall supervise the keeping of the books of the Corporation, and shall discharge such other duties as pertain to the office or as are prescribed by the Board of Directors.

Section G – Treasurer. The Treasurer, if any, shall have such powers and perform duties as may be prescribed from time to time by the Board of Directors, including the care and custody of the funds, money and property of the Corporation to the extent directed by the Board of Directors.

Section H – Compensation of Officers. Although not prohibited by the Certificate of Incorporation, no officer or close relative of any officer shall receive any salary, equity position, professional fees or other compensation for services to the Corporation. The term “close relative” shall have the same meaning with respect to an officer as is provided for with respect to a director in Section F of Article III of these Bylaws.

ARTICLE VI

Executive Director

The Executive Director shall be the chief administrative employee of the Corporation, and shall be appointed, and may be discharged, by majority vote of the executive Committee of the Board of Directors. Subject to the supervision of the Board of directors and/or the Executive Committee, the Executive Director shall have primary authority with respect to all matters involving the personnel and the day-to-day operations of the Corporation, shall prepare the budget of the Corporation for approval by the Board of Directors, shall be empowered to make budgeted expenditures of \$5,000 or less without approval of the Board of Directors, shall be empowered to make changes in the approved budget provided that such changes do not modify any category of the budget by more than 10%, shall make recommendations to the Board of Directors on practices, policies and programs of the Corporation, and shall represent the Corporation in seeking all approvals and necessary actions with respect to marketing and development projects and other investments in which the Corporation is participating. The Executive Director shall be entitled to notice of all meetings of the Board of Directors, but shall not be entitled to be present during any discussions relating to his or her employment, performance or compensation.

ARTICLE VII

Committees

Section A – Special Committees. The Chairperson may appoint special committees from time to time as required. Special project review committees may be appointed to review projects and proposals for ongoing joint development projects as necessary. Each such committee may include persons who are not members of the Board of Directors.

Section B – Executive Committee. The Executive Committee shall consist of a minimum of three (3) directors and a maximum of five (5) directors, chosen from the Board of Directors, and be appointed by the Chairperson of the Board of Directors. Except as otherwise provided by law, the Executive Committee may act for the Board of Directors, to implement policies and procedures established by the Board of Directors.

ARTICLE VIII

Nonprofit Corporation

The Corporation shall at all times be operated on a nonprofit basis, and no part of the income or assets of the Corporation shall be distributed to, or inure to the benefit of, any member, director or officer or any other person.

ARTICLE IX

Seal

The Corporation shall not have a seal.

ARTICLE X

Financial Transactions

Section A – Contracts. Except as otherwise provided in these Bylaws, the Board of Directors may authorize any officer or officers, agent or agents, to enter into any contract or execute and deliver any instrument in the name and on behalf of the Corporation, and such authority may be general or confined to specific instances.

Section B – Checks, Drafts, Etc. All checks, drafts or other orders for the payment of monies, and all notes, bonds or other evidence of indebtedness issued in the name of the Corporation shall be signed by such officer or officers, agent or agents, employee or employees, of the Corporation, and in such manner as shall from time to time be determined by the Board of Directors.

Section C – Depository. All funds of the Corporation shall be deposited from time to time to the credit of the Corporation in such depositories as the Board of Directors may select.

ARTICLE XI

Indemnification

Section A – Indemnification. The Corporation shall indemnify persons pursuant to Article X of its Certificate of Incorporation.

Section B – Advances of Expenses. Expenses incurred in defending civil or criminal action, suit or proceeding may, at the discretion of the Board of Directors, be paid by the Corporation in advance of the final disposition of the action, suit or proceeding upon receipt of an undertaking by or on behalf of the member, director, officer, employee or agent to repay such amount if it shall ultimately be determined that the member, director, officer, employee or agent is not entitled to be indemnified by the Corporation as authorized in this section.

Section C – Non-Exclusivity of Rights. The rights conferred on any person by this bylaw shall not be exclusive of any other right which such person may have or hereafter acquire under any bylaws, agreement, vote of disinterested directors or otherwise, both as to action in the person’s official capacity and as to action in another capacity while holding office.

Section D – Survival of Rights. The indemnification and advancement of expenses provided by, or granted pursuant to, this bylaws, unless otherwise provided when authorized or ratified, shall continue as to a person who has ceased to be a member, director, officer, employee or agent, and shall inure to the benefit of the estate or conservator of such a person.

Section E – Insurance. A corporation shall have power to purchase and maintain insurance on behalf of any person who is or was a member, director, officer, employee or agent of the Corporation, or is or was serving at the request of the Corporation as a member, director, officer, employee or agent of another corporation, against any liability asserted against the member, director, officer, employee or agent and incurred by the member, director, officer, employee or agent in any such capacity or arising out of status as such, whether or not the corporation would have the power to indemnify the member, director, officer, employee or agent against the liability under the provisions of this bylaw or under Oklahoma law.

Section F – Savings Clause. If any portion of this bylaw shall be invalidated on any ground by any court of competent jurisdiction, the Corporation shall indemnify each member, director, officer or other agent to the fullest extent permitted by any applicable portion of this bylaw that shall not have been invalidated, or by any other applicable law.

ARTICLE XII

Miscellaneous

Section A – Waiver of Notice. Any member and/or director may waive in writing any notice of a meeting required to be given by these Bylaws. The attendance of a director at any meeting shall constitute a waiver of notice of such meeting by such director, and the member who appointed him or her, except in case a director shall attend a meeting for the express purpose of objecting to the transaction of any business on the ground that the meeting has not been lawfully called or convened.

Section B – Rules and Regulations. The Board of Directors shall have the power to make and adopt such rules and regulations not inconsistent with law, the Certificate of Incorporation or these Bylaws, as it may deem desirable for the management of the business and affairs of the Corporation.

Section C – Accounting System and Reports. The Board of Directors shall cause to be established and maintained, in accordance with generally accepted principles of accounting, an appropriate accounting system.

ARTICLE XIII

Amendments

These Bylaws may be altered, amended or repealed by the affirmative vote of a majority of the number of directors in office and entitled to vote, at any regular or special meeting, provided the notice of such meeting shall have contained a copy of the proposed alteration, amendment or repeal.

The foregoing Bylaws were adopted by resolution of the Board of Directors on the ____ day of _____, 200 ____.

Chairperson

APPENDIX 2

BUDGETS USED TO DEVELOP THE PROJECTED
ANNUAL INCOME STATEMENT

Extended Projected Income Statement

Plains Grains Incorporated
Stillwater, Oklahoma

Income Statement

Revenues

Revenues from Workshops	120,000
Revenues from Wheat Quality Tests	14,861
Appropriations from Wheat Commissions	250,000
Other Income (sale of assets, etc.)	<u>-</u>
Total Revenues	384,861

Expenses

Salaries

Director Salary	90,000
Assistant Director Salary	50,000
Administrative Staff Salary	<u>40,000</u>
Total Salaries	180,000

Benefits & Employee Related

Payroll Tax	9,000
Retirement Tax	27,000
INS Tax	<u>18,000</u>
Total Benefits & Employee Related	54,000

Marketing and Administrative

Marketing Materials (Development, Printing, Distribution)	3,300
Web-Site Maintaince Fee	350
Contributions	500
Consulting	20,000
Bank Charges	100
Vehicle Lease	7,200
Interest Expense	250
Dues & Subscriptions	3,950
Legal & Accounting	3,500
Travel	12,000

Contracted Services (Workshops)	12,000
Travel, Lodging, and Meals (Workshops)	<u>44,676</u>
Total Marketing and Administrative	107,826
 <u>Supplies</u>	
Product Manufacturing and Flour Tests (Workshops)	12,000
Sanitation Supplies	100
Office Supplies	1,000
Laboratory Supplies and Services (Wheat Quality Testing)	13,510
Miscellaneous	<u>500</u>
Total Supplies	27,110
 <u>Maintenance & Repair</u>	
Computer, Fax, and Printer Servicing	500
Vehicle Maintenance	1,000
Miscellaneous	<u>500</u>
Total Maintenance & Repair	2,000
 <u>Utilities</u>	
Vehicle Fuel	2,600
Telephone/Fax/Internet	<u>7,200</u>
Total Utilities	9,800
 <u>Fixed Expenses</u>	
Rent	1,260
Depreciation - Office Equipment	250
Licenses	-
Insurance (office and board members)	<u>2,500</u>
Total Fixed Expenses	4,010
 Total Expenses	 384,746
 Net Income	 115

	Workshop Fee			Total	Total
	Occurrence	Fee	Per Individual	Workshop	Cost Per Year
Individual Cost					
Travel	2	47	94	936	5,616
Lodging	4	120	480	4,800	28,800
Meals					
Breakfast	4	6	24	240	1,440
Lunch	4	13	52	520	3,120
Break	3	5	15	150	900
Evening Meal	4	20	<u>80</u>	<u>800</u>	<u>4,800</u>
Total Meals and Entertainment			171	1,710	10,260
Total Travel, Lodging, and Meals			745	7,446	44,676
Group Cost					
Contracted Services				2,000	12,000
Product Manufacturing and Flour Tests				<u>2,000</u>	<u>12,000</u>
Total Group Cost				4,000	24,000
Total Workshop Cost				11,446	68,676
Cost Per Individual				1,145	
Workshope Fee				1,800	

Travel

Budget based on 6 workshops with 10 participants each.

Travel figured at \$0.36 per mile.

Revenues**Revenues from Workshops**

# of Participants	* Fee	* # of Workshops	= Revenue
10	\$ 2,000	6	120,000

Revenues from Wheat Quality Tests

# of Tests Done	* Fee	= Revenue
70	\$ 193	13,510
10% Mark-Up		14,861

Appropriations from Wheat Commissions

# of Contributors	* Contribution	= Revenue
5	\$ 50,000	250,000

Testing fee was achieved by summing cost for quality testing done at the CII lab.

Testing Fee	
Moisture	11
Protein (Combustion)	14
Farinograph	35
Alveograph	65
Falling Number	14
Test Weight	9
Experimental Milling	<u>45</u>
Total	\$193

Marketing and Administrative Budget

Marketing Materials (Development, Printing, Distribution)

Promotional Items	1300
Educational Materials	500
Other	<u>1500</u>
Total	\$ 3,300.00

Web-Site Maintenance Fee	240
Contributions	500
Consulting	20,000
Bank Charges	100
Vehicle Lease	7,200
Interest Expense	250
Dues & Subscriptions	3,950
Legal & Professional	3,500
Travel	12,000
Conference Room Rentals (Workshops)	500
Contracted Services (Workshops)	12,000
Meals & Entertainment (Workshops)	<u>44,676</u>
Total	\$ 111,516.00

Promo Items	
cups (100 @ \$7)	700
lanyard (75 @ \$2.12)	159
pens (100 @ \$1.50)	150
bags/folders (175 @ \$1.00)	175
Total	1184 round to 1300

Educational Materials	
Speciality Paper (3 Reams @ 15)	45
Postage (100 @ \$0.60)	<u>60</u>
Total	105 round to 120

Dues and Subscriptions	
Wheat Quality Council	3000
Oklahoma Wheat Growers Association	100

Wheat Marketing Center, Portland	600
Other	<u>250</u>
Total	\$ 3,950.00

APPENDIX 3

SAS DATA, MODEL, AND RESULTS

Crop Quality Survey Data

Grade Data	Test weight, damaged kernels, foreign materials, shrunken and broken, and total defects
Non-Grade Data	Dockage, moisture, protein, and single kernel data
Single Kernel Data	Mean hardness, weight, and diameter of the kernels sampled; standard deviation of hardness, weight, and diameter
Flour Data	Protein, Ash Moisture
Flour Properties	Falling number, wet gluten, gluten index, and extraction rate
Dough Properties (Farinograph)	Peak time, Stability, absorption, absorption 14% MB
Dough Properties (Alveograph)	P, L, W, P/L
Baking Evaluation	External characteristics, internal characteristics, loaf volume
Internal Characteristics	Crumb texture, crub grain, crumb color, and crumb shape

WGTWlb	Wheat Grade Test Weight (lb)
WGTWkg	Wheat Grade Test Weight (kg)
WGDamKer	Wheat Grade Damaged Kernels
WGForMat	Wheat Grade Foreign Material
WGSbBr	Wheat Grade Shrunken and Broken
WGTotDef	Wheat Grade Total Defects
WNGDock	Wheat Non-Grade Dockage
WNGMois	Wheat Non-Grade Moisture
WNGProt	Wheat Non-Grade Protein
WNGHar*	Wheat Non-Grade Hardness
WNGHarSD*	Wheat Non-Grade Hardness Standard Deviation
WNGWe*	Wheat Non-Grade Weight (mg)
WNGWeSD*	Wheat Non-Grade Weight Standard Deviation
WNGDia*	Wheat Non-Grade Diameter
WNGDiaSD*	Wheat Non-Grade Diameter Standard Deviation
FPFalNu	Flour Properties Falling Number
FPWetGlu	Flour Properties Wet Gluten
FPGluInd	Flour Properties Gluten Index
FPExtRa	Flour Properties Extraction Rate
FDPro14	Flour Data Protein 14% MB**
FDPro0	Flour Data Protein 0% MB**
FDash14	Flour Data Ash 14% MB**
FDash0	Flour Data Ash 0% MB**
FDMois	Flour Moisture (%)
DPFPT	Dough Properties Farinograph Peak Time
DPFStab	Dough Properties Farinograph Stability
DPFAbs	Dough Properties Farinograph Absorption (%) "as is" MB**
DPFAbs14	Dough Properties Farinograph Absorption (%) 14% MB**
DPAP	Dough Properties Alveograph P (mmH ₂ O)
DPAL	Dough Properties Alveograph L (mm)
DPAW	Dough Properties Alveograph W (erg/gm)
DPAP_L	Dough Properties Alveograph P/L
BEECL	Baking Evaluation External Characteristics Low
BEECM	Baking Evaluation External Characteristics Medium
BEECH	Baking Evaluation External Characteristics High
BECTL	Baking Evaluation Crumb Texture Low
BECTM	Baking Evaluation Crumb Texture Medium
BECTH	Baking Evaluation Crumb Texture High
BECGL	Baking Evaluation Crumb Grain Low
BECGM	Baking Evaluation Crumb Grain Medium

BECGH	Baking Evaluation Crumb Grain High
BECCL	Baking Evaluation Crumb Color Low
BECCM	Baking Evaluation Crumb Color Medium
BECCH	Baking Evaluation Crumb Color High
BECSL	Baking Evaluation Crumb Shape Low
BECSM	Baking Evaluation Crumb Shape Medium
BECSH	Baking Evaluation Crumb Shape High
BELVL	Baking Evaluation Loaf Volume Low
BELVM	Baking Evaluation Loaf Volume Medium
BELVH	Baking Evaluation Loaf Volume High

* Single Kernel Characteristic System measurements

** MB is Moisture Basis

```

proc mixed data = sasuser.complete;
class year district;
model FPFa1NU = year*district wgtwlb wgdamker wgformat wgshbr wngdock wngmois
wngprot wnghar wngharsd wngwe wngwesd wngdia wngdiasd;
proc mixed data = sasuser.complete;
class year district;
model fpextra = year*district wgtwlb wgdamker wgformat wgshbr wngdock wngmois
wngprot wnghar wngharsd wngwe wngwesd wngdia wngdiasd;
run;
proc mixed data = sasuser.complete;
class year district;
model dpfpt = year*district wgtwlb wgdamker wgformat wgshbr wngdock wngmois
wngprot wnghar wngharsd wngwe wngwesd wngdia wngdiasd;
run;
proc mixed data = sasuser.complete;
class year district;
model dpfstab = year*district wgtwlb wgdamker wgformat wgshbr wngdock wngmois
wngprot wnghar wngharsd wngwe wngwesd wngdia wngdiasd;
run;
proc mixed data = sasuser.complete;
class year district;
model dpfabs = year*district wgtwlb wgdamker wgformat wgshbr wngdock wngmois
wngprot wnghar wngharsd wngwe wngwesd wngdia wngdiasd;
run;
proc mixed data = sasuser.complete;
class year district;
model dpfabs14 = year*district wgtwlb wgdamker wgformat wgshbr wngdock wngmois
wngprot wnghar wngharsd wngwe wngwesd wngdia wngdiasd;
run;
proc mixed data = sasuser.complete;
class year district;
model dpap = year*district wgtwlb wgdamker wgformat wgshbr wngdock wngmois
wngprot wnghar wngharsd wngwe wngwesd wngdia wngdiasd;
run;
proc mixed data = sasuser.complete;
class year district;
model dpal = year*district wgtwlb wgdamker wgformat wgshbr wngdock wngmois
wngprot wnghar wngharsd wngwe wngwesd wngdia wngdiasd;
run;
proc mixed data = sasuser.complete;
class year district;
model dpaw = year*district wgtwlb wgdamker wgformat wgshbr wngdock wngmois
wngprot wnghar wngharsd wngwe wngwesd wngdia wngdiasd;
run;
proc mixed data = sasuser.complete;

```

```
class year district;
model dpap_1 = year*district wgtwlb wgdamker wgformat wghbr wngdock wngmois
wngprot wnghar wngharsd wngwe wngwesd wngdia wngdiasd;
run;

quit;
```

The SAS System

The Mixed Procedure

Model Information

Data Set	SASUSER.COMPLETE
Dependent Variable	FPFalNu
Covariance Structure	Diagonal
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
Year	3	2000 2001 2003
District	5	C NC PH SW WC

Dimensions

Covariance Parameters	1
Columns in X	24
Columns in Z	0
Subjects	1
Max Obs Per Subject	445
Observations Used	196
Observations Not Used	249
Total Observations	445

Covariance Parameter Estimates

Cov Parm	Estimate
Residual	530.86

Fit Statistics

-2 Res Log Likelihood	1658.9
AIC (smaller is better)	1660.9
AICC (smaller is better)	1660.9
BIC (smaller is better)	1664.0

The SAS System

The Mixed Procedure

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Year*District	9	173	4.11	<.0001
WGTWlb	1	173	0.01	0.9325
WGDamKer	1	173	1.90	0.1700

WGForMat	1	173	1.57	0.2120
WGShBr	1	173	1.84	0.1773
WNGDock	1	173	0.04	0.8456
WNGMois	1	173	1.83	0.1777
WNGProt	1	173	12.60	0.0005
WNGHar	1	173	0.01	0.9076
WNGHarSD	1	173	0.44	0.5090
WNGWe	1	173	4.76	0.0305
WNGWeSD	1	173	0.33	0.5645
WNGDia	1	173	11.01	0.0011
WNGDiaSD	1	173	0.62	0.4323

The SAS System

The Mixed Procedure

Model Information

Data Set	SASUSER.COMPLETE
Dependent Variable	FPExtRa
Covariance Structure	Diagonal
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
Year	3	2000 2001 2003
District	5	C NC PH SW WC

Dimensions

Covariance Parameters	1
Columns in X	29
Columns in Z	0
Subjects	1
Max Obs Per Subject	445
Observations Used	332
Observations Not Used	113
Total Observations	445

Covariance Parameter Estimates

Cov Parm	Estimate
Residual	4.1069

Fit Statistics

-2 Res Log Likelihood	1399.6
AIC (smaller is better)	1401.6
AICC (smaller is better)	1401.6
BIC (smaller is better)	1405.3

The Mixed Procedure

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Year*District	14	304	17.11	<.0001
WGTWlb	1	304	2.02	0.1563
WGDamKer	1	304	0.77	0.3817
WGForMat	1	304	0.82	0.3648
WGShBr	1	304	2.76	0.0979
WNGDock	1	304	0.06	0.8112
WNGMois	1	304	0.78	0.3768
WNGProt	1	304	0.00	0.9511
WNGHar	1	304	15.88	<.0001
WNGHarSD	1	304	6.55	0.0110
WNGWe	1	304	1.41	0.2357
WNGWeSD	1	304	0.11	0.7425
WNGDia	1	304	0.25	0.6192
WNGDiaSD	1	304	0.53	0.4661

The Mixed Procedure

Model Information

Data Set SASUSER.COMPLETE
 Dependent Variable DPFPT
 Covariance Structure Diagonal
 Estimation Method REML
 Residual Variance Method Profile
 Fixed Effects SE Method Model-Based
 Degrees of Freedom Method Residual

Class Level Information

Class	Levels	Values
Year	3	2000 2001 2003
District	5	C NC PH SW WC

Dimensions

Covariance Parameters	1
Columns in X	29
Columns in Z	0
Subjects	1
Max Obs Per Subject	445
Observations Used	332
Observations Not Used	113
Total Observations	445

Covariance Parameter Estimates

Cov Parm	Estimate
Residual	4.2563

Fit Statistics

-2 Res Log Likelihood	1410.5
AIC (smaller is better)	1412.5
AICC (smaller is better)	1412.5
BIC (smaller is better)	1416.2

The Mixed Procedure

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Year*District	14	304	7.38	<.0001
WGTWlb	1	304	0.01	0.9096
WGDamKer	1	304	0.06	0.8033
WGForMat	1	304	4.80	0.0293
WGShBr	1	304	2.33	0.1276
WNGDock	1	304	1.98	0.1603
WNGMois	1	304	0.26	0.6104
WNGProt	1	304	21.97	<.0001
WNGHar	1	304	23.22	<.0001
WNGHarSD	1	304	2.85	0.0925
WNGWe	1	304	1.11	0.2934
WNGWeSD	1	304	1.58	0.2100
WNGDia	1	304	2.85	0.0921
WNGDiaSD	1	304	6.24	0.0130

The Mixed Procedure

Model Information

Data Set	SASUSER.COMPLETE
Dependent Variable	DPFStab
Covariance Structure	Diagonal
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
Year	3	2000 2001 2003
District	5	C NC PH SW WC

Dimensions

Covariance Parameters	1
Columns in X	29
Columns in Z	0
Subjects	1
Max Obs Per Subject	445
Observations Used	332
Observations Not Used	113
Total Observations	445

Covariance Parameter Estimates

Cov Parm	Estimate
Residual	11.7880

Fit Statistics

-2 Res Log Likelihood	1720.2
AIC (smaller is better)	1722.2
AICC (smaller is better)	1722.2
BIC (smaller is better)	1725.9

The Mixed Procedure

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Year*District	14	304	9.61	<.0001
WGTWlb	1	304	0.04	0.8348
WGDamKer	1	304	0.16	0.6888
WGForMat	1	304	5.67	0.0178
WGShBr	1	304	0.07	0.7982
WNGDock	1	304	1.90	0.1691
WNGMois	1	304	0.04	0.8356
WNGProt	1	304	3.68	0.0561
WNGHar	1	304	22.98	<.0001
WNGHarSD	1	304	0.18	0.6684
WNGWe	1	304	0.13	0.7176
WNGWeSD	1	304	0.13	0.7205
WNGDia	1	304	3.25	0.0722
WNGDiaSD	1	304	7.86	0.0054

The Mixed Procedure

Model Information

Data Set	SASUSER.COMPLETE
Dependent Variable	DPFabs
Covariance Structure	Diagonal
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
Year	3	2000 2001 2003
District	5	C NC PH SW WC

Dimensions

Covariance Parameters	1
Columns in X	29
Columns in Z	0
Subjects	1
Max Obs Per Subject	445
Observations Used	333
Observations Not Used	112
Total Observations	445

Covariance Parameter Estimates

Cov Parm	Estimate
Residual	4.0755

Fit Statistics

-2 Res Log Likelihood	1401.6
AIC (smaller is better)	1403.6
AICC (smaller is better)	1403.6
BIC (smaller is better)	1407.3

The Mixed Procedure

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Year*District	14	305	3.24	<.0001
WGTWlb	1	305	0.75	0.3856
WGDamKer	1	305	0.13	0.7154
WGForMat	1	305	0.95	0.3299
WGShBr	1	305	0.80	0.3722
WNGDock	1	305	0.02	0.8999
WNGMois	1	305	0.12	0.7329
WNGProt	1	305	67.74	<.0001
WNGHar	1	305	7.71	0.0058
WNGHarSD	1	305	4.55	0.0338
WNGWe	1	305	1.59	0.2082
WNGWeSD	1	305	1.01	0.3162
WNGDia	1	305	0.16	0.6918
WNGDiaSD	1	305	8.14	0.0046

The Mixed Procedure

Model Information

Data Set	SASUSER.COMPLETE
Dependent Variable	DPFAbs14
Covariance Structure	Diagonal
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
Year	3	2000 2001 2003
District	5	C NC PH SW WC

Dimensions

Covariance Parameters	1
Columns in X	24
Columns in Z	0
Subjects	1
Max Obs Per Subject	445
Observations Used	196
Observations Not Used	249
Total Observations	445

Covariance Parameter Estimates

Cov Parm	Estimate
Residual	0.9421

Fit Statistics

-2 Res Log Likelihood	563.1
AIC (smaller is better)	565.1
AICC (smaller is better)	565.1
BIC (smaller is better)	568.2

The Mixed Procedure

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Year*District	9	173	15.68	<.0001
WGTWlb	1	173	9.18	0.0028
WGDamKer	1	173	1.34	0.2486
WGForMat	1	173	0.21	0.6486
WGShBr	1	173	3.58	0.0601
WNGDock	1	173	1.39	0.2407
WNGMois	1	173	10.32	0.0016
WNGProt	1	173	119.89	<.0001
WNGHar	1	173	28.14	<.0001
WNGHarSD	1	173	6.55	0.0113
WNGWe	1	173	15.64	0.0001
WNGWeSD	1	173	0.67	0.4143
WNGDia	1	173	4.04	0.0460
WNGDiaSD	1	173	2.12	0.1468

The Mixed Procedure

Model Information

Data Set	SASUSER.COMPLETE
Dependent Variable	DPAP
Covariance Structure	Diagonal
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
Year	3	2000 2001 2003
District	5	C NC PH SW WC

Dimensions

Covariance Parameters	1
Columns in X	29
Columns in Z	0
Subjects	1
Max Obs Per Subject	445
Observations Used	333
Observations Not Used	112
Total Observations	445

Covariance Parameter Estimates

Cov Parm	Estimate
Residual	88.7723

Fit Statistics

-2 Res Log Likelihood	2341.3
AIC (smaller is better)	2343.3
AICC (smaller is better)	2343.3
BIC (smaller is better)	2347.0

The Mixed Procedure

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Year*District	14	305	8.97	<.0001
WGTWlb	1	305	0.90	0.3437
WGDamKer	1	305	0.10	0.7470
WGForMat	1	305	1.87	0.1726
WGShBr	1	305	1.14	0.2857
WNGDock	1	305	0.27	0.6008
WNGMois	1	305	0.46	0.5000
WNGProt	1	305	5.50	0.0197
WNGHar	1	305	17.45	<.0001

WNGHarSD	1	305	0.21	0.6432
WNGWe	1	305	14.46	0.0002
WNGWeSD	1	305	0.43	0.5123
WNGDia	1	305	3.02	0.0832
WNGDiaSD	1	305	8.99	0.0029

The Mixed Procedure

Model Information

Data Set	SASUSER.COMPLETE
Dependent Variable	DPAL
Covariance Structure	Diagonal
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
Year	3	2000 2001 2003
District	5	C NC PH SW WC

Dimensions

Covariance Parameters	1
Columns in X	29
Columns in Z	0
Subjects	1
Max Obs Per Subject	445
Observations Used	333
Observations Not Used	112
Total Observations	445

Covariance Parameter Estimates

Cov Parm	Estimate
Residual	514.29

Fit Statistics

-2 Res Log Likelihood	2877.1
AIC (smaller is better)	2879.1
AICC (smaller is better)	2879.1
BIC (smaller is better)	2882.8

The Mixed Procedure

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
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Year*District	14	305	56.53	<.0001
WGTWlb	1	305	0.50	0.4810
WGDamKer	1	305	0.76	0.3831
WGForMat	1	305	0.06	0.8123
WGShBr	1	305	0.66	0.4167
WNGDock	1	305	0.00	0.9643
WNGMois	1	305	0.35	0.5549
WNGProt	1	305	27.33	<.0001
WNGHar	1	305	0.04	0.8432
WNGHarSD	1	305	0.05	0.8250
WNGWe	1	305	3.15	0.0767
WNGWeSD	1	305	0.58	0.4469
WNGDia	1	305	0.04	0.8513
WNGDiaSD	1	305	7.57	0.0063

The Mixed Procedure

Model Information

Data Set	SASUSER.COMPLETE
Dependent Variable	DPAW
Covariance Structure	Diagonal
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
Year	3	2000 2001 2003
District	5	C NC PH SW WC

Dimensions

Covariance Parameters	1
Columns in X	29
Columns in Z	0
Subjects	1
Max Obs Per Subject	445
Observations Used	333
Observations Not Used	112
Total Observations	445

Covariance Parameter Estimates

Cov Parm	Estimate
Residual	1345.27

Fit Statistics

-2 Res Log Likelihood	3170.4
AIC (smaller is better)	3172.4
AICC (smaller is better)	3172.4

BIC (smaller is better) 3176.1

The Mixed Procedure

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Year*District	14	305	29.73	<.0001
WGTWlb	1	305	0.90	0.3444
WGDamKer	1	305	0.39	0.5327
WGForMat	1	305	0.96	0.3273
WGShBr	1	305	0.61	0.4368
WNGDock	1	305	0.00	0.9811
WNGMois	1	305	0.03	0.8699
WNGProt	1	305	76.81	<.0001
WNGHar	1	305	11.37	0.0008
WNGHarSD	1	305	0.32	0.5698
WNGWe	1	305	0.00	0.9608
WNGWeSD	1	305	1.41	0.2357
WNGDia	1	305	0.73	0.3952
WNGDiaSD	1	305	1.81	0.1796

The Mixed Procedure

Model Information

Data Set	SASUSER.COMPLETE
Dependent Variable	DPAP_L
Covariance Structure	Diagonal
Estimation Method	REML
Residual Variance Method	Profile
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Residual

Class Level Information

Class	Levels	Values
Year	3	2000 2001 2003
District	5	C NC PH SW WC

Dimensions

Covariance Parameters	1
Columns in X	29
Columns in Z	0
Subjects	1
Max Obs Per Subject	445
Observations Used	333
Observations Not Used	112
Total Observations	445

Covariance Parameter
Estimates

Cov Parm	Estimate
Residual	0.03927

Fit Statistics

-2 Res Log Likelihood	-14.3
AIC (smaller is better)	-12.3
AICC (smaller is better)	-12.3
BIC (smaller is better)	-8.6

The Mixed Procedure

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Year*District	14	305	28.29	<.0001
WGTWlb	1	305	0.12	0.7281
WGDamKer	1	305	0.18	0.6732
WGForMat	1	305	2.00	0.1578
WGShBr	1	305	0.11	0.7355
WNGDock	1	305	0.08	0.7829
WNGMois	1	305	0.01	0.9146
WNGProt	1	305	5.45	0.0202
WNGHar	1	305	2.47	0.1174
WNGHarSD	1	305	0.25	0.6158
WNGWe	1	305	16.65	<.0001
WNGWeSD	1	305	0.97	0.3249
WNGDia	1	305	1.38	0.2416
WNGDiaSD	1	305	9.45	0.0023

VITA

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