

Approved Feb 7, 1989  
Date

MINUTES OF THE HOUSE COMMITTEE ON AGRICULTURE AND SMALL BUSINESS

The meeting was called to order by Representative Susan Roenbaugh at  
Chairperson

9:04 a.m./~~p.m.~~ on January 24, 1989 in room 423 S of the Capitol.

All members were present except: Representative Jenkins

Committee staff present: Norman Furse, Revisor of Statutes Office  
Lynne Holt, Legislative Research Department  
Marjorie Brownlee, Committee Secretary

Conferees appearing before the committee: Dr. Walter Woods, Dean of the School of Agriculture, Kansas State University  
Dr. Kurt Feltner, Association Dean and Director of the Agriculture Experiment Station, Kansas State University  
Dr. Charles Deyoe, Head of the Grain Science and Industry Department, Kansas State University  
Dr. Curtis Kastner, Professor in the Department of Animal Science and Industry, Kansas State University  
Dr. Jane Bowers, Head of the Foods and Nutrition Department, Kansas State University

Chairman Roenbaugh introduced to the Committee Dr. Walter Woods, Dean of the School of Agriculture, Kansas State University.

Dr. Woods told the Committee that the purpose of his and his colleagues appearances was to present an update on the Agriculture Experiment Station at Kansas State University. He said they had elected to present material on one aspect of the Experiment Station---the Value-Added Research.

Said Dr. Woods, they have worked aggressively to make sure that the Agriculture Experiment Station is on target and are trying to capitalize on those opportunities to increase the utilization of Kansas products and increase and enhance communications with industry. He called attention to the Value-Added Research Developments booklet prepared to inform legislators. (Attachment 1)

Dr. Woods further cited the two efforts which added-value is attempting to put forth: (1) to enhance the quality of the products we are producing; and (2) to seek to bring about alternative uses of the products that we produce from agricultural sources.

Dr. Kurt Feltner, Associate Dean and Director of the Agriculture Experiment Station, was called on by Dr. Woods to discuss his part in the program. Dr. Feltner noted that his responsibilities are in the area of budgeting, staffing, and program coordination. He talked about the mission of the Experiment Station, the margin of excellence program whereby areas which they deem important are given added attention, and the in-house grants and how they work. (Attachment 2)

Dr. Woods asked Dr. Charles Deyoe, Head of the Grain Science and Industry Department, to inform the Committee of his area activities. Dr. Deyoe outlined several short term and long term objectives. Some of their research concerns wheat quality development, work with starches, modification and improvement in the stability of Vitamin C, food fibers as they relate to health, the production, milling and utilization of hard white winter wheat, etc. (Attachment 3)

CONTINUATION SHEET

MINUTES OF THE HOUSE COMMITTEE ON AGRICULTURE AND SMALL BUSINESS,  
room 423-S, Statehouse, at 9:04 a.m. ~~p.m.~~ on January 24, 19 89

Called upon next to address the Committee was Dr. Curtis Kastner, Professor in the Department of Animal Science and Industry. His department works on research with meat and livestock products. Dr. Kastner discussed various aspects of research including safety and nutrition, product, and process development for value-added research, and research on products which the consumer demands. (Attachment 4)

The last person to address the Committee was Dr. Jane Bowers, Head of the Department of Foods and Nutrition. She discussed research on which they are working in the areas of nutrition and taste. (Attachment 5) She noted that we are a very "diet" orientated society---whether it be to reduce, gain weight, or just for good nutrition. She showed the Committee a sample of cake which had been produced with a sugar substitute which had a very similar appearance to a leading "sugared" product which has been on the market for some time. Dr. Bowers indicated it is essential to produce these low-calorie items with a good texture and eye appeal.

Chairman Roenbaugh adjourned the meeting at 9:55 a.m.

The next meeting of the House Committee on Agriculture and Small Business is at 9:00 a.m. in Room 423-S on January 25, 1989.



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**VALUE-ADDED**

**R**  
**ESEARCH**  
**DEVELOPMENTS**

\_\_\_\_\_ A Report to \_\_\_\_\_  
\_\_\_\_\_ Kansas Legislators \_\_\_\_\_

\_\_\_\_\_ By the \_\_\_\_\_  
\_\_\_\_\_ Kansas Agricultural Experiment Station \_\_\_\_\_  
\_\_\_\_\_ Kansas State University \_\_\_\_\_

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*Attachment 1*

# **CONTENTS**

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## **INTRODUCTION**

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**KANSAS  
STATE  
UNIVERSITY**

## Dean of Agriculture

Waters Hall  
Manhattan, Kansas 66506  
913-532-6147

January 24, 1989

To members of the Kansas Legislature

Dear Friends:

Even though Kansas is the nation's leader in flour milling and red meat slaughter and 95 percent of all food consumers buy is processed, most of the state's agricultural production is consumed out-of-state or overseas without further processing.

Increasingly, the state's ability to fuel economic development, capitalize on its agriculture base, and expand market share will depend on implementing (1) cost and energy effective production techniques and developing (2) new products, expanded markets and adding value to agricultural commodities throughout the state.

In developing, processing and marketing value-added products, producers and small businesses often require reliable, research-based information. This report provides an overview of value-added research developments and facilities at Kansas State University.

We invite your comments about these or any other Experiment Station research programs. We want to provide research programs that will best serve the state and strengthen economic performance.

Sincerely,

Walter R. Woods  
Dean of Agriculture and Director,  
Kansas Agricultural Experiment Station

# EXECUTIVE SUMMARY

Specialized, value-added research facilities in the Kansas Agricultural Experiment Station include a pilot flour mill, bakery, feed formulation plant, meat and poultry slaughter and processing facilities, and a full-line dairy processing plant. Faculty expertise is concentrated in the departments of Grain Science and Industry, Animal Sciences and Industry, Horticulture, Agricultural Economics, Foods and Nutrition, Biochemistry, Agricultural Engineering and Chemical Engineering. Researchers in grain science have accumulated 100 staff years of industry experience with food and feed grain problems.

K-State is recognized worldwide for its unique work with grains. Research is directed toward enhancing the value-added properties of wheat and grain-based cereal products and involves cereal chemistry, milling technology, feed management, and milling and baking qualities of new wheat varieties. Research emphasis includes both food and non-food uses of wheat and grains and improved separation processes for gluten, starch, bran and germ for industrial, food, pharmaceutical and other uses.

KSU plant breeding programs increase important value-added properties of food crops like wheat, white corn, white wheat and melons; feed grains like corn, soybeans and grain sorghum; and alternate crops like pearl millet and sunflowers.

Engineers are working to design improved grain cleaning systems, measure wheat hardness, improve market classification systems, reduce drying costs and improve storability for cereals, forage and biomass crops.

Meat processing facilities include new slaughter, chilling and cured and fresh meat processing equipment that simulates current industry practice. Research is designed to improve the marketability of retail-ready meat cuts and includes restructured, pre-cooked and vacuum-packed products. Packaging techniques that prolong shelf-life, ensure meat safety and maximize consumer acceptance are important research objectives. If 20 percent of the boxed red meat in Kansas was cut into retail-ready cuts, it would create 1,500 new jobs, provide \$26 million in new wages and increase product value by \$58 million.

K-State scientists are developing sweetened, reduced-calorie baked goods and testing additives and preservatives for processed poultry, soybean curd and oil and frozen or dehydrated vegetables. Because of K-State research, corn protein additives can now be used for protein supplements, to decrease fat and cholesterol content and for new product development.

# INTRODUCTION

**Mission:** The Kansas Agricultural Experiment Station (KAES) conducts basic and applied research in agriculture and related areas that will help ensure an adequate supply of wholesome foods and fiber products for consumers and at the same time provide income opportunities for Kansas producers and agribusinesses, quality rural environments, and conservation of natural resources for all citizens.

**Scope:** KAES, the largest research organization at Kansas State University, supports programs in five colleges, 28 departments, four branch stations, and 11 experiment fields.

The Kansas Agricultural Experiment Station has fulfilled its special mission for 100 years. As a result, our state enjoys many competitive advantages in agriculture. Kansas ranks first in red meat processing, wheat and sorghum produced, flour milled, sorghum silage and forage sorghum; second in all cattle and calves on farms and total cropland; third in commercial grain storage; fourth in exports of farm products; and seventh in total agricultural cash receipts (about \$6 billion).

**Focus:** To minimize risk and optimize profit, the need for food processing and product development research was recognized early in the state's agricultural development.

Specialized KAES facilities for value-added research include:

- Pilot feed formulation and manufacturing facilities
- Pilot bakery
- Pilot flour mill
- Specialty mill for dry milling corn, sorghum and cereals
- Full-line dairy manufacturing plant
- Facilities for milling and baking experimental lines of wheat
- Meat and poultry slaughter and processing facilities
- Facilities for research in restructured, pre-cooked, vacuum-packed products and for beef chilling, hot processing and electrical stimulation systems
- Crop Development and Testing. Breeding programs are conducted in wheat, grain sorghum, corn, soybeans and alfalfa, dry beans and melons. Crop adaptability is tested at four branch stations and 11 experiment fields.

**Research expertise:** Significant research expertise in processing agricultural products exists among faculty in the departments of Grain Science and Industry, Animal Sciences and Industry, Horticulture, Agricultural Economics, Foods and Nutrition, Biochemistry, Agricultural Engineering and Chemical Engineering. Scientists in these areas also link with faculty in other KSU departments and colleges.



## VALUE-ADDED

# RESEARCH FACILITIES AND RESEARCH THRUSTS

### Wheat and Wheat Products

**Pilot plant facilities:** The Department of Grain Science and Industry houses a modern 3,000 to 5,000 pound per hour feed formulation and manufacturing plant, a modern bakery and a 200 hundredweight per day pilot flour mill. Research is directed toward enhancing the value-added properties of wheat and grain-based cereal products and involves efforts in cereal chemistry, milling technology, feed management, and milling and baking quality of new wheat varieties. In addition to their experience at KSU, grain science researchers collectively have accumulated 100 staff years of experience working with industry on food and feed problems related to milling and cereal grains.

Because of its unique work in grains, K-State is the only university in the free world with an undergraduate degree in milling science and is the only university in the United States where students can obtain undergraduate degrees in feed science.

**Non-food uses of wheat:** Research to expand the economic impact of wheat and other cereal grains as food and non-food products is of high priority. In the non-food area, researchers are testing wheat and wheat byproducts for expanded uses as industrial adhesives and plastics. Also being investigated are industrial uses of selected parts of the kernel and milling byproducts.

**Wheat starch:** Because of its versatility, wheat starch formulations are being tested as a building trade adhesive, as a cooking starch, and as an instant starch. Wheat starch or modified wheat starch can also be used in bread, cookies, doughnuts, fruit and cream pie filling, noodles, cheese spread, crackers, breading for fried foods and other food products. Fundamental work on the modification of wheat starch has led to the development of starch pastes that give thickening power, clarity, and cold temperature stability. Wheat starch granules also are being investigated for possible use in degradable plastics. Specialty starch for use in the paper industry and the food industry are near commercialization. Because of interest in high-fiber diets, researchers are investigating ways to make bran more usable.

**Wheat gluten and kernel components:** Gluten produced from wheat by Kansas processors is a major source of gluten for industry. Because wheat gluten is also imported, production of this valuable material could be increased. Improved methods to separate the components of the wheat kernel into its chemical parts will

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provide better separation of gluten, starch, bran and germ. These components offer opportunities for use in industrial, food, pharmaceutical, and other industries. Process improvements in separating gluten from wheat and factors that affect yield during drying and processing are being investigated.

**Wheat quality:** To improve marketability, all KSU hard winter wheats are selected for their milling and baking properties using facilities in the U.S. Grain Marketing Laboratory in Manhattan and in the KSU Department of Grain Science and Industry. Kansas has become a regional and national leader in breeding and producing wheat of superior quality.

**White wheat:** KAES scientists are working to develop hard white winter wheats. New markets are possible for premium hard white wheats because they have excellent attributes, including a potential for greater flour extraction, different flavor, and better usage of their bran. Kansas hard white wheats could also compete better with white wheats from other countries for export. After 7 years of developing a white wheat germ plasm base, it appears that hard white wheats are competitive with the best hard red wheat lines in yield, quality and pest resistance. The functional properties of hard white wheat flours, farina and other products are being studied to assist in developing value-added snacks, specialty rolls and bread and other white wheat products.

**Wheat genetics:** The KSU Wheat Genetics Resource Center contains the nation's largest collection of wheat's wild relatives. Wild wheats provide important sources of disease and pest resistance and genetic diversity, so the center is an integral part of the wheat breeding program.

## **Plant Breeding Programs**

**Food and feed grains:** K-State plant breeders work to improve the state's important crops, including wheat, grain sorghum, corn, soybeans, alfalfa, melons and dry beans. Each plant breeding program emphasizes improved product quality, nutritive value and pest resistance. There are many value-added effects of breeding programs in wheat, white corn, and melons — all of which are used for human food. In addition, numerous plant breeding efforts involve increasing the nutritional value and digestibility as well as improving processing of soybeans and feed grains for animals. Plant breeding programs to increase the adaptability, reliability and profitability of such alternate crops as pearl millet and sunflowers are conducted at the Fort Hays Branch Experiment Station.

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**White corn:** White corn is used to produce corn flour, tortillas and other value-added products. The K-State corn breeding project is developing drought-tolerant lines and germ plasm with hard endosperm to reduce handling and processing losses.

## Grain Processing

**Post-harvest grain problems:** As part of the Food Grains Institute, agricultural engineers travel widely to help developing countries solve a variety of post-harvest grain problems with storage, processing and transportation. The institute also cooperates in the research program conducted by the U.S. Grain Marketing Research Laboratory.

Facilities for value-added research include grain cleaning and grain processing laboratories. Other research includes increasing the value of cereal grains through better classification and sorting of grains and the design and performance testing of grain cleaning equipment.

**Measuring wheat hardness:** The lack of a reliable hardness test has been a major problem for farmers, millers and the Federal Grain Inspection Service. Agricultural engineers, in cooperation with other state and federal scientists, have built and patented a wheat hardness measuring machine. The new tester has the potential to become the standard for the grain industry for distinguishing between hard and soft wheat.

**Clean grain:** Because grain containing impurities has become a domestic and international marketing issue, agricultural engineers have analyzed and performance-tested promising grain cleaning systems from all over the world. This research should result in improved design for grain cleaning in combines and all types of grain cleaning equipment.

**Byproducts:** Brewers' condensed solubles are an important byproduct of alcohol production (including ethyl alcohol fuel additives). Agricultural engineers are working to increase the marketability of products using brewers' solubles by optimizing manufacturing processes and improving flow and storage characteristics.

**Crop storage:** Engineers are testing a variety of methods to reduce drying costs and increase the storage quality of crops. Sulfur dioxide is being tested as a preservative for cereals, forage and biomass crops.

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## Livestock and Animal Products

Kansas is the leading beef slaughtering state in the nation and K-State is a nationally recognized leader in research on dairy, beef and poultry processing.

**Meat and meat products:** A new, modern meats laboratory processing center has just been completed as part of a \$7.2 million renovation project for Weber Hall. Meat processing facilities include an abattoir, state-of-the-art beef carcass processing and beef chilling systems, and complete cured and fresh meat processing capabilities that simulate current industry practices. Research is designed to improve the marketability of retail-ready meat cuts and includes restructured, pre-cooked and vacuum-packed products. Packaging techniques that prolong product shelf-life, ensure meat safety and maximize consumer acceptance are being studied, as are marketing, lighting and display systems. The economic impact of this research: If 20 percent of boxed red meat in Kansas was cut into retail-ready cuts, it would create 1,500 meat-cutting positions in Kansas, and those jobs would mean \$26 million in wages annually. Additionally, the value of the product would be increased by \$58 million each year.

**Restructured meat:** Consumers demand meat products that are nutritious, palatable, convenient and competitively priced. Research is underway to evaluate using restructuring technology to reduce or eliminate salt, reduce fat while maintaining taste, and increase the dietary fiber content of convenient, pre-cooked products that are restructured from less valuable carcasses and carcass parts. Restructuring allows the creation of steak- and roast-like items that are more valuable than their ground counterparts. Consequently, if 10 percent of the red meat produced and initially processed in Kansas was further processed into restructured steaks, roasts and chops, the gross return on Kansas-processed red meat would increase \$210 million annually.

**Surimi:** Creation of value-added products from underutilized meat sources is possible using a surimi process. (Surimi is an intermediate raw material that can be colored, flavored and formed into meat products.) It is estimated that at least 16 pounds of meat per head of cattle and 4 pounds per head of swine could be claimed as edible meat by mechanical deboners, converted to surimi, and then processed further into value-added meat products. This could represent 110 million pounds of value-added edible meat worth \$55 million annually for the state. Surimi from chickens and turkey also is being evaluated in restructured poultry products.

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**Dairy:** Facilities at K-State include a complete dairy processing center for fluid milk, butter, cheese and ice cream. The capacity of the dairy plant in Call Hall is sufficient to simulate large-scale production but also accommodates smaller research and development projects. This center represents the only full-line dairy processing plant at land-grant universities in Kansas, Oklahoma, Colorado, Nebraska, Missouri and Iowa. Research emphasis on dairy products includes rapid methods and automation in microbiology, flavor chemistry, toxicology, new product development and dairy plant operational techniques and efficiency.

**Lactose:** Some consumers are allergic to the lactose in dairy products. Dairy scientists are investigating the production of low-lactose ice creams and ice milks by using enzymes that convert the lactose to other edible forms. Efforts to increase the protein and to decrease the fat content also are underway.

**Poultry:** The poultry products processing plant, located in Call Hall, includes an abattoir and processing capabilities that support poultry and egg product development research.

## Nutrition and Consumer Acceptance

**Sensory analysis:** Many value-added products are tested for consumer acceptance in a specially designed sensory analysis center. The center, extensively used by cooperating scientists, includes environmentally controlled panel rooms, laboratories for preparing food and reference odorants, texture and color measuring equipment, and computerized data collection.

**Food additives:** Foods and nutrition research includes the use of additives and preservatives on processed poultry, soybean curd, soybean oil and dehydrated or frozen vegetables. Other studies include the addition of dietary fiber and the use of alternative sweeteners, emulsifiers and bulking agents in baked goods. Nutrition and metabolic studies are conducted in an accredited animal laboratory.

**Corn germ protein:** Corn germ protein has been approved as a food additive by FDA and USDA as a result of K-State studies and a petition authored by a KSU researcher. As a result, corn germ protein can be used to supplement proteins of animal origin, decrease fat and cholesterol content, and to develop a large spectrum of new foods.

**Low-calorie baked goods:** Research on reduced-calorie sweetened baked products can help reposition desserts for the many people interested in weight control and fitness. The new products utilize bran (muffins) and cellulose gums and bulk from wheat and sorghum that previously were animal feed. Other

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reduced calorie baked goods use wheat, potato and corn starches to increase bulk and decrease caloric content.

**Flavor control:** Stale, warmed-over flavors and aroma are a major drawback in marketing pre-cooked, ready-to-eat meat. K-State researchers are working to develop new technologies for processing poultry and reducing warmed-over flavor in pre-cooked beef.

**Hospitality industry:** A fully equipped quantity food preparation laboratory is available for use in creating value-added products for the hospitality industry.

## Horticultural Crops

Because high-value fruits and vegetables are perishable commodities, KSU horticulturists are working to improve post-harvest handling techniques. Plant breeders have developed a high-quality crenshaw muskmelon variety that is adapted to Kansas and has the potential for high yields of sunscald-resistant fruit. Yield trials are promising and, because of its small size, dense plantings are possible. Horticulturists also are developing dual-purpose ornamental and perennial plants for use first in the home and later for planting in the yard. The key to the transition is a better understanding of the flowering process. Cold-tolerant lines of grapes have been identified using suspension cell culture techniques. Trials to regenerate whole plants using selected cold-tolerant lines are underway.

## Forestry

Forests are appreciated for the beauty, protection and natural habitat they provide. However, more than 50 percent of the wood biomass used in Kansas is for fuel. K-State foresters and chemical engineers are working to develop the technology to produce both liquid and gaseous fuel from woody biomass. Numerous tree species have been evaluated using both fluidized and downdraft gasification conversion systems.

## Process Engineering

The Department of Chemical Engineering is equipped to conduct research and development studies in process engineering, particularly in biochemical engineering, pollution control, transport phenomena, reactor engineering and particle dynamics. Ongoing or proposed research with value-added products includes production of soy yogurt from soy milk, thermoconversion of woody biomass, biopolymer-based control release devices for pesticides and herbicides, wet processing of wheat and other Kansas grains and production of fructose from sugar.

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## Value-Added Processing Center

The 1988 Legislature created an Agricultural Value-Added Processing Center at Kansas State University. When functional, it is anticipated that the center's research and technology functions will include expertise in processing, packaging and marketing of horticultural food products, meat, and food and feed grains. Work at the center will involve food as well as non-food products. Implementing the program will involve cooperation between the center's leadership council, the Legislature and the Kansas Technology Enterprise Corporation (KTEC).



### **Notice of Nondiscrimination**

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Kansas State University is committed to a policy of nondiscrimination on the basis of race, sex, national origin, handicap, or other nonmerit reasons, in admissions, educational programs or activities, and employment, all as required by applicable laws and regulations. Responsibility for coordination of compliance efforts and receipt of inquiries, including those concerning Title IX of the Education Amendments of 1972 and Section 504 of the Rehabilitation Act of 1973, has been delegated to Jane D. Rowlett, Ph.D., Director, Affirmative Action Office, 214 Anderson Hall, Kansas State University, Manhattan, Kansas 66506, (913)532-6220.



# MISSION – KAES

To develop the body of scientific knowledge necessary for efficient food and fiber production, processing, and distribution; improvement of human nutrition and the use of family resources; conservation of natural resources; and maintenance of a safe environment.

245B  
01-24-89

# MARGIN OF EXCELLENCE

PROGRAM	YEAR		
	89	90	91
Processing Ag. Products	120,000	170,000	260,000
Forage-Based Livestock Sys.	75,000	130,000	200,000
Dryland Cropping Systems	50,000	100,000	150,000
Wheat Biogenetics	50,000	100,000	150,000
	295,000	500,000	760,000

# IN-HOUSE GRANTS

<b>AREA</b>	<b>GRANTS</b>	<b>FUNDING</b>
<b>Sustainable Agriculture</b>	<b>7</b>	<b>\$130,000</b>
<b>Processing and Alternate Uses</b>	<b>3</b>	<b>89,000</b>
<b>Rural Family and Community</b>	<b>2</b>	<b>27,000</b>
<b>Water Quality</b>	<b>1</b>	<b>30,000</b>
		<b>\$276,000</b>

**Over \$1M in requests**

**13 projects will involve scientists in 17 departments**

Presentation to the Kansas House Agriculture and Small Business  
Committee and the Senate Agricultural Committee  
Dr. C. W. Deyoe, Grain Science & Industry  
January 24, 1989

Research activities within our program can be classified as short term and long term. Many projects sponsored by industry have short term objectives and seeks information on a specific problem. Long term research supports many areas of development and it is only through continuous effort that significant advancement is made.

Wheat Quality development is an example of a long term research effort that involves several departments in the College of Agriculture and Branch Experiment Stations of the Agricultural Experiment Station at Kansas State University. The attached material prepared last fall illustrates how a research program that covers several years (10+) for wheat variety development pays dividends. The estimated increased value in this example, for just one year and one variety, was a value of over two million for each of the estimated 10 years of its development.

Recent research efforts in the value added area related to wheat starch is seeing applications by Kansas industry. The special properties related to modified starches has resulted in investments of several million dollars to produce special starches as a result of sales and increased demand identified for the products.

Starch has gained a more favorable position as a raw material in plastic film production due to the demands for degradable films and because of increasing prices and decreasing availability of conventional film-forming resins. The technical and commercial feasibility of using particulate starch as a filler/modifier for the common thermoplastics is now widely accepted. However, our literature search revealed that the commercial development, so far, has been largely confined to maize starch. We are examining the prospect of using wheat starch in the preparation of degradable plastics. In contrast to corn, starch granules of wheat are known to vary in size. Wheat starch has granules of much smaller size than corn starch. It is speculated that incorporation of smaller wheat starch granules (by virtue of their size) into plastics may result in products with better mechanical properties and with increased susceptibility to degradation. We hope to increase the compatibility between starch and the synthetic polymer by using modified starches.

To better understand the products and potential of wheat wet processing a pilot program is being initiated cooperatively with Agricultural Engineering with support from the Kansas Wheat Commission.

Research to modify and improve the stability of Vitamin C (Ascorbic Acid) has resulted in 4 patents held by the KSU Research Foundation and licenses for production and use of some of the materials in Japan and by a company in Idaho. Recent approval by FDA of Ascorbate-

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01-24-89

*Attachment 3*

Phosphate for use in aquatic feeds is leading to expanded activity by the Idaho company and a thrust toward obtaining approval for use in food systems. The Japanese are using Ascorbate Mono-phosphate in cosmetic creams (skin conditioners). The Idaho company applications are in fish and aquatic feeds, an estimated 1.2 billion pound industry, with a potential use of 30-60 million dollars of Ascorbate Phosphate. Research to investigate new applications of the Ascorbate Phosphate in food systems and to extend fresh cooked flavor in meats is beginning.

Food fibers have become a center of attention related to health. Milling research has shown that by special processing, a wheat bran fraction can be produced with double the total dietary fiber value of conventional produced bran. Other research related to food fiber indicates that fiber fractions from sugar beet pulp have excellent cholesterol lowering effects. The markets for food fibers are rapidly expanding as shown by the investments of companies like Conagra in Oat Milling plants.

Other milling research has shown that high quality farina produced from hard red winter wheat can be increased by changes in milling. This year the cost of durum has increased due the greatly reduced production because of drought. That is resulting in significant increases in the use of farina to replace or extend the semolina from durum wheat used in pasta manufacturing.

Research on production, milling and utilization of hard white winter wheat continues to indicate higher milling yields of flour. The lighter color results also in higher yields of low speck count farina (used in products such as Cream-of-Wheat and in the production of pasta products). Application to whole white wheat breads and the use of the bran and other milling fractions from HWWW in specialty breads is of interest to the commercial baking industry. Noodle research at KSU, funded by the Kansas Wheat commission, has shown that use of hard white wheat flour in the production of oriental noodles produces products with better color and good eating properties. A snack noodle has been developed as an outgrowth of that work. The research on oriental noodles, the snack noodle and similar efforts on use of hard winter wheat farina in pasta is available to the food industry and is an area that representatives from the Soviet Union indicate considerable interest insince they produce pastas primarily from hard wheats, not durum wheat.

Faculty are also investigating various factors such as flour quality, gluten quality and quantity and protein content on the quality of pizza dough with industry sponsorship. Kansas is the site of two well known pizza companies.

Research is also ongoing related to grain storage and quality under a USDA special grant project. That research is focused on the current practices of farm and commercial storage and purchasing patterns related to grain quality. We expect that research to identify procedures that can be applied to improve the quality of grain for domestic and export use.

Other research activities include milling properties of corn varieties for a group in Texas and continuing research related to the utilization of soybeans in soy beverages.

Good progress is also being made in separating and fractionating sorghum proteins from 16 cultivars with widely different kernel characteristics. Digestibility data for each fraction should allow us to determine the contribution of the various fractions to the total digestibility (or indigestibility) of sorghum grain. Starch digestibility in the grain samples has also been determined, and its relationship to protein fraction digestibility could provide information for plant breeders to use to improve grain sorghum for use in animal feeds and for industrial or food uses.

SUMMARY OF WHEAT VARIETIES PRODUCED IN KANSAS IN 1988 AND THE  
EFFECT OF KANSAS RELEASES

Column with heading "State" is calculated using percentages published for the State.

Column with heading "Variety subtotal" is calculated from data on variety plantings for the individual Districts. Those totals are somewhat different from those in the column for "State" but do generally agree.

\$\$\$ value is based on a price of \$3.77/bushel, the quoted Topeka price when the estimate was being calculated.

All values given are in millions.

Adjustments have not been made for potential variety yield differences due to the difficulty of correctly documenting those differences under farm conditions.

Kansas releases represent 42.7% of the states wheat production.

The value of the production of Kansas releases includes the value of the wheat produced but also the effect of the quality of those wheats on the milling and baking qualities of the "wheat mix" from Kansas.

Added value due to the disease resistance for Arkan is estimated as \$26.58 million. That value is calculated based on the estimate that there was an increase of 13% in production for that variety due to disease resistance. Added production would be approximately 7 million bushels. At normal extraction rates that would produce enough flour for the people in Kansas.

The three top varieties, Kansas releases, account for a value to the state on first sale of \$474.2 million. Total wheat value on first sale is estimated as \$1,217,710,000. That value does not include value added in the market system nor value added during milling, utilization of products and by-products or storage and handling.

C. W. Deyoe

SUMMARY OF VARIETIES AND DISTRICT PRODUCTION (1988)\*  
(MILLIONS OF BUSHELLS)

UPDATED 11/21/88--INCLUDES AUG. 1 , OCT 12 & NOV. 9, 1988 PROD. FORECAST

VARIETY	ORIG. ESTI. STATE	N.W.	W.C.	S.W.	N.C.	CENTRAL	S.C.	N.E.	E.C.	S.E.	VARIETY SUBTOTAL	\$\$\$ VALUE	13% REDUCTN BASED ON DISEASE RESIST. (X 1 M.)
BUSHELS - MILLIONS													
(KANSAS)													
ARKAN	48.127	0.130	0.028	0.597	10.190	12.141	15.570	4.108	4.980	7.273	55.017	207.41	180.45
NEWTON	43.282	10.470	3.723	5.809	4.448	7.918	5.848	1.275	0.443	1.148	41.082	154.88	\$26.96
LARNED	35.207	3.209	7.029	11.673	0.849	3.599	2.506	0.319	0.133		29.317	110.52	
EAGLE	4.522	0.389	0.945	1.629	0.040	0.240	1.063				4.306	16.23	
NORKAN	2.584	0.454	0.194		1.334	0.336	0.304	0.212	0.044		2.879	10.85	
SAGE	2.261	0.032	0.639	2.335	0.040	0.048		0.083	0.011		3.188	12.02	
DOODGE	1.615		0.222	0.380	0.121	0.384	0.380	0.047			1.534	5.78	
SUBTOTAL (AGRIPRO)	137.598	14.684	12.780	22.422	17.023	24.665	25.672	6.044	5.611	8.421	137.322	517.71	
AGRI.HAWK	24.548	3.241	2.500	5.266	1.294	2.015	7.747	0.047	0.133	0.617	22.861	86.19	
AGRI.VICTORY	20.026	1.783	0.972	2.172	5.054	3.887	4.405	1.027	0.896	0.638	20.835	78.55	
AGRI.MUSTANG	14.535	1.653	1.639	2.986	1.617	1.296	4.405	0.331	0.553	0.936	15.416	58.12	
AGRI.THUNDERBIRD	5.168	0.389	0.250	0.760	1.617	1.152	0.608	0.472	0.111	0.425	5.784	21.81	
AGRI.WRANGLER	2.261		0.222	0.109	0.364		0.911	0.224	0.243	0.234	2.308	8.70	
AGRI.STALLION	1.615		0.111	0.217	0.000	0.480	0.380	0.012	0.111	0.468	1.778	6.70	
SUBTOTAL (PIONEER)	68.153	7.066	5.695	11.510	9.947	8.830	18.457	2.113	2.047	3.317	68.982	260.06	
PION.2157	23.256	0.875	0.306	3.257	1.617	4.367	12.380	0.212	0.343	1.255	24.613	92.79	
PION.2165	2.584	0.227		0.054	0.283	0.960	1.063	0.012	0.022	0.425	3.047	11.49	
SUBTOTAL (TEXAS)	25.840	1.102	0.306	3.312	1.900	5.327	13.444	0.224	0.365	1.680	27.660	104.28	
TAM 107	15.827	3.209	3.028	4.560	0.728	1.392	0.380	0.035	0.277	0.276	13.885	52.35	
TAM 105	4.845	0.065	1.028	1.629	0.121	0.336	0.835	0.083	0.243	0.362	4.702	17.73	
TAM 108	3.230	0.648	0.056	0.054	0.162	0.336	1.671	0.153	0.210	0.276	3.567	13.45	
SUBTOTAL (NEBRASKA)	23.902	3.922	4.112	6.243	1.011	2.063	2.886	0.272	0.730	0.914	22.154	83.52	
SCOUT/SCOUT66	9.367	0.648	2.778	3.366	0.081	0.192	0.835		0.011		7.912	29.83	
SIouxLAND	2.907		0.083	0.163	1.294	0.384	0.380	0.720	0.044		3.068	11.57	
SUBTOTAL (COLORADO)	12.274	0.648	2.862	3.529	1.375	0.576	1.215	0.720	0.055	0.000	10.980	41.39	
VONA	3.230	0.454	0.361	1.086	0.323		0.911			0.021	3.157	11.90	
BACA	1.938		0.083	1.032		0.048	0.304				1.467	5.53	
SUBTOTAL (OKLAHOMA)	5.168	0.454	0.445	2.117	0.323	0.048	1.215	0.000	0.000	0.021	4.624	17.43	
TRIUMPH64	2.584				0.162	0.384	1.595	0.035	0.089	0.681	2.945	11.10	
CHISHOLM	2.261		0.056	0.271			1.519			0.510	2.356	8.88	
SUBTOTAL	4.845	0.000	0.056	0.271	0.162	0.384	3.114	0.035	0.089	1.191	5.302	19.99	
RH 830	9.044		0.083		5.014		0.911	0.944	0.432	0.213	7.597	28.64	
OTHER HRW	34.561										0.000	0.00	
SOFT VARIETIES	1.615										0.000	0.00	
CALDWELL								0.035	0.255	1.510	1.800	6.79	
SUBTOTAL	45.220	0.000	0.083	0.000	5.014	0.000	0.911	0.980	0.686	1.723	9.397	35.43	

DISTRICT/ TOTAL 323.000 32.414 27.782 54.291 40.435 47.987 75.953 11.805 11.067 21.266 323.000 \$1,217.71

\* ESTIMATES BASED ON DATA FROM CROP STATISTICS, KANSAS STATE BOARD OF AGRIC.



INTERNATIONAL GRAINS PROGRAM  
--1988 Summary--

In this year, the tenth anniversary for the International Grains Program, our activities continued to provide programs that bring benefits to both U.S. exporters and foreign importers of American grains. It is our belief that the quality wheat, corn, soybeans and grain sorghum produced here are products that can leave end-users around the world well satisfied with the purchases they have made.

Problems can occur, however, when importers are not fully aware of the technicalities of U.S. grain merchandising, contracting, or grading systems, or when end-users could benefit from better information on storing, handling and processing our particular products. This is where IGP can function best.

Our marketing seminars and short courses provide information on a wide range of related topics. Participants are shown how to use U.S. futures contracts and options, and are made more aware of available subsidy and aid programs, which can make American grains look much more competitively priced. They also become familiar with the Federal grain grading system, which enables them to better order exactly what they want in a shipment, helping prevent disappointments in orders due simply to miscommunication.

Grain storage and handling is a topic that has received much attention at the International Grains Program. Grain may leave American shores in good shape, but what happens before it enters the mill can completely change that. Our programs in this area are tailored to meet the requirements of different climates, and the limitations of different local raw materials and infra-structures.

The short courses offered in flour and feed milling are designed to help participants refine their operations to most efficiently utilize the grains they purchase, and to introduce them to other options in utilization of end products and by-products.

Finally, the International Grains Program makes friends. And, all other considerations being equal, friends buy from friends.

In 1988, the IGP presented 26 seminars and short courses, in Manhattan and around the world, and hosted 17 teams and six individual visitors representing the grain industry and government agencies of 56 countries. The scope of these activities would be greatly limited without the assistance of sponsoring and cooperating groups. The activities summarized in this annual report benefited from the support of U.S. Wheat Associates, the American Soybean Association, U.S. Feed Grains Council, agencies of the United States Department of Agriculture, the Kansas Wheat, Corn, Soybean, and Grain Sorghum Commissions, the Texas and Oklahoma Wheat Commissions, the Kansas State Board of Agriculture, and numerous related private businesses. All supporters of the International Grains Program can take pride in their contributions and their accomplishment.

In summary, the International Grains Program had a busy and effective year. The following pages will present these activities in more detail, outlining the program's continued efforts to enhance the potential for increased sales of U.S. grains in the global market.

## 1988 Calendar of Activities

### January

- 15-21 Do Sup Chung to Taiwan  
\*sponsored by U.S. Feed Grains Council
- 1/20-2/7 Robert McElhiney, Ulysses Acasio & Kim Koch to Nigeria  
\*sponsored by the American Soybean Association
- 25 Grain Marketing Study Tour for 4H and Adult Leaders  
\*sponsored by the Kansas Wheat Commission

### February

- 9-11 Jilin Corn Team, PRC  
\*sponsored by U.S. Feed Grains Council
- 25-3/11 Ulysses Acasio to Egypt and Syria  
\*sponsored by U.S. Wheat Associates
- 29-1 Hichem Griba, Tunisia  
\*sponsored by U.S. Wheat Associates

### March

- 2-4 Roger T. Johnson to journalist seminar in Canada
- 25 Feed Team, PRC  
\*sponsored by U.S. Feed Grains Council

### April

- 5 Tour and discussion with North Central Directors of  
Agriculture Instruction
- 6-7 Ravi Bhagat, India  
\*sponsored by U.S. Wheat Associates
- 11-22 U.S. Grain Marketing System Short Course  
\*participants sponsored by U.S. Wheat and the  
American Soybean Association
- 28 North European Dust Suppression Team, W. Germany & Norway  
\*sponsored by the American Soybean Association

### May

- 5/9-6/19 Harvey Kiser to the People's Republic of China  
\*sponsored by U.S. Wheat Associates
- 13-21 Charles Deyoe to the USSR  
\*sponsored by U.S. Wheat Associates
- 24-26 Import Managers, South Korea  
\*sponsored by U.S. Wheat Associates

## June

6-17 Grain Grading, Storage & Handling Short Course  
\*some participants sponsored by U.S. Wheat  
3-13 John Wingfield to Morocco  
\*sponsored by U.S. Wheat Associates  
14 Milling Team, Philippines  
\*sponsored by U.S. Wheat Associates  
15-17 Feed Team, Greece  
\*sponsored by American Soybean Association  
20 Wheat Team, Jordan  
\*sponsored by U.S. Wheat Associates  
20-23 In-Country Marketing Seminar, Dominican Republic  
\*sponsored by American Soybean Association  
23 West African Trade Mission  
\*sponsored by U.S. Wheat Associates  
28 Ted Katoh, Sumitomo Corp.

## July

6-9 In-Country Feed Seminar, Costa Rica  
\*sponsored by American Soybean Association  
11-22 Flour Milling Short Course  
\*sponsored by U.S. Wheat Associates  
19-23 Joe Ponte to Venezuela  
\*sponsored by American Soybean Association  
20-21 Canadian visitors  
28-29 Soviet technical milling team  
\*sponsored by U.S. Wheat Associates  
7/25-8/5 Advanced Flour Milling Short Course  
\*sponsored by U.S. Wheat Associates

## August

8-9 Feed Team, PRC  
\*sponsored by U.S. Feed Grains Council  
8-9 Jung-Xi Yang, South Korea  
\*sponsored by O.I.C.D.  
8-9 Jamie Bishop, Australia  
16-20 William Tierney in Brazil  
\*sponsored by U.S. Wheat Associates  
17 Wheat Trade Team, Colombia  
\*sponsored by U.S. Wheat Associates  
22 hosted WETEC representatives  
26-9/1 Elieser Posner to Cyprus  
\*sponsored by U.S. Wheat Associates

September

- 8-15 Robert Pudden to Portugal  
\*sponsored by U.S. Wheat Associates
- 17-25 Roger T. Johnson & Harvey Kiser in Yugoslavia  
\*sponsored by U.S. Wheat Associates
- 20 Ben Beretta, South Africa  
\*sponsored by U.S. Wheat Associates
- 21 Wheat Trade Mission, Sudan  
\*sponsored by U.S. Wheat Associates
- 25-10/6 Turkish Feed Manufacturing Short Course  
\*sponsored by the American Soybean Association
- 26-30 Ulysses Acasio & Carl Reed to Philippines  
\*sponsored by U.S. Wheat Associates
- 27 Milling Team, Morocco  
\*sponsored by U.S. Wheat Associates
- 27 Akira Kani, Japan  
\*sponsored by the Kansas Wheat Commission
- 29 Wheat Team, India  
\*sponsored by U.S. Wheat Associates
- 30 Joe Ponte to Mexico  
\*sponsored by the American Soybean Association

October

- 10-13 Grain Storage Team, Ivory Coast  
\*sponsored by O.I.C.D.
- 15-11/12 Elieser Posner to the People's Republic of China  
\*sponsored by U.S. Wheat Associates
- 27-11/18 Robert Pudden overseas  
\*sponsored by U.S. Wheat Associates

November

- 2 Senegal Bakers  
\*sponsored by U.S. Wheat Associates
- 5-20 Charles Deyoe and Paul Seib to the People's Republic of China  
\*sponsored by the Wuxi Institute of Light Industry
- 11-18 Ralph Wolffing to Japan and South Korea  
\*sponsored by U.S. Wheat Associates
- 26-12/2 Robert Pudden to Bolivia  
\*sponsored by U.S. Wheat Associates

December

- 15-16 Export Marketing Seminar, Kansas City
- 19-21 Extension Milling & Baking Mini-Course

REPORT TO HOUSE AND SENATE AGRICULTURAL COMMITTEES  
MEAT AND LIVESTOCK PRODUCTS

The meats research mission at Kansas State University in meat and livestock products is to serve the food industry in Kansas. Specifically, we are attempting to generate the information and technologies that are needed to further the concept of value-added processing since this offers great promise for economic benefit to Kansas food processors and their communities, and to foster the processing of food products in a way that is safe for the consumer. For example, Kansas is the number one beef processing state in the nation, and we initially process over 4.6 billion pounds of meat and meat products. Over 90% of the fresh meat tonnage is exported by Kansas processors before maximizing the value-added concept. Hence, one goal is to develop techniques and processing methodologies required to increase the amount of processing of Kansas products that are already produced in the state. These processing techniques can be utilized by existing companies within the State of Kansas, and can attract outside industries that prefer to be located at or near the point of the supply of raw materials and then further process those products for shipment to other national and international markets. Additionally, your efforts in these areas of research should also attract companies that want to be near a source of technical information and technically trained potential employee pool.

I. Research Priorities for Domestic and International Markets

- A. Safety and Nutrition - Consumer Confidence and Well Being
- B. Product and Process Development for Value-Added Research
- C. Consumer Demands
  - 1. Active Lifestyle - Convenience
  - 2. Price Driven
  - 3. Health Conscious - Low Calorie, Low Salt, High Fiber
  - 4. Traditional Consumers
- D. Generate Basic Information

II. Research Benefits for Kansas

- A. Develop Technologies to Add Value to Raw Materials Produced and Initially Processed in the Midwest
- B. Emphasize Centers of Expertise to Serve Existing Industries and Attract New Industries
  - 1. Source of Information
  - 2. Source of Potential Employees

*AESB*  
01-27-89

*Attachment 4*

### III. Current and Future Research - Examples

#### A. Red Meats and Poultry

1. Surimi-Like Protein Concentrate from Low Value Carcasses or Parts for Use in Value-Added Products
2. Low-Fat, Low-Salt, Pre-Cooked, Restructured Products
3. Low-Fat, High-Fiber Sausages
4. Packaging Technologies for Centralized Processing - Color and Safety
5. Processing Technologies Required for Pre-Cooked Product Shelf-Life and Wholesomeness
6. Optimum Chilling Techniques for Beef and Pork Carcasses
7. Corn Germ Protein in Meat Products

#### B. Dairy

1. Development of Low Lactose Dairy Products
2. Accelerate Cheese Aging Process and Predict Ultimate Quality
3. Control Stale Flavor Development in UHT Milk

#### C. Food Safety - Microbiology and Toxicology

1. Develop Rapid Methods for the Estimation of Numbers and Kinds of Microbes in Food Products from Animals
2. Develop Rapid Techniques Which Would Detect Contaminants in Animal Tissues

January, 1989  
Jane Bowers  
Dept. Fds & Nutri  
KSU

Processing and distribution account for over 3/4 of the total retail price of food. "Value-added" processes for food add dollars to the Kansas economy. Processing or manufacturing food products so that they have attributes or characteristics that consumers "VALUE" will result in a greater demand for those products.

Consumers "VALUE" convenience; taste; safety; and nutrition. We consider all those characteristics in research with food products. However, the characteristics I will emphasize are NUTRITION and TASTE.

Health and fitness are of great concern to the U.S. population. Diet has always had a vital influence on health. As the incidence of disease of dietary deficiencies have diminished, they have been replaced by diseases of dietary excess and imbalance--problems that now relate to the leading causes of illness and death in the U.S.; touch the lives of most of us; and generate substantial health care costs.

Nutrition issues for most people are:

- Fat & Cholesterol
- Energy and weight control
- Complex carbohydrate and fiber
- Sodium

The first two issues relate to the problem of obesity. Obesity affects about 34 million adults or about 1/4 of the adult population. It is a risk factor for a number of diseases. Recent surveys indicate 83% consumers are concerned about vitamin/mineral, salt, fat, cholesterol or calorie content of food. More than 68 M Americans use low-calorie foods and beverages (1984), an increase of more than 60% from 1978-84. Predictions indicate an increase from a \$65 B market for diet and health foods in 1985 to more than \$80 B by 1990. Health conscience consumers tend to reduce caloric intake by reducing the quantity of sweets in the diet --often cakes and cookies. Finding alternate sweeteners for those products make it possible for people to include those cereal products in their diet and increase or maintain the consumption of Kansas cereal grain. The baking industry needs research based information to formulate products from non-caloric sugar and fat replacers.

Until recently, undesirable quality characteristics of reduced calorie baked products limited their consumer acceptance. Carole Setser has conducted research to provide information on ingredient formulation for cakes that result in quality baked products with a 50-55 percent reduction in calories.

*Ag. S.M.B.*  
07-24-89

ATTACHMENT 5



## FIBER

Dietary patterns emphasizing foods high in complex carbohydrates and fiber indicate a possible reduced risk for coronary heart disease and diabetes. Work by Robert Reeves in our laboratories help explain those findings. The studies emphasize the mechanisms by which dietary fiber lowers blood cholesterol and blood glucose. The animal and human studies have included normal subjects as well as those with hyperlipidemia or diabetes. The results of these studies provide a health rationale for incorporation of fiber into food products.

Additional work to incorporate fiber into food products evaluating sensory characteristics using oat fiber, legume and soy hull fiber in 2 or 3 products will be evaluated by students in residence halls. Additionally marketability will be investigated.

## SODIUM

Studies indicate a relationship between high sodium intake and high blood pressure and stroke for some populations. Salt contains about 40% by weight sodium and is used widely in processed foods. Sodium is necessary for normal metabolic function, but it is consumed in the U.S. far beyond adequate levels. Studies are underway examining the functional properties of salt in meat products and investigating ingredients that may replace those functional properties of salt, but result in a lower sodium content.

## SENSORY ANALYSIS CENTER

The Sensory Analysis Center assists food processors in product development and to enhance the marketability of Kansas agricultural products, especially value-added products by providing services that help determine quality and quality control, shelf-life, packaging options, and product characteristics. by identification of flavor problems and development of testing procedures. Two recent projects for Kansas companies were: " Effects of storage on flavor and texture of cookies" and "Sensory characteristics of various "instant" pasta formulations for product development".

The public benefits from increased availability of food products low in calories, fat, sodium, sugar, and high in natural forms of fiber and of acceptable sensory characteristics. Because the public is becoming increasingly conscious of the role of nutrition in health, development of such products should benefit the developing food industry in Kansas.