Approved February 3, 1992
Date

MINUTES OF THE HOUSE COMMITTEE ON ECONOMIC DEVLEOPMENT.

The meeting was called to order by Representative Diane Gjerstad at
Chairperson

3:40 ~~a~~/p.m. on Thursday, January 23, 1992 in room 423-S of the Capitol.

All members were present except:

Representatives Baker, Bishop, Dean, Sluiter, Wagnon and Wisdom. Excused.

Committee staff present:

Lynne Holt, Legislative Research
Betty Manning, Secretary

Conferees appearing before the committee:

Sam Brownback, Secretary of Agriculture
Richard Hahn, Ph.D., Director, KS Agricultural Value-Added Center

The meeting was called to order at 3:40 p.m. by the Chairperson, Representative Diane Gjerstad. She announced Terry Scanlon, President of KDFA, passed away and a card was sent to the family on behalf of the committee.

Chairperson Gjerstad introduced Secretary of Agriculture, Sam Brownback who discussed new Sub-title (G) funds available under the new farm bill dealing with non-industrial food uses of agricultural products. Secretary Brownback stated agriculture plays a critical and substantial role in the Kansas economy accounting for at least $24 billion in economic activity. New markets are rapidly emerging for agricultural commodities. Further, it is predicted in the near future industrial uses of corn will exceed exports of corn from the United States.

Secretary Brownback stated one major concern is how Kansas can become a major economic player in these new value-added areas. Kansas is resident state for New Uses Council, a national organization Kansas helped co-found to promote industrial uses of agricultural commodities. This and other organizations helped get Subtitle (G) in the farm bill that creates, within U.S.D.A., a separate entity for joint public/private ventures to commercialize new uses of agricultural commodities. Subtitle (G) is presently funded at $4.5 million. This amount is proposed to be doubled in the next fiscal year. Some of this funding could end up in Kansas projects if Kansas is properly positioned and will aggressively seek it.

The Secretary stated KTEC has authorized $100,000 this year to create the Kansas Industrial Agricultural Program and believes this should be a separate corporation under KTEC that could enter into projects with private companies and seek public and private sector funding to bring these products to the marketplace. Attachment 1.

Secretary Brownback circulated to committee members wheat stuffing materials made from wheat.

Secretary Brownback responded to questions from the committee members.

MINUTES OF THE HOUSE COMMITTEE ON ECONOMIC DEVELOPMENT,

room 423-S, Statehouse, at 3:40 ~~a.m.~~/p.m. on Thursday, January 23, 1992.

Chairperson Gjerstad stated the statute for Kansas Value-Added Center (KVAC) will sunset on July 1, 1992. Copy of the statute was distributed to committee members. Attachment 2.

The Chair recognized Dr. Richard Hahn, Director of Kansas Value-Added Center (KVAC). He explained how KVAC is organized and outlined services provided and stated KVAC is governed by a twelve member leadership council who determines what happens in the program and approves all expenditures for projects and staffing.

Dr. Hahn introduced Susan Goetsch, Manager of Technical Services, who works closely with a lot of Kansas food processing companies and helps in delivering KVAC services. New snack products were distributed to the committee members for sampling.

In November, leadership council evaluated KVAC and noted areas needing improvement. Those areas include increasing awareness of KVAC, expand to larger businesses, increase emphasis on new technology and visit more plants. Attachment 3.

Dr. Hahn responded to questions from committee members.

Chairperson Gjerstad expressed her concern that it seems Kansas is spending a disproportionment amount of time and interest on production of simple foods and seemed it was time to make a leap forward into the next phase - the non-food uses, especially in the biotechnology field and what could be done to facilitate this transition.

Dr. Hahn stated four things were needed to develop a technology. First, you have to have ideas; second, you need people, technologists and entrepreneurs; third, facilties for developing product, labs, etc.; and fourth, investment capital. Dr. Hahn responded that Kansas does not have technologists who have been active in these important areas and the easiest way to achieve this is to allocate $250,000 to a university for five years to hire top notch researcher to work in this area, whether in genetic engineering or space science or separation research. But, this money must be available for the five year period.

Chairperson Gjerstad thanked Dr. Hahn for his presentation.

The Chair stated the Senate has introduced a bill striking the sunset date and with the committee's permission the House will not introduce a bill but will request Majority Leader to refer the Senate bill to the House Economic Development Committee for consideration.

The meeting adjourned at 5:10 p.m.

I Jan. 23, 1992 GUEST REGISTER

HOUSE

Committee on Economic Development

NAME	ORGANIZATION	ADDRESS
ALAN COBB	KASB	TOPEKA
Bob Sherburne	Topeka Inc. FTZ	Topeka
Susan Hurt	Rep Reinhardt	
Joe Lieber	Ks. Co-op Council	Topeka
Eldon R. Fastrup	Ks St Board of Ag	Topeka
Dick Hahn	KVAC	Manhattan
Sam Brownback	KSBOA	Topeka
Ray Burns	Ks BOA	Topeka
Susan L. Goetsch	KVAC	Manhattan
Jeff R. Wilson	Intern/Rep. Baker	Lawrence

TESTIMONY

to

THE HOUSE COMMITTEE ON ECONOMIC DEVELOPMENT

by

Secretary Sam Brownback
Kansas State Board of Agriculture

January 23, 1992

Eco-Devo
Attach #1
01-23-92

Madam Chairman, it's always a pleasure to appear in front of the House Economic Development Committee. Agriculture plays a critical and substantial role in the Kansas economy currently accounting for at least $24 billion in economic activity.

The reason for my appearance today is to discuss the growing areas of non-food, non-feed uses of agricultural commodities. The Kansas State Board of Agriculture has been involved in this area since 1988.

This area is expanding in front of our very eyes. New markets are rapidly emerging for agricultural commodities. These are in the non-food uses of farm commodities. Soon agriculture will no longer be referred to as a food and fiber industry alone, but one of food and fuels, medicine and materials.

A few examples might be in order. The industrial utilization of corn in the areas of super absorbent materials, plastics, ethanol and other applications is currently at approximately 1.3 billion bushels annually. It is predicted that in the near future the industrial uses of corn will exceed the exports of corn from the United States. The National Corn Growers Association has indicated that each 100 million bushels of new uses adds 5 cents per bushel to all bushels of production.

Approximately 10 million bushels of soybeans annually are used for soybean ink with the potential to go to 100 million bushel of annual consumption. Other non-food uses of soybean oil uses some 16 million bushels. 100% starch based, degradable plastics are beginning to break into the marketplace with enormous potential for the utilization of wheat, corn, grain sorghum and potato starch.

Some of these biobased products are coming from Kansas. We have four ethanol plants in the state. A grain sorghum processing plant in Dodge City processes that crop for non-food purposes. A new sunflower plant that can also process industrial crambe will open near Goodland in 1992.

These and many other industrial applications are breaking into the marketplace. Kansas Agriculture and the agricultural complex can grow with these, <u>if we will</u>.

Other examples include biodiesels out of soy oil or tallow, transmission fluids made partially, and we hope in the future, wholly out of vegetable oils, edible plates and the like.

<u>The key question before us today is how Kansas can become a major economic player in these new value-added arenas</u>.

Kansas has already done a lot in this area. We are the resident state for the New Uses Council. This is a national organization that Kansas helped to co-found that exists to promote industrial uses of agricultural commodities. This organization, and a number of others, helped get Subtitle G in the Farm Bill that creates, within USDA, a separate entity designed to do joint public/private ventures to commercialize promising new uses of agricultural commodities. Subtitle G is currently funded at $4.5 million. That amount is proposed to be more than doubled

in the next federal fiscal year. Some of this funding could end up in Kansas projects if we are properly positioned and aggressively seek it.

Kansas Technology Enterprise Corporation has authorized the spending of $100,000 this fiscal year to create the Kansas Industrial Agriculture Program. We are interviewing individuals to run this initial organization. It is my belief that this should be a separate corporation under KTEC that could itself enter into projects with private companies, seek private and public sector funding in order to bring these products to the marketplace.

The first ever national expo of industrial uses of farm commodities will be held in St. Louis, October 6-9, 1992. I am currently Chairing this effort which is cosponsored by USDA, the Department of Energy, the New Uses Council, the American Association of Industrial Crops and others. The objective of this expo is twofold. One is to do technology transfer. We will have displays of emerging products and bring together business people, financiers and others interested in commercializing these technologies. The second objective is to showcase to the public, the burgeoning number of products that are coming from this area. I believe that Kansas should be present at this expo both in displaying and with businesses interested in gathering technologies for use in the state.

The Kansas State Board of Agriculture has nominated three individuals to serve on the Subtitle G Alternative Agriculture Research and Commercialization Board. We are hopeful of landing at least one individual on this nine-member AARC Board.

The Kansas Value Added Center is currently funding several projects in the industrial uses category. These range from a biodiesel project using tallow, to stuffing material made from wheat and milo. These are promising technologies.

If Kansas is to remain a leader in the industrial uses of agriculture field and thus, profit economically from this emerging area, I believe we need to take the following steps:

1. Support KTEC's efforts to set up a separate corporation under the KTEC umbrella that can enter into public/private joint ventures on commercialization. This is an imperative step to be properly structured in order to help emerging technologies bridge that very difficult gap from development to commercialization. This effort needs to be adequately funded and monitored to make certain that the needs and missions defined are being met.

2. The Kansas Value Added Center (KVAC) should be reauthorized. KVAC has been a leading force in working with the academic and entrepreneurial community to provide a network and some minimal assistance in the development of these technologies. KVAC cannot participate in the commercialization but plays a critical role in the development. It has done a good job with minimal money and should be continued with even additional funding.
3. Researchers in Kansas, from appropriate disciplines, should be encouraged to look at the area of industrial uses of farm commodities for research and commercialization activities. We have found an increasing number of researchers in various universities in the state willing and interested to address this field. I believe they should be encouraged even

further. Research follows dollars. If funds are made available in this field I believe you will attract additional research in it.

4. The state should seek to get one or more vehicles that run on 85% ethanol in the Motor Pool fleet. These cars are being driven in several states. I believe this should be pursued in Kansas. To date, our efforts have not yielded results in getting an E-85 vehicle in Kansas. Hopefully, in the future as well we can get a vehicle or more that runs on a biodiesel. This would be good for testing and good for demonstration of these alternative fuels coming from the Midwest.

5. The State of Kansas should support the continuation of the New Uses Council in the state. The New Uses Council is currently housed in the KTEC facility. The Chairman of this organization is Jeff Gain, who is also CEO of the National Corn Growers Association. I believe it is important that the New Uses Council remain headquartered in Kansas to give us a local source of national, and indeed, international information. If we can keep this entity headquartered here, nurture and sponsor it, I believe this will yield us dividends in the future for as far as having early access to all that will occur in this field in the future.

Thank you madam Chairman for this opportunity to appear in front of you concerning an area that I am very enthused about and one which I believe holds tremendous promise for our state. I would be happy to respond to questions.

(b) In order to assist in the implementation of the international meat and livestock program there is hereby established an advisory committee to be composed of 11 members as follows:

(1) One member from the Kansas sheep association appointed by the Kansas sheep association;

(2) one member from the Kansas pork producers council appointed by the Kansas pork producers council;

(3) one representative of the Kansas dairy industry appointed by the interbreed dairy council;

(4) one member from the cow-calf division of the Kansas livestock association appointed by the Kansas livestock association;

(5) one member from the feedlot division of the Kansas livestock association appointed by the Kansas livestock association;

(6) one member from the Kansas meat processing association appointed by the Kansas meat processing association;

(7) one member from the national meat packers association appointed by the national meat packers association;

(8) the chairpersons of the standing agriculture committees of the Kansas legislature;

(9) the director of the international meat and livestock program; and

(10) the secretary of the state board of agriculture, who shall serve as chairperson of the committee.

History: L. 1986, ch. 3, § 1; July 1.

76-479. Same; annual report to governor and legislature. The head of the animal sciences and industry department of Kansas state university shall annually prepare and submit to the governor and the legislature prior to the commencement of its regular session, a report containing the activities and accomplishments relating to the international meat and livestock program which may have occurred in the preceding calendar year.

History: L. 1986, ch. 3, § 2; July 1.

76-480. Sale of certain real estate in Riley county by board of regents; use of proceeds. The state board of regents is hereby authorized and empowered, for and on behalf of Kansas state university of agriculture and applied science, to sell and convey all of the rights, title and interest in the following described real estate located in Riley county, Kansas: A tract of land located in the Southwest Quarter of Section 35, Township 9 South, Range 7 East of the 6th P.M. in Riley County, Kansas, more particularly described as follows: Beginning at the South Quarter corner of said Section 35; thence along the South Line of the Southwest Quarter of said Section 35; S.89°21'W. 401.6 feet (S.89°21'W. being an assumed bearing); thence parallel with and 40' perpendicular to the plan baseline of federal aid project 113-81-K-1279(3) as located in the K.D.O.T. resident engineer's office in Wamego, Kansas; N.0°11'W. 1,158.3 feet; thence parallel with and 70 feet perpendicular to the centerline of Riley County public road F.A.S. 1797 the following two courses: N.89°49'E. 35.0 feet; On a curve to the right in a southeasterly direction with a radius of 55.0 feet, an arc distance of 86.4 feet; thence N.89°49'E. 10.0 feet; thence parallel with and 60 feet perpendicular to the centerline of said Riley County public road F.A.S. 1797 the following two courses: S.0°11'E. 519.5 feet; On a curve to the left in a southeasterly direction with a radius of 637.73 feet an arc distance of 254.7 feet; then S.66°56'W. 20.0 feet; thence parallel with and 80 feet perpendicular to the centerline of said Riley County public road F.A.S. 1797; On a curve to the left in a southeasterly direction with a radius of 657.73 feet an arc distance of 417.8 feet to the east line of the Southwest quarter of said section 35; thence along the East line of the southwest quarter of said Section 35; S.0°18'E. 14.2 feet to the point of beginning, containing 3.82 acres. Conveyance of such rights, title and interest in such real estate shall be executed in the name of the state board of regents by its chairperson and executive officer. When the sale is made, the proceeds thereof shall be deposited in the Marlatt memorial park restricted use account of Kansas state university of agriculture and applied science to be used for maintenance of such park.

History: L. 1987, ch. 285, § 1; May 21.

76-481. Agricultural value added processing center; creation; objectives; functions and duties. (a) There is hereby created an agricultural value added processing center which is associated with Kansas state university. The activities of such center shall be subject to the provisions of appropriations acts.

(b) The objectives of the center shall include, but not be limited at Kansas state university and at other appropriate locations in Kansas to, providing technical assistance to existing and potential value added processing fa-

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Attach. #2
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cilities, including incubator facilities; developing a network for collecting and distributing information to individuals involved in value added processing in Kansas; initiating pilot plant facilities to act as research and development laboratories for existing and potential small scale value added processing endeavors in Kansas; providing technical assistance to new agricultural value added processing businesses; developing and promoting communication and cooperation among private businesses, state government agencies and public and private colleges and universities in Kansas; and establishing research and development programs in technologies that have value added commercial potential for food and non-food agricultural products.

(c) Within the limitations of appropriations available therefor, the center shall cooperate with existing state agencies involved in marketing in order to promote market development relating to agricultural value added products. Subject to the provisions of appropriations acts, the functions of the center shall include but not be limited to developing a market referral program, matching distribution to buyers in coordination with other state agencies concerned with marketing Kansas products; assisting private entrepreneurs in the establishment of facilities and markets for new agricultural value added processing endeavors; and introducing coordinated programs to develop marketing skills of existing agricultural value adding processors in Kansas.

History: L. 1988, ch. 1, § 1; May 19.

76-482. Same; leadership council, creation, composition, appointment, terms, annual organization, rules of procedure, expenses of members. (a) There is hereby created the agricultural value added processing center leadership council consisting of 12 members as follows:

(1) A member of the house of representatives and a member of the senate appointed by the legislative coordinating council, and such members shall be from different political parties;

(2) the dean of the college of agriculture at Kansas state university or the dean's designee;

(3) the dean of the college of engineering at Kansas state university or the dean's designee;

(4) the secretary of the state board of agriculture, or the secretary's designee;

(5) the secretary of commerce, or the secretary's designee;

(6) six citizens of Kansas, representing agricultural producers and a variety of processing interests and including at least one person having recognized expertise in both national and international marketing of agricultural products, who shall be appointed by the governor.

(b) The members of the leadership council appointed under subsection (a)(1) shall be appointed for a term ending on the day preceding the commencement of the regular session of the legislature in the first odd-numbered year following their appointment. The members of the leadership council appointed by the governor under subsection (a)(6) shall be appointed for terms as follows: (1) Three members shall be appointed for terms ending on June 30, 1990, and (2) three members shall be appointed for terms ending on June 30, 1991. After the expiration of the initial terms of such members appointed by the governor, members shall be appointed by the governor for terms of two years. All vacancies in the office of appointed members shall be filled by appointment by the officer or council making the original appointment for the remainder of the unexpired term of the member creating the vacancy.

(c) The leadership council shall organize annually by the election from its membership of a chairperson and a vice-chairperson. The leadership council shall adopt such rules of procedure as it deems necessary for conducting its business.

(d) The members of the leadership council shall be paid subsistence allowance, mileage and other expenses for attendance at meetings of the leadership council, or subcommittee meetings thereof authorized by the council, as provided in K.S.A. 75-3223, and amendments thereto.

History: L. 1988, ch. 1, § 2; May 19.

76-483. Same; director, appointment, compensation, location of office, responsibilities; strategy and goals. (a) The leadership council shall appoint the director of the agricultural value added processing center from a list of nominees prepared by the president of the Kansas technology enterprise corporation. The director shall be in the unclassified service under the Kansas civil service act and shall serve at the pleasure of the leadership council. The director shall receive compensation from appropriations made for the Kansas technology

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enterprise corporation for the agricultural value added processing center. The director shall be located in the office of the president of Kansas state university.

(b) The director shall be responsible for publishing a formal strategy and set of goals adopted by the leadership council for the agricultural value added processing center and presenting the strategy and goals to the board of directors of the Kansas technology enterprise corporation. At the direction of the leadership council, the director shall prepare a preliminary budget proposal for fiscal year 1990 and present such budget proposal to the board of directors of the Kansas technology enterprise corporation prior to September 1, 1988. Each year, such board of directors shall submit a proposed budget for the agricultural value added processing center within the budget estimate prepared and submitted to the division of the budget pursuant to K.S.A. 75-3717 and amendments thereto. The director shall present the strategy, goals and budget proposals of the agricultural value added processing center to the standing committees on agriculture and economic development of the senate and the house of representatives at the beginning of the regular session of the legislature in 1989 and shall present a follow-up report to such committees during that session and after April 1, 1989.

(c) The leadership council shall develop and adopt a formal strategy and set of goals for such agricultural value added processing center and shall revise and update such strategy and goals as deemed necessary by the council. The leadership council may recommend such legislation as the council deems appropriate for the purposes of the agricultural value added processing center.

History: L. 1988, ch. 1, § 3; May 19.

76-484. Same; documents and materials deemed trade or business secrets not public records, secured environment. Documents and other materials submitted to the agricultural value added center, the director of such center or the leadership council of such center by Kansas businesses shall not be public records if such documents and other materials are determined to be trade or business secrets. Each such document or other material determined to be trade or business secrets shall be maintained in a secured environment by the director of the agricultural value added center.

History: L. 1988, ch. 1, § 4; May 19.

76-485. Same; citation of act; expiration date. (a) This act shall be known and may be cited as the agricultural value added processing center act.

(b) The provisions of this act shall expire on July 1, 1992.

History: L. 1988, ch. 1, § 5; May 19.

76-486. State board of regents authorized to convey certain property; procedure; use of proceeds; approval by attorney general. (a) The state board of regents is hereby authorized and empowered, in its discretion, for and on behalf of Kansas state university of agriculture and applied science, to sell and convey all of the rights, title and interest in any part or parts or all of the following described real estate, improvements thereon and easements:

(1) Property consisting of 8.9 acres, more or less, plus 9.61 acres of easements, and 2 buildings, situated in Dickinson county, Kansas, nearby Abilene, and more particularly described as follows, to wit: "TRACT NO. S-2-100"—The east 600 feet of the west 1,500 feet of the south 600 feet of the north 1,300 feet of the SW 1/4, except that portion thereof lying within the E 1/2 SW 1/4, in section 6, township 13 south, range 2 east of the 6th Principal Meridian, Dickinson county, Kansas, containing 5.23 acres, more or less; "TRACT NO. S-2-100-2"—The south 185 feet of the north 1,165 feet of the east 150 feet of the west 900 feet of the SW 1/4 of section 6, township 13 south, range 2 east of the 6th Principal Meridian, Dickinson county, Kansas, together with all right, title, and interest in and to any alleys, roads, streets, ways, strips, gores or railroad right-of-way abutting or adjoining such land and in any means of ingress or egress appurtenant thereto, containing .064 acres, more or less, subject to existing easements for public roads and highways, for public utilities, for railroads and pipelines; "TRACT NO. S-2-101"—The east 600 feet of the west 1,500 feet of the south 600 feet of the north 1,300 feet of the SW 1/4 of section 6, township 13 south, range 2 east of the 6th Principal Meridian, Dickinson county, Kansas, except that portion thereof lying within the W 1/2 SW 1/4 of section 6, together with all right, title and interest in and to any alleys, streets, ways, strips or gores abutting or adjoining the land here described, containing 3.03 acres, more or less, subject to existing easements for public roads and highways, for public utilities, for railroads and pipe-

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PRESENTATION TO 1992 KANSAS LEGISLATURE
JANUARY 23, 1992
HOUSE ECONOMIC DEVELOPMENT COMMITTEE

DIANE GJERSTAD, CHAIR

✓ KVAC STATUS
- History
- Statute 1988 Supp. 76-481, Et. Seq
  — Expiration Date July 1, 1992 (Senate Bill 502)
- Leadership Council
- KVAC Fact Sheet
- KVAC Strategy
- Budget

✓ ORGANIZATION OF KANSAS AG VALUE ADDED CENTER
- Organizational Chart
- The Kansas Ag Value Added Team
- Roles of Key Players

✓ EVALUATION OF KVAC
- By Leadership Council
- By Clients

✓ STATUS OF AG VALUE ADDED IN KANSAS
- Food Processing Jobs
- Small Business—Gourmet Foods
- New Plants

✓ KVAC CASE STUDIES
- Work with Industry Groups
- Work with Individual Companies
- New Technology—Food & Nonfood

✓ ATTACHMENTS
- FY91 KVAC Annual Report
- Processing Food in Farm States: An Economic Development Strategy for the 1990s
- The Quiet Revolution in the U.S. Food Market
- "FOCUS on Value Added Agricultural Products"

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Attach #3
01-23-92

OGRAM EXPLANATION:

The Kansas Agricultural Value Added Processing Center (KVAC) was created by the 1988 legislature. Its purpose is to foster economic development by providing technical assistance to Kansas agriculturally related value added processing endeavors. KVAC grew from a concern for the economic plight of agriculture and rural Kansas due to the general distressed condition of agriculture and the number of people leaving farms and rural communities. Various commissions, task forces and state agencies conducted studies of the condition of agriculture in the 1985 to 1988 period. Among these reports are the following:

-- Kansas Economic Development Study: findings, strategy, and recommendations (Redwood - Krider Report).

-- Report of the Task Force on Agriculture of the Legislative Commission on Economic Development (December 1986).

-- Kansas Agriculture and Rural Communities: changing and adapting to survive. Kansas State Board of Agriculture (October 1987).

-- Agriculture 2000, the Kansas Plan. KSU Agriculture Experiment Station (October 1987).

-- The Future Direction of Kansas Agriculture and Agribusiness A Blue Print Study. Kansas State Board of Agriculture (January 1988).

-- Task Force Report on Non-Food Uses of Kansas Agricultural Product. Kansas State Board of Agriculture (January 1989).

A constant theme in these reports was that agricultural value added processing could provide economic benefits to agriculture and rural Kansas. In addition, "The State of Kansas can facilitate the success of private endeavors by assuring a supportive commercial environment and by supporting technical assistance and infrastructure facilities useful to Kansas industry." (Blue Print study p. XIV)

STATUTORY HISTORY:

Early in the 1988 session, Senator Fred Kerr and others began work on the formal establishment of an agricultural value added processing center. The resulting bill, SB 599, responded to the need for such a center as reported by a number of commissions and study groups. Upon passage by both houses, the bill was signed by the governor on May 10, 1988. The bill is now codified as 1988 Supp. 76-481, et. seq.

The bill provided six objectives for the center and for a 12 member Leadership Council to set policy and hire a director. The first meeting of the Leadership Council was in September 1988 and a director was hired on March 26, 1989. The center became operational May 1, 1989.

Activities of the center are subject to appropriations acts. Appropriations for operations of the center are included within the budget of Kansas Technology Enterprise Corporation. In addition to operational funding, the legislature on several occasions has provided funding for special projects to be administered by KVAC. The KVAC director is required to present the strategy, goals, and budget proposals to the legislature annually. The Agricultural Value Added Processing Center is scheduled to sunset on July 1, 1992.

(b) In order to assist in the implementation of the international meat and livestock program there is hereby established an advisory committee to be composed of 11 members as follows:

(1) One member from the Kansas sheep association appointed by the Kansas sheep association;

(2) one member from the Kansas pork producers council appointed by the Kansas pork producers council;

(3) one representative of the Kansas dairy industry appointed by the interbreed dairy council;

(4) one member from the cow-calf division of the Kansas livestock association appointed by the Kansas livestock association;

(5) one member from the feedlot division of the Kansas livestock association appointed by the Kansas livestock association;

(6) one member from the Kansas meat processing association appointed by the Kansas meat processing association;

(7) one member from the national meat packers association appointed by the national meat packers association;

(8) the chairpersons of the standing agriculture committees of the Kansas legislature;

(9) the director of the international meat and livestock program; and

(10) the secretary of the state board of agriculture, who shall serve as chairperson of the committee.

History: L. 1986, ch. 3, § 1; July 1.

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cilities, including incubator facilities; developing a network for collecting and distributing information to individuals involved in value added processing in Kansas; initiating pilot plant facilities to act as research and development laboratories for existing and potential small scale value added processing endeavors in Kansas; providing technical assistance to new agricultural value added processing businesses; developing and promoting communication and cooperation among private businesses, state government agencies and public and private colleges and universities in Kansas; and establishing research and development programs in technologies that have value added commercial potential for food and non-food agricultural products.

(c) Within the limitations of appropriations available therefor, the center shall cooperate with existing state agencies involved in marketing in order to promote market development relating to agricultural value added products. Subject to the provisions of appropriations acts, the functions of the center shall include but not be limited to developing a market referral program, matching distribution to buyers in coordination with other state agencies concerned with marketing Kansas products; assisting private entrepreneurs in the establishment of facilities and markets for new agricultural value added processing endeavors; and introducing coordinated programs to develop marketing skills of existing agricultural value adding processors in Kansas.

History: L. 1988, ch. 1, § 1; May 19.

76-482. Same; leadership council, creation, composition, appointment, terms, annual organization, rules of procedure, expenses of members. (a) There is hereby created the agricultural value added processing center leadership council consisting of 12 members as follows:

(1) A member of the house of representatives and a member of the senate appointed by the legislative coordinating council, and such members shall be from different political parties;

(2) the dean of the college of agriculture at Kansas state university or the dean's designee;

(3) the dean of the college of engineering at Kansas state university or the dean's designee;

(4) the secretary of the state board of agriculture, or the secretary's designee;

(5) the secretary of commerce, or the secretary's designee;

(6) six citizens of Kansas, representing agricultural producers and a variety of processing interests and including at least one person having recognized expertise in both national and international marketing of agricultural products, who shall be appointed by the governor.

(b) The members of the leadership council appointed under subsection (a)(1) shall be appointed for a term ending on the day preceding the commencement of the regular session of the legislature in the first odd-numbered year following their appointment. The members of the leadership council appointed by the governor under subsection (a)(6) shall be appointed for terms as follows: (1) Three members shall be appointed for terms ending on June 30, 1990, and (2) three members shall be appointed for terms ending on June 30, 1991. After the expiration of the initial terms of such members appointed by the governor, members shall be appointed by the governor for terms of two years. All vacancies in the office of appointed members shall be filled by appointment by the officer or council making the original appointment for the remainder of the unexpired term of the member creating the vacancy.

(c) The leadership council shall organize annually by the election from its membership of a chairperson and a vice-chairperson. The leadership council shall adopt such rules of procedure as it deems necessary for conducting its business.

(d) The members of the leadership council shall be paid subsistence allowance, mileage and other expenses for attendance at meetings of the leadership council, or subcommittee meetings thereof authorized by the council, as provided in K.S.A. 75-3223, and amendments thereto.

History: L. 1988, ch. 1, § 2; May 19.

76-483. Same; director, appointment, compensation, location of office, responsibilities; strategy and goals. (a) The leadership council shall appoint the director of the agricultural value added processing center from a list of nominees prepared by the president of the Kansas technology enterprise corporation. The director shall be in the unclassified service under the Kansas civil service act and shall serve at the pleasure of the leadership council. The director shall receive compensation from appropriations made for the Kansas technology

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enterprise corporation for the agricultural value added processing center. The director shall be located in the office of the president of Kansas state university.

(b) The director shall be responsible for publishing a formal strategy and set of goals adopted by the leadership council for the agricultural value added processing center and presenting the strategy and goals to the board of directors of the Kansas technology enterprise corporation. At the direction of the leadership council, the director shall prepare a preliminary budget proposal for fiscal year 1990 and present such budget proposal to the board of directors of the Kansas technology enterprise corporation prior to September 1, 1988. Each year, such board of directors shall submit a proposed budget for the agricultural value added processing center within the budget estimate prepared and submitted to the division of the budget pursuant to K.S.A. 75-3717 and amendments thereto. The director shall present the strategy, goals and budget proposals of the agricultural value added processing center to the standing committees on agriculture and economic development of the senate and the house of representatives at the beginning of the regular session of the legislature in 1989 and shall present a follow-up report to such committees during that session and after April 1, 1989.

(c) The leadership council shall develop and adopt a formal strategy and set of goals for such agricultural value added processing center and shall revise and update such strategy and goals as deemed necessary by the council. The leadership council may recommend such legislation as the council deems appropriate for the purposes of the agricultural value added processing center.

History: L. 1988, ch. 1, § 3; May 19.

76-484. Same; documents and materials deemed trade or business secrets not public records, secured environment. Documents and other materials submitted to the agricultural value added center, the director of such center or the leadership council of such center by Kansas businesses shall not be public records if such documents and other materials are determined to be trade or business secrets. Each such document or other material determined to be trade or business secrets shall be maintained in a secured environment by the director of the agricultural value added center.

History: L. 1988, ch. 1, § 4; May 19.

76-485. Same; citation of act; expiration date. (a) This act shall be known and may be cited as the agricultural value added processing center act.

(b) The provisions of this act shall expire on July 1, 1992.

History: L. 1988, ch. 1, § 5; May 19.

76-486. State board of regents authorized to convey certain property; procedure; use of proceeds; approval by attorney general. (a) The state board of regents is hereby authorized and empowered, in its discretion, for and on behalf of Kansas state university of agriculture and applied science, to sell and convey all of the rights, title and interest in any part or parts or all of the following described real estate, improvements thereon and easements:

(1) Property consisting of 8.9 acres, more or less, plus 9.61 acres of easements, and 2 buildings, situated in Dickinson county, Kansas, nearby Abilene, and more particularly described as follows, to wit: "TRACT NO. S-2-100"—The east 600 feet of the west 1,500 feet of the south 600 feet of the north 1,300 feet of the SW 1/4, except that portion thereof lying within the E 1/2 SW 1/4, in section 6, township 13 south, range 2 east of the 6th Principal Meridian, Dickinson county, Kansas, containing 5.23 acres, more or less; "TRACT NO. S-2-100-2"—The south 185 feet of the north 1,165 feet of the east 150 feet of the west 900 feet of the SW 1/4 of section 6, township 13 south, range 2 east of the 6th Principal Meridian, Dickinson county, Kansas, together with all right, title, and interest in and to any alleys, roads, streets, ways, strips, gores or railroad right-of-way abutting or adjoining such land and in any means of ingress or egress appurtenant thereto, containing .064 acres, more or less, subject to existing easements for public roads and highways, for public utilities, for railroads and pipelines; "TRACT NO. S-2-101"—The east 600 feet of the west 1,500 feet of the south 600 feet of the north 1,300 feet of the SW 1/4 of section 6, township 13 south, range 2 east of the 6th Principal Meridian, Dickinson county, Kansas, except that portion thereof lying within the W 1/2 SW 1/4 of section 6, together with all right, title and interest in and to any alleys, streets, ways, strips or gores abutting or adjoining the land here described, containing 3.03 acres, more or less, subject to existing easements for public roads and highways, for public utilities, for railroads and pipe-

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Session of 1992

SENATE BILL No. 502

By Senators Oleen and F. Kerr, Bond, Burke, Daniels, Ehrlich, Frahm, Francisco, Gaines, Karr, D. Kerr, Langworthy, Lee, McClure, Montgomery, Moran, Morris, Petty, Reilly, Sallee, Thiessen, Vidricksen, Walker, Webb, Winter and Yost

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AN ACT concerning the agricultural value added processing center; amending K.S.A. 76-485 and repealing the existing section.

Be it enacted by the Legislature of the State of Kansas:

Section 1. K.S.A. 76-485 is hereby amended to read as follows: 76-485. ~~(a)~~ This act shall be known and may be cited as the agricultural value added processing center act.

~~(b) The provisions of this act shall expire on July 1, 1992.~~

Sec. 2. K.S.A. 76-485 is hereby repealed.

Sec. 3. This act shall take effect and be in force from and after its publication in the statute book.

January 21, 199?

KANSAS AGRICULTURAL VALUE-ADDED PROCESSING CENTER

Leadership Council

Authorization 1988 Supp. 76-481 to 485

Chairperson: Bernie L. Hansen

Vice Chairperson: Lee Reeve

PRIVATE SECTOR REPRESENTATIVES

	Appointment Date	Expiration Date
Bernard (Bernie) L. Hansen, President FLINT HILLS FOODS, INC. P.O. Box 435 Alma, Kansas 66401 (913) 765-3396 FAX: (913) 765-2294	08-10-88	06-30-91
James (Jim) Kramer, Managing Partner KRAMER SEED FARMS 907 South Monroe Hugoton, Kansas 67951 (316) 544-4330 (316) 544-8000 pick-up phone	08-10-88	06-30-92
Jerry Lasater MIDWEST GRAIN PRODUCTS INC 1300 Main, Box 130 Atchison, Kansas 66002 (913) 367-1480 FAX: (913) 367-1838	06-30-90	06-30-92
Karen Pendleton PENDLETON'S FRESH KAW VALLEY ASPARAGUS RR #2, Box 371 Lawrence, Kansas 66046 Home: (913) 843-1409 Farm: (913) 843-3192 FAX: (913) 841-6287	08-10-88	06-30-91
Dale Rodman, Executive Vice President EXCEL CORPORATION 151 N. Main, Box 2519 Wichita, Kansas 67201 (316) 291-2500 FAX: (316) 291-2508	08-10-88	06-30-91
Lee Reeve, Owner-Manager REEVE CATTLE CO. P.O. Box 1036 Garden City, Kansas 67846 (316) 275-0234 FAX: (316) 275-8393	09-08-88	06-30-92

LEGISLATIVE REPRESENTATIVES

Rep. William Bryant
Route 2, Box 170
Washington, Kansas 66968 Home-(913) 325-2618

Sen. Janice Lee McClure
HCR 1, Box 70
Sublette, Kansas 66067 (316) 675-2552

KANSAS STATE UNIVERSITY REPRESENTATIVES

Walter R. Woods, Ph.D
Dean of Agriculture
Kansas State University
115 Waters Hall
Manhattan, Kansas 66506 (913) 532-7137 FAX: (913) 532-6563

Dr. Donald Rathbone, P.E.
Dean of Engineering
Kansas State University
146 Durland Hall
Manhattan, Kansas 66506 (913) 532-5590 FAX: (913) 532-7810

STATE GOVERNMENT REPRESENTATIVES

Sam Brownback, Kansas Secretary of Agriculture
Kansas State Board of Agriculture
109 SW 9th Street
Topeka, Kansas 66612 (913) 296-3558 FAX: (913) 296-7951 or 296-2247

Laura Nicholl, Secretary
Kansas Department of Commerce
400 SW 8th Street, 5th Floor
Topeka, Kansas 66603 (913) 296-3480 FAX: (913) 296-5055

EX OFFICIO:

William G. Brundage, Ph.D
President of KTEC
112 W. 6th, Suite 400
Topeka, Kansas 66603 (913) 296-5272 FAX: (913) 296-1160

KVAC FACT SHEET

Established by 1988 Legislature as Agricultural Value Added Processing Center
Senate Bill 599 - Signed May 19, 1988 (76-481 to 5)

MISSION: To enhance the economy of Kansas through technical assistance to Kansas agriculture processing industries

LOCATION: Suite 301 Umberger Hall, Kansas State University, Manhattan, KS 66506

STAFFING: Director - Richard Hahn
Manager—Technical Services - Susan Goetsch
Executive Secretary - Mary Kay Gunnels
Graduate Assistant (½ Time) - Jim Parker

BUDGET: Funding Primarily Economic Development Initiative Fund

FY92 Budget $ 650,170

SERVICES PROVIDED:

1. *Free consultant service to Kansas businesses*. Provide information, problem solving, technical advice, and technical networking. Resources include: KVAC staff, KSU Value Added Extension Specialists, faculty from 5 regents universities, Board of Agriculture, Marketing Division, private consultants and contractors.

2. *Product and process development and commercialization assistance*. Includes product improvement and quality control, regulatory compliance, technical assistance, etc. Limited matching funding is available.

3. *Making available pilot plant facilities* for private use to scale up processes and prepare market test quantities. Limited matching funding is available.

4. *Development of new technology* and opportunities for Kansas ag processing industry. KVAC provides limited start up funding for promising ideas.

5. *Training for Kansas industry*. In cooperation with other groups, KVAC provides training grants, short courses and seminars, as well as individualized training in a wide variety of technical areas.

6. KVAC provides leadership and opportunities for *coordination* and acts as liaison among various groups interested in the Kansas agriculture value added industry.

KVAC STRATEGY

1. Support existing ag based value added businesses.

2. Support commercialization of new opportunities.

   — food
   — non food

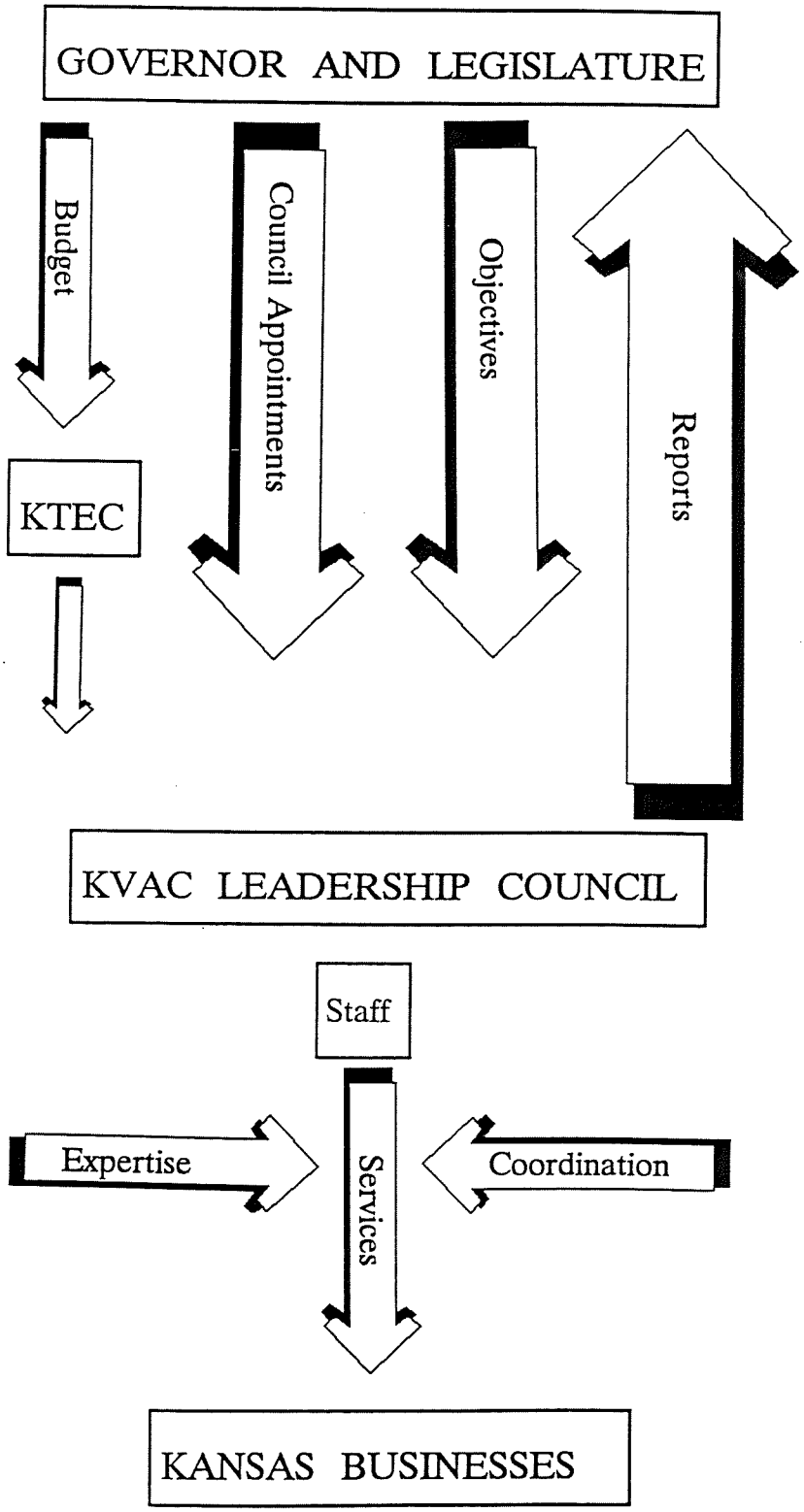
3. Through technology transfer, find opportunities for ag diversification, new crops, biotechnology and new markets including exports.

KVAC BUDGET SUMMARY

(Program 7050 KTEC Budget)

	FY91 Actual	FY92 Estimate	FY93 Request (B Level)	FY93 Governor's Recommendation
Salaries & Wages	$110,913	$160,645	$155,240	$155,205
Total Contractural Services	44,515	46,000	50,000	50,000
Total Commodities	1,529	2,000	2,500	2,500
Capitol Outlay	7,448	3,000	3,000	3,000
Grants & Contracts	509,871	438,525	412,000	412,000
Total Expenditures	$674,276	$650,170	$622,740	$622,705
Number of Positions	3.0	3.5	3.0	3.0

KVAC ORGANIZATIONAL CHART



KANSAS AG VALUE ADDED TEAM

CLIENTS	COORDINATION AND LIAISONS	SERVICE PROVIDORS
Kansas Ag Processing Industry Food & Non Food		KVAC
Economic Development Organizations	K	Kansas Universities Faculty & Staff
Production Agriculture	V A	KSU Value Added Extension Specialists
Trade Associations	C	Pilot Plants
Entrepreneurs		Kansas State Board of Ag Marketing Division
Investors		Regulator KDHE USDA FDA
		Business & Financing Assistance KDOC SBDC CDC
		DIRECT, Libraries
		KTEC
		Consultants AIB Contracts

Evaluation of KVAC by Leadership Council (November 8, 1991)

— Responsive, market focused, client oriented

— Good networking and cooperation has been established

— Providing valuable and needed services in all parts of the state

— Areas to improve:
- ♦ increase awareness of KVAC
- ♦ expand to larger businesses
- ♦ increase emphasis on new technology
- ♦ more plant visits

Evaluation of KVAC by clients
(Survey sent to 200 clients in October 1991)

— Size of businesses served
45% have 1 or 2 employees
17% have 10 or more

— Location of business
33% rural
33% cities under 5,000
10% cities over 50,000

— Age of owner
60% 35-49

— Business income
many businesses "not yet profitable"
1/4 did not depend on enterprise for family income
for 40% it is only family income

Was KVAC helpful?

Was information useful?

How did KVAC impact your business?

STATUS OF AG VALUE ADDED IN KANSAS

— Food Processing Jobs

Jobs increased 14.8% from 1978 to 1988 (+ 3,300 jobs)
Meat processing (+ 4,600 jobs)
Other food processing lost jobs!

52% of Kansas Food Processing jobs in Meat Processing
14% of Kansas Food Processing jobs in Grain Processing
12% of Kansas Food Processing jobs in Baking

— Small Business (Gourmet Foods)

Very active entrepreneurial climate.
Land of Kansas Trademark Program (Board of Agriculture)
365 companies registered!
29% marketing raw or minimum processed products
13% dry blended products
11% snacks
10% processed meats
8% bakeries
28% other processed foods
7% gift baskets

— Kansas High Potential for Food Processing

-- See Processed Food in Farm States: An Economic Development Strategy for the 1990's (Kansas ranks #2 potential in region)

-- Kansas ranks 6th in region in new food plants 88-90 (Food Engineering Annual Survey)

CASE STUDIES

Work With Industry Groups (not KVAC only!)

(1) Jam and jelly producers (also includes fruit producers).
— Evaluation of product quality (chemical & sensory analysis).
— Training course on processing techniques and quality control.
— Processing workshop -- juice production.
— "Better Process Control School" -- FDA.
— Individual process assistance, plant expansion, new equipment.
— Individual new product development.
— Pilot plant production of market test quantities.
— Nutrition labeling/packaging assistance.
— Marketing assistance.
— Articles in "FOCUS on Value-Added Agricultural Products".

(2) Small Retail Bakers

(3) Meat Processors

Work With Individual Companies (not KVAC only!)

- Information
- Troubleshooting
- Packaging, labeling
- Business plans and financing
- Plant and process design and improvement
- Marketing assistance
- Product development (from concept through test market quantities)

New Technology

(1) Beef blood by-products as animal feed.
(2) Utilization of beef fat as a diesel fuel.
(3) Starch based plastic materials.
(4) Bio-plastic composites using hides, straw, etc.
(5) Low fat meat products.
(6) Grain based snacks.

KVAC ANNUAL REPORT
FY91
July 1, 1990 to June 30, 1991

KVAC was established in May 1989 with a targeted mission, to provide technical assistance to Kansas agriculture processing businesses. By direction of the Leadership Council and its strategic plan, programs have focused on small businesses and with a rural development orientation.

Judging the impact of technical assistance activities is difficult since results may take several years to have economic impact on the business. To provide more meaningful economic impact information, KVAC is conducting a survey of its clients for FY90 and FY91 to assess KVAC's effectiveness. This information will be available by January 1, 1992.

In the interim, we will continue to use the indirect measures we have previously used and specific examples of assistance. Our goals, as stated in the 1991 budget document and FY91 results, are as follows:

		Goal	Actual
Clients Served	- new in FY 91	36	48
	- ongoing	48	33
	- information only		340
Counties Served		40	51
Suggestions implemented		50%	cannot judge
New products commercialized		3	4
Projects authorized		20	23
Cost/project		$18,000	$12,142
Seminars sponsored		4	6
Reports published		6	12

Communication

An important activity of KVAC staff is to publicize the center by presenting talks to economic development groups and the value added industry. This has been done through two appearances on KKSU radio and six news releases about the center. During the year we made presentations to nine community economic development groups and 12 value added industry groups. KVAC also had an exhibit at the Kansas State Fair and the Land of Kansas Food Expo.

Food Focus has become and effective communication tool to the value added industry. The first issue was published in late FY90 and four issues were published in FY91. It is sent to 850 companies, economic development groups and interested individuals in the state. KVAC provides funding for publication and contributes articles as well to overall content. Editorial supervision and much of the content is provided by the KSU Value Added extension specialists. Feedback from readers has been "excellent."

Council Meetings

The Leadership Council met six times during FY91 in Topeka, Manhattan, Wichita and Hesston. These meetings have been utilized as opportunities to meet with economic development representatives in the locale of the meeting to inform them about KVAC and solicit their input and concerns regarding agriculture value added.

Training

KVAC has been a co-sponsor of six seminars in FY91, providing primary funding for four. Topics include the following: food quality assurance, beef by-product utilization, sorghum syrup processing, specialty meat products, food marketing, and fruit juice processing. Total attendance was 250 persons representing about 150 companies.

Training grants have also been provided to 13 individuals or companies. These are used to upgrade specific company or personal skills and have proven an economic and effective way to improve technical expertise in Kansas.

Nutrition Labeling

The Nutrition Labeling and Education Act of 1990 mandated nutrition labeling of all food products. Kansas food processors face a significant technical and financial challenge of complying in FY92. KVAC has begun both an education process on what will be required and in getting labels prepared. In FY91 we assisted 35 companies in preparing a nutrition label for their "flagship" product. In addition, we worked with a Kansas laboratory in upgrading their skills and capabilities to do nutrition analysis. This is the only qualified lab in the state to do these tests. Further, we worked with the Board of Agriculture, Marketing Division, in establishing a voluntary label review process by the marketing division for all Land of Kansas products.

Pilot Plant Capability

Kansas has excellent pilot plant processing capabilities in baking, grain processing, extrusion, meat processing, and dairy processing. In other agri processing areas, our capability is almost non-existent. Part of KVAC's founding mission was to improve our capabilities in this area. Significant progress was made during FY 91. Space allocations were obtained at KSU for a 1,014 square foot value added thermal processing laboratory in Seaton Hall and a 900 square foot value added developmental laboratory in Justin Hall. Funding of $166,000 was provided for equipping these facilities. An additional $18,000 was provided to improve our dry product blending capability in Grain Science. When operational, these new laboratories will join the previously funded Value Added Sensory Center and Horticulture Processing Lab as key components for assistance of Kansas companies.

Coordination/Cooperation

A key role of KVAC is to facilitate cooperation among various agencies and groups in delivering required services to the agri processing industry. In addition to frequent personal interaction, KVAC has utilized a bi-monthly meeting of value added workers to achieve a significant improvement in communication and cooperation. At this meeting, representatives from the Board of Ag Marketing Division, Department of Commerce, Wheat Commission, Cooperative Extension, SBDC, CDC, and SBA have an opportunity to exchange views and activities on Kansas Value Added. These meetings have fostered interactions between groups that normally interact infrequently and provide more targeted and coordinated assistance for Kansas businesses.

FY91 Expenditures

A copy of FY91 expenditures is attached. $521,614 (77.4%) was spent directly on grants and support services to Kansas businesses and $152,621 was expended to operate the office. Grants and support can be categorized as follows:

Co-development grants to 10 companies	$147,636
Grants approved, but not awarded in FY91 to 5 companies	34,500
Technology development - 3 projects	32,000
Training grants - 13 projects	8,743
Value Added graduate assistants	92,000
Equipment grants	180,614
TOTAL	$521,614

Selected Results

Starch Thermoplastics Technology Development

Leveraged $15,000 in KVAC funds with $35,000 from the grain commissions and private industry to initiate a program to develop starch based plastic materials. Project has participants from 3 KSU departments, Pittsburg State University, and two private companies.

Identity Preserved Red Wheat (Great Plains Red, Wa Keeney)

KVAC grant provided essential operations and marketing funding that enabled GPR to plant $25,000 acres in '90, break even in operations and expand marketing efforts. Value of success at 1 mm bu per year is $3 mm to Kansas economy.

Identity Preserved White Wheat (AWWPA, Atchison)

In FY91, AWWPA board committed to expanding plantings and develop a strategic plan for success. KVAC grant provided essential operational and marketing funding that led to expanded market opportunities and this critical decision.

Send-A-Cake, Topeka

KVAC participated in development and testing of high quality cake formulations for this new business concept. Business successfully started up May 1, 1991, employees 3, and is enjoying good initial market success.

Canola Variety Tests

Interest in growing Canola remains high with 90% of US consumption of 500 million lbs imported. KVAC provided supplemental funding for testing about 100 canola varieties at five Kansas locations. Due to severe winter, crop was almost a total loss. Enough survivors were found to encourage plant breeders that in 2 to 3 years, varieties adopted to Kansas will be available. This will allow Kansas to participate in growing and processing this important new crop.

Beef Plasma for Animal Diets

KVAC provided matching funding to a Kansas company for testing a specialty beef blood plasma fraction as a protein source for baby pigs. Tests were highly successful and product is in commercial introduction.

Sugarless Caramel Corn

Patent disclosures have been filed on sugarless caramel corn developed through KVAC funding. Kansas snack food company has done plant testing and will introduce to the market as soon as patent lawyer approves.

Food Processing Facility Designs

- Small flour mill designed and constructed. Start up assistance provided.
- Jelly processing lines designed for two companies. New kettles purchased.
- Multiple use kitchen designed.
- Sterile bottling room designed.
- Facility designed for dried vegetable product.
- Process design improvements provided sorghum syrup processor plus assistance on proper processing and product quality.

Product Development / Scale Up

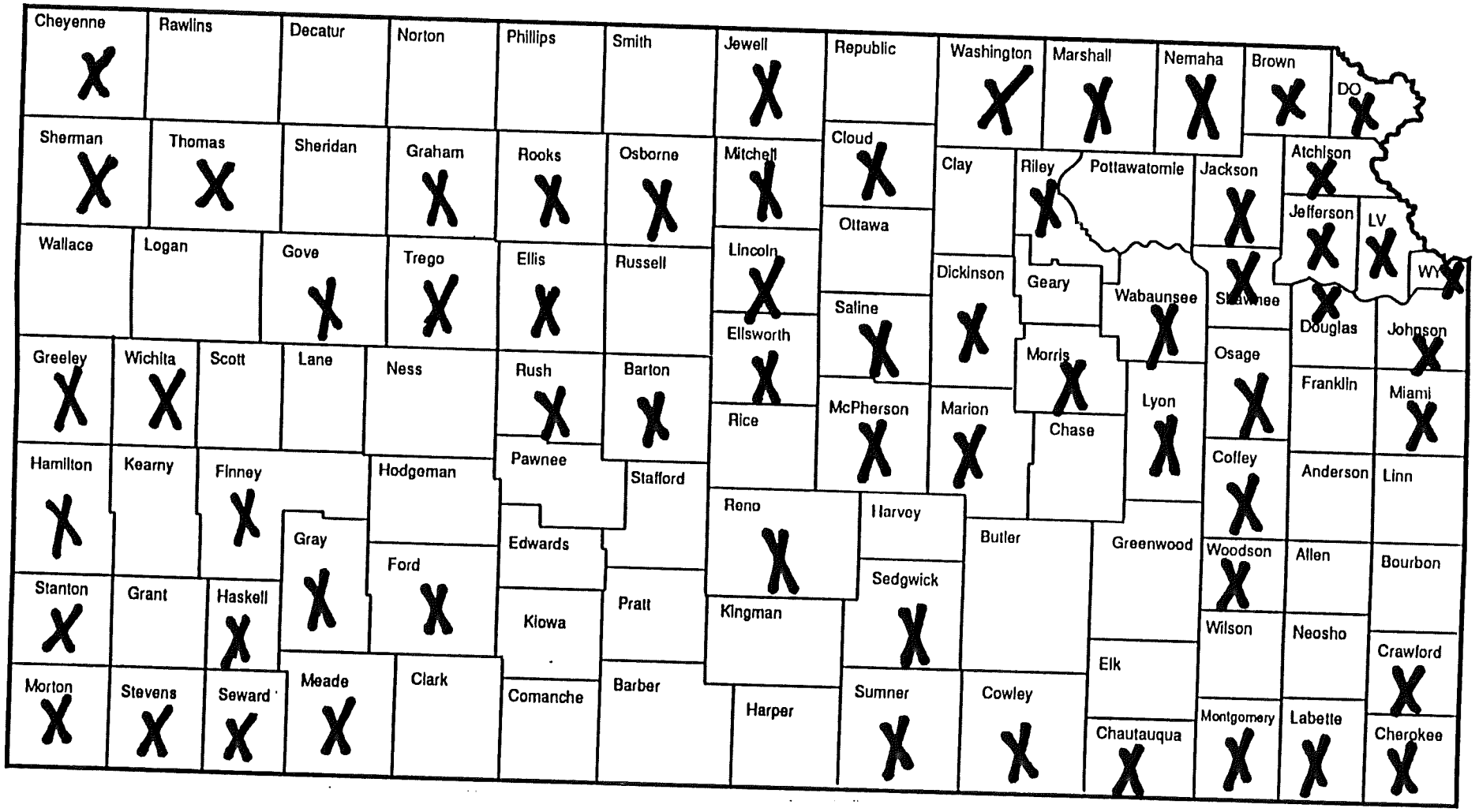
- Unique sausage product prepared in KSU pilot plant for test marketing (KVAC matched SBA Minority Business Grant).
- Dried vegetable product prepared in pilot plant for market testing (KSU).
- Formulation for refrigerated pizza converted, packaging designed, and quantity prepared for test marketing (AIB).
- Developed unique breakfast sausage seasoning blend and tested in pilot plant. Is now in commercial production.
- Second formula revision made for hay coating product. Sales being made in US, Canada, Europe and Australia. Projects 14 new jobs in next 18 months.
- Formulation developed for "meatless patties" based on textured soy concentrate.
- Procedures developed for crushing, stabilizing, and storing Kansas grape juice.
- Problems diagnosed and formula revisions made to correct "sticky" tortilla problem during hot, humid weather.
- Studies implemented to develop frozen spice leaves as a new product.

08/07/91

FY91 ACTUAL EXPENDITURES

	'91 Actual
Salaries	$110,913
Leases	2,086
Travel	7,152
Other Fees (Training	4,508
Professional Fees	26,235
Other Contractual	3,767
Office Supplies	1,302
Capitol Outlay	7,448
Grants	490,871
University Transfers	19,000
TOTAL	$674,276
Manning	2½

KANSAS



X KVAC FY91 CONTACTS

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Processing Food in Farm States: An Economic Development Strategy for the 1990s

By Alan D. Barkema, Mark Drabenstott, and Julie Stanley

Officials in farm-dependent states are turning to the food processing industry as a critical source of economic growth in the 1990s. Many of these farm states—found mostly in the western Corn Belt and northern Great Plains—have yet to replace jobs lost in the deep farm recession in the 1980s, despite three years of strong farm recovery more recently. The 1980s farm downturn is strong evidence that farm production alone is no longer a sufficient engine for farm state economies. Consequently, turning farm products into food products is viewed as a key to stronger economic growth in the 1990s.

What can farm states do to encourage food processing activity in the 1990s? They face an uphill battle in expanding food manufacturing, but a strategy of developing food products suited to farm output and consumer markets will pay some dividends. The first section of this article identifies seven farm states with the greatest potential to expand food processing activity: Arkansas, Idaho, Iowa, Kansas, Minnesota, Nebraska, and Wisconsin. The second section examines how these states can develop food products to encourage growth in food processing and identifies four products best suited to the seven states. The third section considers the outlook for these four food products in the 1990s. The article concludes that a successful food processing strategy will depend on investments in emerging food technologies that could offset the distance separating the farm states from major consumer markets.

Alan D. Barkema is a senior economist at the Federal Reserve Bank of Kansas City, Mark Drabenstott is an assistant vice president and economist at the bank, and Julie Stanley is a research associate at the bank.

I. Farm States with Food Processing Potential

All farm states are interested in developing more food processing, but not all share the same prospects for success. Comparing the location of farm and food production is a useful first step in assessing development prospects. All farm states face a location disadvantage—they are a long way from major population centers. Nevertheless, farm states that are closer to major popu-

Table 1
Average Hourly Earnings in Various Industries, December 1989

Industry	Average hourly earnings
Manufacturing	$10.66
Durable goods	$11.18
Electrical equipment	10.52
Motor vehicles and equipment	14.50
Nondurable goods	9.95
Food and kindred products	9.47
Beverages	13.36
Grain mill products	11.26
Bakery products	10.69
Dairy products	10.34
Fats and oils	9.94
Sugar and confectionery products	9.61
Preserved fruits and vegetables	8.99
Meat products	7.82
Textile mill products	7.86
Apparel	6.45
Paper and allied products	12.11
Printing and publishing	11.07
Leather and leather products	6.73
Transportation and public utilities	12.70
Wholesale trade	10.62
Retail trade	6.66
Finance, insurance, and real estate	9.76

Source: U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, February 1990.

lation centers or have a base of food processing companies already established are more likely to succeed in expanding the food industry.

Why is food processing important to farm states?

Farm states have linked their economic futures to food processing because it can boost economic activity arising from their abundant farm production. Food processing is a manufacturing industry that inherently increases the economic activity attached to farm products. It combines labor, machinery, energy, and technology to convert bulky farm products into packaged, palatable foodstuffs (Connor 1988, p. xxiii). Thus, food processing allows farm state economies to increase employment and income before farm products are shipped to distant markets.

The food processing industry is a big industry to target. Food processing shipments totaled $388.4 billion in 1989, ranking first among the 20 key types of U.S. manufacturing during the year. The industry employs nearly 1.7 million people, making it the fourth-biggest manufacturing jobs category, after electrical machinery, nonelectrical machinery, and transportation equipment (Bureau of Economic Analysis 1990).

Targeting the food processing industry is desirable for farm states because the industry is so stable. The economies of farm states were highly cyclical in the 1980s. Historically, food manufacturing has been very steady and much less cyclical than many other types of manufacturing.[1]

Food processing jobs also generally pay attractive wages and thus have a welcome impact on state incomes. At $9.47 an hour, food wages are not the highest among manufacturing industries, yet they are high relative to other types of nondurable manufacturing often found in rural areas—such as textiles, apparel, and leather goods (Table 1). Even so, wages paid in the food industry range widely—from $7.82 an hour in meat products to $13.36 an hour in beverage products.

Which states depend on farm production?

The first step in identifying states where a food processing strategy will be important is to define farm states. There is no accepted definition of a farm state in common usage. For the purposes of this article, a farm state is a state where farm output is significant to its overall economy. States that depend on agriculture have a sizable stake in adding economic value to their farm output.[2]

Specifically, farm states can be defined as states where farm output as a share of gross state output (GSP) is at least twice the national average.[3] Nationally, farm output is 2.2 percent of the total output of goods and services. The farm share of GSP is at least double the national average in just ten states: South Dakota, North Dakota, Nebraska, Iowa, Idaho, Kansas, Arkansas, Montana, Minnesota, and Wisconsin (Chart 1 and Table 2).

These ten farm states can expect stiff competition for the nation's food processing activity. The primary competition will come from other states that produce a large volume of farm products. The ten biggest include only half of the ten farm states—Iowa, Minnesota, Nebraska, Wisconsin, and Kansas. The five other states that lead the nation in agricultural production have large, diversified economies including strong food processing industries. The food processing industries in these larger, more diversified states are the primary competition for food processing initiatives in the farm states.[4]

Where is food processed?

How successful can the ten farm states be in developing more food processing? One way to begin answering this question is to compare

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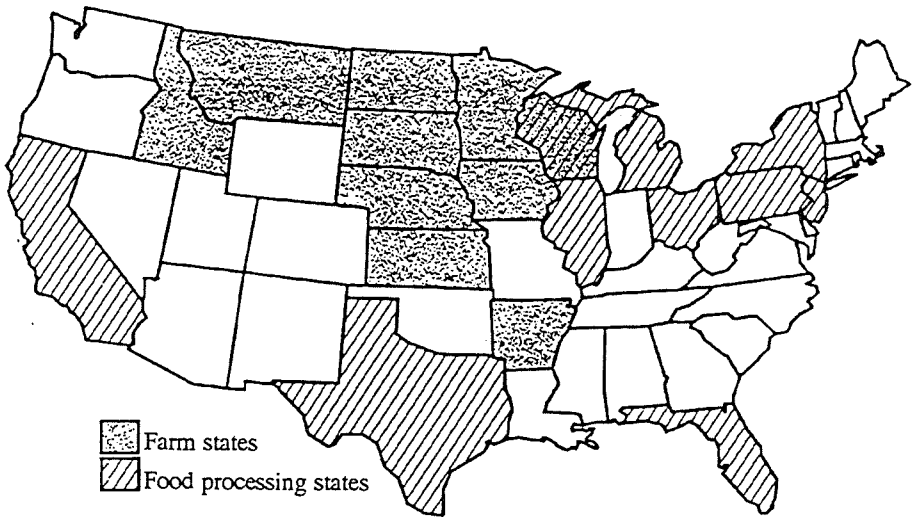
Table 2
The Importance of Farm Production in the 50 States, 1984-86 Average

Farm share of gross state product					
Rank	State	Share (percent)	Rank	State	Share (percent)
1	South Dakota	17.48	26	Delaware	2.17
2	North Dakota	14.51	27	Illinois	2.06
3	Nebraska	13.85	28	New Mexico	2.01
4	Iowa	11.25	29	Arizona	1.93
5	Idaho	10.11	30	California	1.88
6	Kansas	6.77	31	Texas	1.77
7	Arkansas	6.34	32	Wyoming	1.71
8	Montana	5.55	33	Utah	1.63
9	Minnesota	5.02	34	Maine	1.51
10	Wisconsin	4.46	35	South Carolina	1.41
11	Kentucky	4.18	36	Ohio	1.37
12	Mississippi	4.14	37	Michigan	1.34
13	Oregon	3.54	38	Pennsylvania	1.22
14	Oklahoma	3.26	39	Virginia	1.16
15	Vermont	3.15	40	Louisiana	1.06
16	Indiana	3.01	41	Maryland	.93
17	Washington	2.94	42	Nevada	.74
18	Missouri	2.82	43	West Virginia	.70
19	North Carolina	2.71	44	New Hampshire	.52
20	Colorado	2.59	45	New York	.50
21	Alabama	2.54	46	Rhode Island	.45
22	Hawaii	2.44	47	Connecticut	.42
23	Florida	2.29	48	New Jersey	.39
24	Tennessee	2.24	49	Massachusetts	.30
25	Georgia	2.18	50	Alaska	.11
				National average	2.17

Source: U.S. Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business*, May 1988, and unpublished data.

Chart 1
The Leading Farm and Food Processing States



Source: See Table 3.

the location of farm production and food production. Are the farm states already processing a lot of food? If not, are they near regions that do? The answers to these questions will describe the amount of food processing activity already occurring in the farm states and reveal the major source of competition the farm states face in further developing their food processing industries.

In general, farm states account for a relatively small share of the nation's total food processing output (Table 3). Some overlap exists in the location of the nation's farm production and food processing activities, but the overlap is relatively small.

The nation's food processing activity is concentrated in two regions, the Sun Belt and the industrial states spanning the Great Lakes and the Northeast. As shown in Chart 1, the top ten food processing states include three Sun Belt states (California, Florida, and Texas) and seven industrial states in the Great Lakes and Northeast regions (Wisconsin, Illinois, Michigan, Pennsylvania, New York, and New Jersey). These seven industrial states form a major food processing belt that accounts for more than a third of the nation's food processing activity.

Food processing appears to have located in the Sun Belt and Northeast primarily because these regions are close to the nation's major population centers. Nine of the ten leading food

Table 3
Population and Food Processing Activity in the Major Food Processing States and the Farm States

	Population[1]		Share of U.S. food processing output[2]		Food processing share of Gross State Product[2]	
Major food processing states	Thousands	(Rank)	Percent	(Rank)	Percent	(Rank)
California	29,063	(1)	11.90	(1)	1.67	(22)
Illinois	11,658	(6)	7.32	(2)	2.54	(10)
New York	17,950	(2)	5.90	(3)	1.23	(33)
Texas	16,991	(3)	5.86	(4)	1.31	(31)
Pennsylvania	12,040	(5)	5.34	(5)	2.12	(16)
Ohio	10,907	(7)	4.72	(6)	1.92	(19)
New Jersey	7,736	(9)	4.38	(7)	2.14	(15)
Wisconsin	4,867	(17)	3.56	(8)	3.27	(6)
Michigan	9,273	(8)	3.37	(9)	1.60	(24)
Florida	12,671	(4)	3.37	(10)	1.45	(30)
Farm states						
Wisconsin	4,867	(17)	3.56	(8)	3.27	(6)
Iowa	2,840	(29)	2.57	(13)	4.04	(2)
Minnesota	4,353	(21)	2.56	(14)	2.42	(13)
Nebraska	1,611	(36)	1.49	(22)	4.01	(3)
Kansas	2,513	(32)	1.48	(23)	2.50	(11)
Arkansas	2,406	(33)	1.47	(24)	3.35	(5)
Idaho	1,014	(42)	0.80	(32)	4.31	(1)
South Dakota	715	(45)	0.35	(39)	2.60	(9)
North Dakota	660	(47)	0.23	(42)	1.45	(29)
Montana	806	(44)	0.13	(48)	0.77	(42)

[1] 1989.

[2] 1984-86 average.

Sources: U.S. Department of Commerce, Bureau of the Census, Current Population Reports, *Population Estimates and Projections, State Population and Household Estimates: July 1, 1989* (population data); Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business,* May 1988, and unpublished data (Gross State Product data).

processing states—all except Wisconsin—rank among the ten most populous states in the nation. More than half of the nation's population resides in the ten leading food processing states (Table 3). Unlike the three Sun Belt states, which are leaders in both farm and food production, all of the states of the northeastern food processing belt—except Illinois—produce a comparatively small volume of farm products.

In contrast to the high concentration of food processing activity in the Northeast and Sun Belt states, such activity in the ten farm states is limited. The ten farm states account for only 15 percent of the nation's total food output. Only one of the ten farm states, Wisconsin, is among the ten leading food processing states. Food processing activity in the ten farm states generally diminishes in states further removed from the food processing belt. For example, each of the westernmost farm states—Idaho, Montana, North Dakota, and South Dakota—processes only a small fraction of the nation's food. On the other hand, the three farm states adjacent to the food processing belt—Iowa, Minnesota, and Wisconsin—are the leading food processors among the ten farm states.

The food processing industry is nonetheless a vital part of the economy in farm states. Food processing accounts for an average 1.7 percent of GSP for the 50 states as a whole. Eight of the ten farm states exceed that average by a considerable amount (Table 3). By contrast, both food processing and farm production play a relatively small role in the large, well-diversified economies of the major food processing states. The clear challenge for farm states wishing to boost food processing activity is to find ways to compete effectively with the location advantages of the major food processing states.

Which farm states can expand food processing?

Which farm states appear most able to expand food processing in the 1990s? Two criteria define a farm state's ability to expand. The first is the distance from the state to major population centers. All farm states face a location disadvantage, but some are farther from major markets than others. The second is the presence of a viable food processing base from which to grow. States that have little or no food processing already established probably have little likelihood of successfully entering the competitive, capital-intensive industry.

One indicator of a farm state's food processing base is the amount of food processed in the state compared with the amount of farm products produced there. Put another way, the ratio of farm output to food processing output in each farm state approximates how much of the state's farm output is already processed before it is shipped elsewhere. A high farm-food output ratio indicates relatively little food processing activity and points to only a small base from which to expand. Conversely, a low farm-food output ratio indicates a much stronger food processing base that can be expanded more readily. In short, farm states do not share the same capacity to expand food processing. Those with more favorable location and with a food industry base already established have better prospects to expand.

Two groups of states emerge from examining the farm-food output ratios of the farm states. All ten farm states have farm-food output ratios above the national average of 1.25 (Table 4). But of more importance, the ten states appear to fall into two groups representing high and low potential for expanding food processing. The two groupings appear consistent with the location of the states relative to population centers.

High-potential farm states. The seven high-potential states have relatively low farm-food output ratios and are within striking distance of major consumer markets. The farm-food output ratios range from 1.36 in Wisconsin to 3.45 in Nebraska. The range of ratios indicates a big-

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Table 4
Major Farm Products and Food Processing Industries in the Farm States

Panel A—High Potential States

Major farm products	Farm-food output ratio	Product share of state farm cash receipts (percent)[1]	Major food processing industries	Industry share of state food employment (percent)[2]
Wisconsin	1.36			
Dairy products		60	Dairy products	32
Meat animals		20	Meat products	23
			Preserved fruits and vegetables	14
Arkansas	1.89			
Poultry and eggs		45	Meat products	62
Meat animals		13	Preserved fruits and vegetables	12
Food grains		13		
Oil crops		13		
Minnesota	2.07			
Meat animals		30	Meat products	31
Dairy products		20	Dairy products	17
Feed grains		16	Preserved fruits and vegetables	12
Oil crops		15		
Idaho	2.35			
Meat animals		29	Preserved fruits and vegetables	61
Vegetables		21		
Dairy products		13		
Food grains		10		
Feed grains		10		
Kansas	2.71			
Meat animals		62	Meat products	50
Food grains		15	Bakery products	11
Feed grains		13	Grain mill products	11
Iowa	2.78			
Meat animals		50	Meat products	50
Feed grains		22	Grain mill products	20
Oil crops		20		
Nebraska	3.45			
Meat animals		63	Meat products	56
Feed grains		22	Grain mill products	14

Table 4 - Continued

Panel B—Low-Potential States

Major farm products	Farm-food output ratio	Product share of state farm cash receipts (percent)[1]	Major food processing industries	Industry share of state food employment (percent)[2]
South Dakota	6.73			
Meat animals		57	Meat products	63
Feed grains		13	Dairy products	16
Oil crops		10	Bakery products	10
Montana	7.20			
Meat animals		52	Meat products	15
Food grains		24	Dairy products	29
Feed grains		13	Grain mill products	16
			Bakery products	21
North Dakota	9.98			
Meat animals		26	Meat products	11
Food grains		30	Dairy products	14
Feed grains		14	Preserved fruits and vegetables	17
Oil crops		12	Sugar and confectionery products	17

[1] Average 1986-88.

[2] 1987.

Sources: U.S. Department of Agriculture, Economic Research Service, *Economic Indicators of the Farm Sector, State Financial Summary, 1988* (product share of state farm cash receipts); U.S. Department of Commerce, Bureau of the Census, *County Business Patterns, 1987,* various issues (industry share of state food employment).

ger food processing base in some states than others. Nevertheless, each state in the high-potential group—Wisconsin, Arkansas, Minnesota, Idaho, Kansas, Iowa, and Nebraska—has a strong food processing base from which to grow.

The seven high-potential states face different challenges in terms of their location. Wisconsin, Minnesota, and Iowa are along the western fringe of the northeastern food processing belt. Arkansas is well-positioned to serve the Sun Belt population centers. Idaho, Kansas, and Nebraska are somewhat further removed from consumer markets. Despite their location differences, all

of the high-potential states face a distinct challenge in overcoming the high shipping costs that result from their distance to population centers.

Low-potential farm states. Low-potential states have a weak food processing base and are a long way from consumer markets. Farm-food output ratios in the low-potential states range from 7.0 to 10.0, significantly higher than in the high-potential states. Farm output is generally smaller in Montana, North Dakota, and South Dakota than in the other farm states. Nevertheless, farm output far outweighs food production in these northern Great Plains states. These states lack a dominant farm commodity to spark food processing development. In addition, these three sparsely populated states are a long distance from population centers, a strong negative factor for expanding food processing activity. Given the limited potential for expanding food processing in these three states, the remainder of this article will focus on the seven states with high potential for expanding their food processing industry.

II. The Challenge for Farm States: Developing Successful Food Products

States with high potential for expanding their food processing industry already have a food processing base from which to grow; but how can they expand that base? The answer lies in developing successful food products. Product development is a combination of four steps: choosing, where possible, food products in growing demand; assessing the competition in food product markets; developing promising technologies; and adding value to farm state products. In brief, the farm states must target markets carefully, choosing to compete in markets where prospects for growth are bright, where competition is less concentrated, and where technological developments may open new market niches. But these steps must be taken within the overall constraint of using the states' own farm products. This section examines the factors affecting each of the four product development steps and concludes by identifying four promising food products farm states can target to boost food processing activity.

Choosing growth markets

Farm states should target food products that promise to be in growing demand. Demographic trends in the consumer population are likely to play a strong role in determining patterns of growth among various food products. By anticipating the influence of these demographic trends on patterns in food demand, farm states can improve their chances of success in expanding their food processing activity.

The major trend likely to characterize the U.S. food market in the years ahead is clear: the consumer will demand more food products offering greater convenience with high nutritional value. Spurring the demand for such food products is a changing U.S. lifestyle that will limit the time available for meal preparation. More than four-fifths of all U.S. households now have a single parent or two wage earners. Within five years, two-thirds of all households will contain just one or two persons; two-thirds of all women will be in the work force; and three-fourths of all households will own microwave ovens (U.S. Department of Commerce 1990). With meals on-the-run becoming the national norm, continued growth in the consumer's demand for convenient food products can be expected.

At the same time, consumers are becoming increasingly concerned about the nutritional value of processed food products. As a result, consumers will demand—and be willing to pay for—a growing variety of food products that provide a high level of convenience without sacrificing nutritional quality. This strong trend in consumer food demand is almost certain to play a

major role in determining prospects for growth in the food processing products of greatest importance to the farm states.

Assessing the competition

Farm states are most likely to succeed by targeting food products with markets that can be entered easily. Thus, states must promote food products that can compete in a crowded national food market. Economic incentives—gains in employment and income—resulting from increased food processing activity range widely across the many food industries. Farm states can expect stiffer competition in those food industries where economic incentives are greater. Some of the food industries that offer the largest economic payoffs are already highly concentrated and thus are virtually closed to entry by the farm states. Futile efforts to enter those industries would simply deplete scarce development funds. Instead, farm state strategies should target those food industries where the probability of successfully entering the market is reasonable, even if the potential rewards are somewhat smaller.

The economic boost likely to accompany increased food processing ranges widely across food products, depending on the value added to raw farm products and the number of jobs created. Food products associated with higher levels of value added and increased employment naturally attract strong competition. Thus, farm states targeting such food products face a low probability of successful entry into these markets.[5] In addition, production of many high value-added products is dominated by a few large, well-entrenched firms. If farm states target those products, they must recruit branch plants of large companies. Studies show that recruiting out-of-state manufacturers is less effective than fostering indigenous businesses (Smith and Fox 1990). Processing activity in some food markets is also highly concentrated geographically. Farm states are likely to have difficulty promoting products whose production and distribution are based elsewhere, unless ways of overcoming locational disadvantages are found. Farm states are more likely to boost activity in food industries that are more diffuse geographically, especially those industries that use locally produced farm products.

Developing new technologies

Farm states should focus additional effort on emerging food technologies that offer great promise for boosting local processing activity. New methods in both production and distribution will help farm states capitalize on their abundance of raw food products, while effectively minimizing the distance from their fields to major food markets.

Emerging technologies with the greatest promise for farm states are developments in weight-reducing processes, packaging, and biotechnology. Weight-reducing processes reduce shipping costs. For example, in recent years meat packers have cut beef into frozen portions and shipped them in boxes, rather than shipping the much heavier carcasses. The development of boxed beef has helped encourage the meat packing industry to move from urban centers to the southern plains states. In the future, similar innovations in other food products could offset the distance from farm states to consumer markets.

Two other new types of packaging promise to extend product shelf life and allow shipment to distant markets. Controlled-atmosphere packaging involves placing a food product in a sealed package with low levels of oxygen and high levels of carbon dioxide to maintain freshness. Retort pouch packaging replaces the customary can or jar with a paper-foil pouch in which food is sealed and heated under pressure. The pouch packaging weighs less than conventional packaging materials, which reduces shipping costs and helps farm states overcome their locational disad-

vantage. In addition, the method leads to a high-quality product because the heating time required to ensure sterility is reduced (Labuza 1985, p. 74).

Advances in biotechnology may also open new food frontiers to farm states by developing new farm products and creating new uses for existing farm products. Genetic engineering may enable plant and animal scientists to develop crops and animals with more desirable food qualities. For example, wheat varieties may be developed with protein characteristics suited to a particular bakery product. Or, cattle may be genetically altered to reduce particular types of fat. Genetic advances such as these may not lead immediately to greater food processing activity; yet they may enhance cooperation between farm producer and food processor, a link that may lead to more economic activity in the farm states.

Biotechnology may also lead to fermentation techniques that would convert farm products into enzymes with useful properties. Worldwide, the food processing industry uses $445 billion of enzymes in producing its products (Hopper and Lund 1990). For example, producing the artificial sweetener aspartame requires the use of an enzyme reaction. New research may find ways to produce these enzymes from current crops, enhancing the opportunity to add value to raw farm products.

Adding value to farm state products

Market growth, market access, and technology will be important factors in successful food product development. But farm states must build their food processing strategies on the farm and food product strengths they already have. A readily available supply of certain farm products provides food processing industries in the farm states one competitive advantage to help offset the disadvantage of being far from consumer markets. But to take advantage of their cheap supply of farm products, compatible food products must be developed. Farm and food production activities differ markedly among the farm states. Nevertheless, the farm states are similar in that the food processing activity already underway in each state is based on its leading farm products (Table 4).

The seven high-potential farm states—Wisconsin, Minnesota, Arkansas, Idaho, Iowa, Kansas, and Nebraska—have successfully built strong food processing industries around a diverse set of homegrown farm products. The dairy industry is a leading industry in Wisconsin and Minnesota. Wisconsin's dairy industry generates about three-fifths of all farm product sales in the state and about a sixth of all dairy farm sales in the nation. The dairy processing industry, in turn, is Wisconsin's dominant food processing industry, employing nearly a third of the state's food processing workers.[6] Dairy production is also a leading industry in Minnesota's farm economy, but the state's livestock, grain, and soybean production yield a farm economy that is more diverse than that of Wisconsin. Meat and poultry dressing plants and the dairy processing industry are the leading food processing employers in the state, accounting for nearly half of the state's food processing employment.

Arkansas and Idaho are similar in that each has successfully exploited a relatively narrow food market niche. In Arkansas, broiler production generates 45 percent of the state's farm product sales. In turn, the state's huge broiler industry supports a poultry dressing and processing industry that accounts for more than 60 percent of the state's food processing employment. In Idaho, more than 60 percent of the state's food processing workers are employed in the vegetable processing industry, which is spawned by the state's substantial vegetable production.

The three remaining high-potential farm states, Iowa, Kansas, and Nebraska, produce a broad range of similar farm and food products. Huge grain and soybean crops support large livestock feeding industries, the dominant farm

enterprise in each state. Together, Iowa, Kansas, and Nebraska account for about 30 percent of the nation's livestock sales, a volume that has given rise to the region's large meat products industry. The meat products industry—primarily meat packing plants—employs at least half of all food processing workers in each of the three states. In addition to providing ample feed for livestock in these states, grain production serves as the raw material for a number of grain and bakery products. These grain processing industries are the second leading food processing employers in the three states.

In sum, the seven farm states with high potential for developing additional food processing activity have already established a base in four key industries: meat products, dairy products, preserved vegetables, and grain products. The challenge facing the farm states is determining how to unlock even more value from these homegrown farm products before they are shipped elsewhere.

III. Prospects for Key Food Products in the Farm States

As farm states grapple with strategies for developing their food products, what are their prospects for succeeding in the 1990s? Put another way, when farm state officials combine all elements of food product development—growth in consumer markets, access to markets, and new technology—what is the outlook for each of the four key food products?

Meat products

Large livestock production has already allowed the farm states to establish a strong beachhead in the meat products industry. Growth in the industry will be strongly influenced by the consumer's growing appetite for convenient food products. Favoring the industry's growth are emerging packaging technologies that mesh with growing demand for processed meat and poultry products requiring little preparation time.

The demand for all meat products has trended higher in recent years, largely due to a surge in poultry consumption. Rising poultry consumption, however, has been accompanied by a sharp drop in red meat consumption. After cresting in 1976, per capita consumption of red meat has fallen about 21 pounds (16 percent). More than offsetting the slump in demand for red meat has been a 23-pound (63 percent) surge in per capita poultry consumption (Putnam 1990).

The shift in consumption from red meat to poultry is due in part to the consumer's acceptance of the poultry industry's numerous offerings of innovative, competitively priced food products. Although the red meat industry has lagged behind in developing new product offerings, the industry has begun to add more value to its products before shipping. For example, about 86 percent of the nation's total beef production is now shipped as boxed beef (U.S. Department of Commerce 1990).

Looking ahead, the red meat industry's ability to curb the consumer's shift to poultry will depend on whether it can develop new convenience products to meet consumer demands. New packaging technologies may play a major role in determining the balance between the demand for red meat and poultry. Meat packers already ship beef and fresh turkeys to processing plants under controlled-atmosphere storage. Further innovations in controlled-atmosphere packaging might expand meat markets by extending the shelf life of meat products. Retort pouch packaging could be used for meat products, reducing weight and shipping costs relative to shipping boxed beef. Thus, further packaging innovations may allow farm states to add more value to meat products before shipping.

Favoring further development of the meat products industry in the farm states is the relative ease with which farm states can enter meat prod-

Table 5
Characteristics of Farm State Food Processing Industries

	Four-firm concentration ratio[1] (percent)	Four-state concentration ratio[2] (percent)	Value ratio[3] (percent)
Food and kindred products	n.a.	28	39
Meat products	n.a.	26	21
Meatpacking plants	29	37	17
Sausages and other prepared meats	19	32	22
Poultry dressing plants	22	45	34
Poultry and egg processing	22	41	20
Dairy products	n.a.	35	29
Creamery butter	41	63	5
Natural and processed cheese	34	60	22
Condensed and evaporated milk	35	53	42
Ice cream and frozen desserts	22	33	27
Fluid milk	16	27	32
Preserved fruits and vegetables	n.a.	35	50
Canned fruits and vegetables	21	46	46
Dehydrated fruits, vegetables, and soup	42	83	41
Frozen fruits and vegetables	27	57	46
Grain mill products	n.a.	31	44
Flour and grain mill products	40	31	31
Cereal breakfast foods	86	55	97
Blended and prepared flour	58	43	30
Wet corn milling	74	76	36
Dog, cat, and other pet food	52	36	60
Prepared feeds	20	30	24
Bakery products	n.a.	31	73
Bread, cake, and related products	34	32	76
Cookies and crackers	59	40	67

[1] 1982.

[2] 1987.

[3] 1986 ratio of value added in processing to value of product shipments.

Sources: U.S. Department of Commerce, Bureau of the Census, *1982 Census of Manufactures, Concentration Ratios in Manufacturing* (four-firm concentration ratio); U.S. Department of Commerce, Bureau of the Census, *County Business Patterns, 1987,* various issues (four-state concentration ratio); U.S. Department of Commerce, Bureau of the Census, unpublished data (value ratio).

uct markets. This article uses two gauges of market competition to measure this ease: 1) the four-firm concentration ratio, or the share of the market in a given product controlled by the four largest firms, and 2) the four-state concentration ratio, or the share of jobs found in the four dominant states for each product. The four-firm concentration ratio in meat products is relatively low, ranging from only 19 percent in sausages and other prepared meats to 29 percent in meat packing plants (Table 5). Similarly, at 26 percent the four-state concentration ratio is the lowest among the four major food industries of importance to the farm states. The low concentration ratios indicate that competition in meat product markets is relatively diffuse. Although more recent data may reflect a more concentrated industry, the market for meat products is more open to the farm states than markets for many other food products. Thus, there appears to be an opportunity to build on the existing meat processing activity the farm states already enjoy.

Economic activity generated by the meat products industry is smaller than that generated by many other food processing industries, however. The amount of value added to raw farm products in meat processing is relatively low. One measure of the amount of value added to raw farm products in various food processing industries is the ratio of value added in processing to the total value of food shipments. A high ratio indicates a substantial amount of economic activity generated by the processing industry. Only 21 percent of the value of the meat products industry's total shipments is added in processing plants, well below the average 39 percent added by all food processing industries. On the other hand, the meat products industry is relatively labor intensive, promising the creation of many jobs. But the industry's average wage is relatively low (Table 1). Still, with new technologies promising to boost the amount of value added in the industry's plants, and with a strong farm state presence in the industry already in place, the meat products industry is a likely target for farm state development efforts.

Dairy products

Prospects for further developing the dairy products industry in the farm states are relatively bright. Although new entrants to the industry will face well-entrenched competition, two of the farm states, Minnesota and Wisconsin, are already among the industry's leaders. Moreover, technological advances could boost milk processing activity in the farm states.

Consumer demand varies widely across the range of dairy products. Per capita consumption of all dairy products has grown slowly in recent years, edging up only 7 percent during the 1980s to 582 pounds in 1988 (Putnam 1990). The market for fluid milk and cream has been one of the weakest segments of the dairy market, with per capita consumption falling sharply in the 1970s and edging down further in the 1980s. Similarly, consumption of frozen dairy products has stagnated since the early 1970s. Sales of low-calorie frozen desserts, however, are expected to be relatively strong in the years ahead, as makers of ice cream and other frozen desserts recognize the consumer's growing nutritional concerns. The cheese market is expected to be the strongest in the dairy industry, spurred by increased use of cheese in convenience foods and other food products (U.S. Department of Commerce 1990).

This array of prospects for various dairy products suggests that dairy processing strategies in the farm states—especially Minnesota and Wisconsin—have successfully targeted the strongest segments of the dairy products market. A strong position in butter, condensed milk, and cheese production has placed Minnesota and Wisconsin among the four leading dairy processing states. Thus, the industry's relatively high four-firm and four-state concentration ratios do not necessarily preclude additional dairy process-

ing activity in the farm states (Table 5). Still, Minnesota and Wisconsin lag behind other states in fluid milk processing, largely due to their distance from major consumer markets.

Recent advances in milk processing techniques, however, may bolster prospects for fluid milk processing in these two farm states. Much of the fluid milk produced in Minnesota and Wisconsin is processed into other products because milk, which is 87 percent water, is heavy and costly to transport long distances to major consumer markets. Although processing milk into other products adds value and economic activity, milk supplies in these two states are so large that further gains are available from shipping more milk to other parts of the country.

Two new technologies may eventually boost milk shipments from the farm states. Newly emerging membrane filtration techniques remove the water from milk through a series of fine filters while retaining nutritional and taste qualities. Milk could be transported in concentrated form and then reconstituted near the point of final sale (Fleming and Kenney 1989).[7] A second new technique is freeze concentration, the same process used to concentrate fruit juices, which would provide a milk concentrate to be sold in the frozen food case. In sum, these new food packaging technologies could significantly enhance dairy processing activity in the farm states by shrinking the locational disadvantage.

Preserved fruits and vegetables

Prospects are mixed for bolstering food processing activity in the preserved fruits and vegetables industry, the dominant processing industry in Idaho. A relatively high value added rewards successful entrants into this market. A handful of states—including Idaho—have captured a substantial share of the market, however, and will be formidable competition for new entrants to the industry. Advances in food technology should continue the industry's record of success in meeting the consumer's demand for convenient, highly nutritious products. But the new technologies are likely to offer only marginal gains to the industry's activity in the farm states.

The consumer's increasing appetite for food products that provide both convenience and nutrition has had a major impact in the preserved fruits and vegetables industry. Many of the industry's product offerings are microwavable, spurring demand among a consumer population with limited time for meal preparation. For example, per capita consumption of frozen vegetables increased a fourth during the 1980s, to nearly 18 pounds, and per capita consumption of frozen potatoes increased two-thirds since the early 1970s, to about 22 pounds in 1988. The consumer's increasing concern for nutritional value—as well as for convenience—promises to maintain the market's growth. In addition, the rapidly increasing number of elderly Americans provides another source of growth for easily prepared, highly nutritious product offerings (U.S. Department of Commerce 1990, and Putnam 1990).

Successful new products in the rapidly growing market would likely be rewarded with a substantial boost in economic activity. Processing activity in the preserved fruits and vegetables industry accounts for half of the value of product shipments, the second highest among all food processing industries (Table 5).

New activity in the farm states, however, will meet strong competition from established market players. Although firm concentration ratios are relatively low, geographic concentration ratios in the industry are high. Nearly 60 percent of the nation's employment in the frozen fruits and vegetables industry and over 80 percent of employment in the dehydrated fruits and vegetables industry are located in just four states (including Idaho, a high-potential farm state).

New food packaging technologies further enhance the prospects for the preserved fruits and vegetables industry and might allow farm states

some additional diversification of their crop bases into fresh produce. Some food companies are already using controlled-atmosphere packaging to ship lettuce plants (complete with roots) in a package infused with carbon dioxide. Such "living plants" arrive at retail markets in better condition and have a longer shelf life than lettuce packaged more conventionally. Similarly, the retort pouch can be used to boost the quality of processed vegetable products. These new technologies may allow farm states to make additional inroads into the fruits and vegetables processing industry. But the new technologies will benefit the industry's established players as well, and farm state gains are likely to be limited.

Grain mill and bakery products

Further processing of huge, locally grown grain crops appears to be a natural method of stimulating additional economic activity in farm states. The value added in selected grain processing industries is among the highest of all food processing industries. But the market for these highly desirable industries is also highly concentrated among a few large firms, potentially limiting farm state gains.

Demand for flour and cereal products has risen in recent years, a positive factor for farm state milling and baking industries. Wheat flour is the dominant product in this food group, accounting for three-fourths of total flour and cereal product consumption. Driving the increase in consumption is a strong demand for fresh baked goods, crackers, pasta products, and breakfast cereals. Consumption of cereal and bakery products is larger in older households, indicating the demand for flour and cereal products will remain strong as the large baby-boom generation ages (Putnam 1990, and U.S. Department of Commerce 1990). With demand strengthening for flour and cereal products, the grain and bakery products industries would seem a natural source for adding value to the huge grain crops produced in the farm states.

In addition, these industries offer substantial economic benefits. For example, in the cereal breakfast foods industry, the value added in processing is 97 percent of the value of product shipments, the highest percentage among all food processing industries (Table 5).

Farm states may have difficulty tapping these markets, however. Markets for many grain-based products tend to be dominated by a few large well-capitalized firms in a few states, posing an effective barrier to entry by farm states. For example, 86 percent of the market for cereal breakfast food is controlled by four firms, one of the highest concentration ratios in the food industry. More than half of the breakfast food industry's jobs are found in just four states. Similarly, four-firm and four-state concentration ratios are relatively high for flour, wet corn milling, and cookies and crackers. Thus, these markets appear difficult to enter unless farm states chase branch plants of major food companies, a costly and difficult approach to development.

Although the grain product markets appear to be natural avenues for using farm state grains, the cost of shipping farm state grain to distant processing points is relatively inexpensive. In addition, technological advances that would enhance grain processing activity in the farm states by reducing the cost of shipping finished grain products or by some other means do not appear likely. In sum, a large portion of the farm states' huge grain crops are likely to remain a ready supply for processing industries elsewhere.

IV. Conclusions

Officials in farm states are turning to food processing as an engine for economic growth in the 1990s. The food industry is an attractive target for economic development because adding value to abundant farm production creates jobs and boosts incomes. Yet the ten farm states are

not major food processing states. To the contrary, a corridor of states spanning from the Great Lakes to the East Coast processes more than a third of the nation's food supply. Based on a comparison of farm output relative to food output, the seven farm states with the greatest potential to expand food processing are Arkansas, Idaho, Iowa, Kansas, Minnesota, Nebraska, and Wisconsin.

Overall, farm states face an uphill battle in becoming major centers for processing the nation's food supply. They have a huge supply of farm products to process, but they are removed from the nation's population centers. Thus, farm states may need help from new technology to offset their locational disadvantage. In the past, farm states have made enormous investments to boost the productivity of agriculture through the funding of research at agricultural experiment stations and land grant universities. Adding value to farm production may require that more of the research effort be focused on the development of new food processing and transportation technologies.

Endnotes

1 One piece of evidence indicating the stability of food processing is the pattern of growth in the food processing component of the nation's aggregate gross state product (GSP). The food processing component of manufacturing has grown more slowly than other manufacturing industries, but food processing has been more stable. Based on a regression from 1972 to 1986, the manufacturing component of the nation's GSP grew 2.27 percent a year with a standard error of 0.35 percent. Food processing grew 2.18 percent a year, with a standard error of 0.21 percent. Nonfood manufacturing grew 2.27 percent a year, with a standard error of 0.38 percent.

2 The farm state definition used in this article is similar to the U.S. Department of Agriculture's definition of a *farm-dependent* county. A farm-dependent county is one in which agriculture accounts for more than 20 percent of the county's total personal income. In addition, the Agriculture Department defines a *farm-important* county as a county where farming accounts for 10 to 20 percent of the county's total personal income.

An alternative definition of farm state is a state that produces a large quantity of farm production. But many of the states with large farm output have large, diversified economies and thus are much less dependent on a food processing strategy. California, the nation's largest producer of farm products, is a prime example.

3 The most recent gross state product data available are for 1986. This analysis is based on an average of the GSP data for 1984 through 1986 to smooth variations in the data caused by changing weather, shifts in farm policy, and other short-term effects.

4 The ten states that lead the nation in farm output in descending order are California, Texas, Iowa, Illinois, Florida, Minnesota, Nebraska, Wisconsin, Kansas, and North Carolina. Thus, the five nonfarm states among the ten leading producers of farm products are California, Texas, Illinois, Florida, and North Carolina. Two of these five states (Texas and Illinois) are focusing some development effort on food processing, but the strategy is generally aimed at rural development rather than statewide development.

5 In essence, farm states must consider both the risks and the rewards of pursuing various food processing industries. A strategy designed to capture industries offering the greatest rewards—in terms of jobs and income created in adding value to raw farm products—may also face the greatest risk of failure. For example, the cereal breakfast food industry leads all food processing industries in the amount of value added to raw farm products. But the breakfast food industry is highly concentrated in the hands of a few well-entrenched firms. Thus, a potentially large economic payoff—the large value added—is offset by a very [illegible]t chance of successfully capturing a piece of the [illegible]try. In contrast, the meatpacking industry offers a lower reward (in terms of value added) than the breakfast food industry. But since the industry is not as concentrated

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as the breakfast food industry, the probability of boosting the industry's activity in the farm states is greater.

6 The analysis of farm production data in this section is based on an average of the three most recent years of data available, 1986 to 1988, to smooth variations caused by changing weather, shifts in farm policies, and other short-term effects. Food processing employment data are for 1987, the most recent data available.

7 Two filtration methods are now being tested, reverse osmosis and ultrafiltration. In reverse osmosis, milk is forced through a semipermeable membrane under pressure. The membrane allows water molecules to pass, but nothing else. Ultrafiltration is a similar technique, but the milk passes through a series of progressive membranes.

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The Quiet Revolution in the U.S. Food Market

By Alan Barkema, Mark Drabenstott, and Kelly Welch

A quiet revolution in the U.S. food market is underway that may change the way farmers and food processors deliver food to consumers. While consumers will still see grocery shelves stocked with the foods they want, the revolution will significantly alter the way producers and processors do business.

Driving this revolution are changes in both consumer tastes and technology. Today's consumer wants nutrition, convenience, and an ever-widening variety of food products. Meanwhile, advances in production and processing technology are enabling farmers and food processors to target specific consumer niches more precisely than ever before. Combined, these changes in consumer demand and food technology are changing the way the food market links producers, processors, and consumers.

The food market is the elaborate system that moves food from producers and processors to consumers. Historically, raw and partially processed farm products en route to the grocery have been sold in a series of generic commodity markets. These markets are becoming obsolete, however, as food processors aim their products at a growing number of smaller consumer niches. Instead, contractual agreements and vertical integration, or mergers, among producers and processors are becoming increasingly common in the food market.

This article considers how changes in the U.S. food market will affect consumers, farms, rural communities, and farm policy. The first section reviews changes in consumer food demand and in food production and processing technology. The second section showshow those changes are leading to more contracting and vertical integration in the U.S. food market. The third section shows how

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the changing food market may encourage lower food prices, bigger farms, fewer viable rural communities, and an overhaul of farm policy.

Changes in Food Consumption and Technology

The U.S. food market is changing from a mass market to many niche, or specialty, markets. The change appears driven by the consumer's preferences for a wider variety of foods that are both nutritious and convenient. The multiplying niches put new production and marketing demands on farmers and food companies accustomed to a general market. The demands may be met by promising technologies just now emerging from the pipeline of agricultural research.

How is U.S. food consumption changing?

U.S. food consumption has evolved steadily over time, causing food companies to respond with new food products. The shift in food consumption is so great today that it is changing not only the *types of food* brought to the market, but also the *market* itself. The mass food market has splintered into many niche markets. Quaker Oats, for example, used to sell one type of oatmeal. Today, it markets three types and 12 flavors of oatmeal, and the types and flavors vary by region of the country.

The emergence of niche markets for food consumed at home can best be seen at the local supermarket. More than 10,000 new food products were introduced in 1990, five times the number of new products a decade ago (The Food Marketing Institute). To make way for all the new products, supermarkets keep expanding; the floor space in the average supermarket grew by 50 percent during the 1980s. While the increase was partly due to industry consolidation and economies of scale, a doubling in the number of products was also an important factor.

Niche markets are also developing for food consumed away from home. Consumers want more restaurant choices, including more ethnic food. The number of ethnic category restaurants (including Mexican, Italian, Asian, and others) increased 9.3 percent a year from 1985 to 1990, more than four times as fast as the total number of restaurants (*RE-COUNT*). Moreover, the average menu at individual restaurants now features more choices than a decade ago (*Nation's Restaurant News*).

Changes in U.S. food demand represent a consumer revolution that is transforming the way food is marketed, whether at home or away from home. Niche marketing is the only way to reach consumers effectively (Clausi). Products aimed at the mass market are now being overtaken by products aimed at specific consumer segments. From Campbell soup to McDonald's hamburgers, food companies are aiming at smaller market niches, a strategy that requires more careful product development and marketing.

Why is food consumption changing?

Three forces are behind the recent shift to smaller food market niches: a new emphasis on nutrition, changes in the American lifestyle, and changes in demographics. Together, these forces translate into strong consumer demands for a greater variety of healthier, more convenient foods.

A new emphasis on nutrition is leading to demand for substantially different food products. U.S. consumers increasingly believe that their diet influences the risk of several major chronic diseases, including

Table 1

Foods with Biggest Increases and Decreases in Consumption

Food consumption gains	Percent change 1976-78 to 1986-88
Fresh broccoli	231.8
Low-calorie sweeteners	193.2
Fresh cauliflower	174.1
Fresh grapes	134.8
Rice	95.1
Yogurt	89.4
Fresh carrots	77.0
Frozen broccoli	67.6
Turkey	62.7
Cheese (excl. cottage)	46.0
Food consumption losses	
Veal	-46.1
Whole milk	-33.8
Canned grean peas	-32.8
Canned peaches	-27.8
Distilled spirits	-25.2
Nonfat dry milk	-23.2
Canned corn	-19.6
Beef	-17.8
Coffee	-7.5
Lamb	-8.8

Source: *Food Consumption, Prices, and Expenditures*, SB-804, U.S. Department of Agriculture, ERS, May 1990.

heart disease and cancer. A shift away from a traditional high-fat, high-protein diet appears underway. Illustrating that shift, one consumer group recently called for the four basic food groups, the historical benchmark of good eating, to be overhauled.[1] As some consumers adhere to a more traditional diet and others adopt newer diets, the number of products consumed in the food market will increase.

Recent food consumption data confirm that consumers are shifting their spending to different foods. Half of the ten foods for which per capita consumption increased the most over the past two decades were fruits or vegetables (Table 1). Notwithstanding President Bush's disdain, broccoli was the food with the biggest gain in consumption. On the other hand, half of the ten foods with the biggest decline in consumption were red meat or dairy products. In short, consumers appear to want nutrition and freshness while reducing cholesterol and fat.

The shift in consumption places new demands on food suppliers. Producers of traditional foods in decline, such as red meat and dairy products, are forced to explore ways of eliminating unwanted food qualities, like saturated fat. The increased demand for fresh fruits and vegetables calls for improving existing delivery systems.

Lifestyle changes point to greater demand for convenience foods. Nearly three-fourths of the women aged 25-54 are now in the work force, compared with about half 20 years ago. Thus, most households have cut back sharply on the time spent preparing food, choosing instead to eat out or buy foods that are at least partially prepared. The shift to convenience will mean that food companies will process foods more fully and package them differently before they reach the consumer.[2]

Demographic shifts are resulting in consumer demands for a wider variety of foods. Two shifts stand out: the aging of the baby-boom generation and the increasing ethnic diversity of the population.

The aging baby-boom generation, composed of persons born between 1946 and 1964, may be one of the most powerful forces in the food market of the 1990s. The Food Institute, for example, estimates that the baby-boom segment is essentially the only population

group that will increase spending on food at home in the 1990s.[3] As they age, baby boomers are becoming more health-conscious and eating a more diverse diet with less protein and more fruits and vegetables.

Meanwhile, the U.S. population is becoming more ethnically diverse, supporting a move toward a more diverse array of food products. The Asian and Hispanic segments of the U.S. population recently have grown two to three times as fast as the general population, a trend that is expected to continue in the 1990s (*New York Times*). The ascendance of these groups comes at a time when the American palate is already becoming more internationalized. The increasing cultural diversity of the nation's population will only amplify the trend to more food market niches.

The promise of technology

The splintering food market leaves farm producers and food companies with many smaller targets instead of the mass market of the past. Fortunately, emerging technologies make it possible to hit these smaller targets. The technologies will be important for both the farmer and the food company.

Farm technology. In the past, advances in agricultural technology have mainly cut costs while increasing farm output. Two classic examples are hybrid seed corn and herbicides. Technologies now becoming available promise to lower costs *as well as* give the producer more control over the final food product. That element of control—the ability to fine-tune farm products for final markets—would mark a breakthrough in putting farmers in touch with consumers.

Biotechnology offers the greatest benefits in controlling farm product characteristics.[4] With biotechnology, scientists can assess the genetic blueprint of plants and animals, insert a gene that produces a desirable trait, and then reproduce plants or animals that carry the gene. With consumers demanding food products with specific nutritional and quality traits, the advantages of biotechnology are enormous. As one observer put it, "the beauty of modern biotechnology lies in its specificity" (*Food Technology*).

A number of prospective biotechnologies offer promise for delivering the food products consumers want. Animal scientists may be able to change genes so that beef cattle and hogs convert feed into lean tissues instead of fat (National Research Council). That breakthrough in leaner meat could spread quickly if scientists perfect current attempts to clone animals, that is, to replicate the genetic profiles of animals. Scientists may also be able to isolate the gene that controls the production of cholesterol in beef, pork, and eggs, offering the possibility of inhibiting its production.

Similar advances are possible in plants. To satisfy the expanding demand for fresh fruit, scientists may be able to insert genes that would keep fruits from bruising and losing flavor once picked. Genetic alteration in the protein composition of major grains would make it possible for farmers to produce corn or wheat for a specific livestock feed or food product requirement.

While none of these technologies is commercially available today, all are being actively pursued in the laboratory. Many industry observers believe that a number of the products could be introduced during the next five years, certainly within the decade of the 1990s.[5]

Food technology. Additional technologies will give food companies new ability to control food characteristics more precisely (*Food Technology*). Several technologies are aimed at reducing fat and cholesterol. A new means of removing substances, supercritical fluid extraction, is being

tested to reduce fat in red meats and cholesterol in eggs. Another method would replace saturated fats with unsaturated fats from non-animal sources in a "restructured" product. An example of this technology already in the market is McDonald's McLean hamburger, which substitutes water and carrageenan, a seaweed derivative, for saturated fat. In a different technology, food processors may be able to add genetically engineered microorganisms to the fermentation of cheese, yogurt, and sausage. The microorganisms would cut fermentation time while reducing the cholesterol level of the final product.

In short, the food chain is being fundamentally changed as new technologies make it possible to design food products from the farm through the processor to the retail shelf. While each technology alone has promise, the integration of the technologies along the entire food chain offers enormous potential for controlling precisely the final cost and characteristics of retail food products.

Consider, for example, the ability to design fresh beef products. At the beginning of the food chain, the producer may select a genetically engineered steer that will convert feed mostly to lean meat. The feed lot operator may then be able to gauge the fat content "on the hoof," through new monitoring technology. Based on the reading, he or she can shift the mix of nutrients and genetically engineered grains to discourage fat levels. New computer software will make these daily decisions routine.

Once the steer is passed to the beef packer, additional steps can be taken to cut fat. After trimming, the processor might select some beef cuts for further processing and fat reduction. Through selective extraction and fat substitution, a variety of low-fat beef products could be sent to the retail market.

All of these steps work together toward achieving with precision what the consumer wants: a low-fat, nutritious food product. Yet technological innovation alone will not guarantee a well-functioning food market. Innovation in the structure of the food market itself is also vital.

The Changing Structure of the Food Market

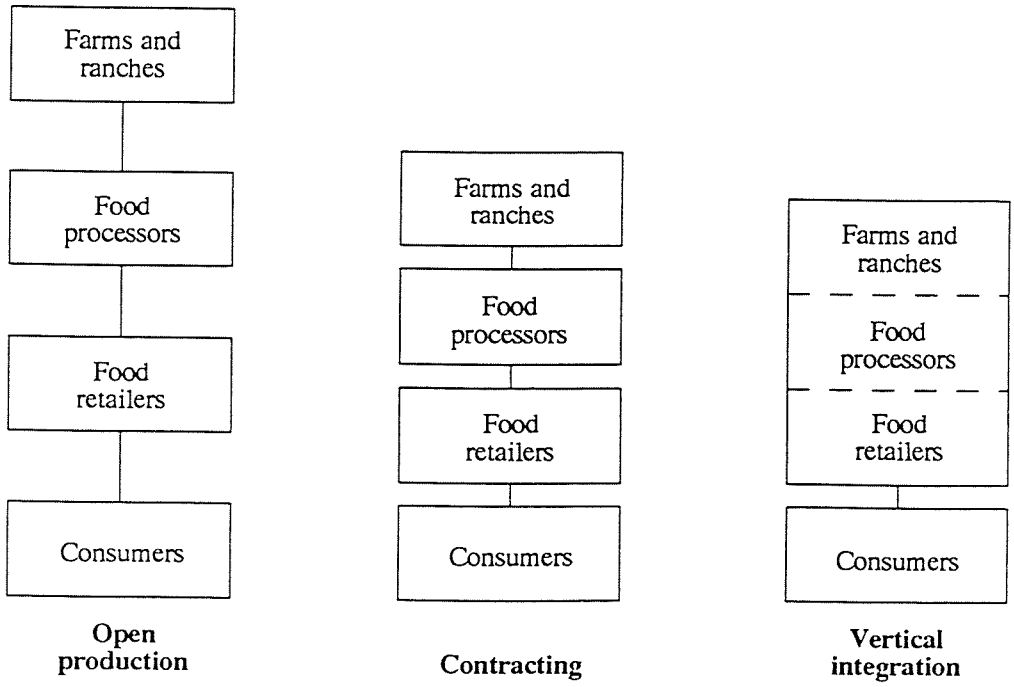
The food market is the elaborate communication and trading system linking farmers and ranchers, food processors, and consumers.[6] Its primary task is to turn raw farm products into the myriad of food products appearing in the grocery store. If the market is working smoothly, the huge produce from the nation's farms and ranches will reach grocery store shelves in exactly the form and quantity that consumers want. The sweeping changes in consumer food demands and in farm and food technologies, however, have triggered a revolution in the food market's structure.

Why is the traditional market structure changing?

The food market's traditional way of matching food demand and food supply is rapidly becoming outmoded, as consumer demand splinters into smaller niches and as farm and food technologies evolve. Aiming the growing number of new food products at new consumer niches takes more precision than the food market's traditional structure can offer. As a result, other ways of coordinating the food market are becoming more common. The new market structure shortens and clarifies the communication channels among farmers and ranchers, food processors, and consumers, reducing the odds that a targeted consumer niche will be missed.

Market analysts view the food market

Figure 1
The Vertical Structure of the U.S. Food Market



vertically. At the top of the market are farms and ranches, and at the bottom are consumers (Figure 1). Food processing and marketing firms fill the middle stages of the market.[7] More value is added to raw farm products at each successive processing and marketing stage. Eventually, finished food products are distributed to retail outlets for sale to the nation's consumers. The food market's task of synchronizing the flow of raw, intermediate, and finished food products is called "vertical coordination."

The traditional form of vertical coordination for many of the nation's major farm products—especially livestock, grains, and oilseeds—is called "open production." Under this coordinating method, the entire production process is completed before any marketing commitments are made. As a result, both farmers and buyers of farm products are exposed to price, quantity, and quality risks during the time after production begins but before marketing commitments are struck. Farmers, for example, are vulnerable to unexpectedly large supplies of farm commodities, which can push prices down. Food processors, on the other hand, are vulnerable to unexpected shortages, which can push prices up, slow processing plants, or force plants to use inferior substitutes.

Open production relies on market prices to tell farmers exactly what food processors—and ultimately consumers—want. The grading and pricing system for farm products

must be detailed enough to differentiate among different types or quality grades that are important to food processors.[8] Price signals can be inaccurate or easily misinterpreted, however, as product specifications become more detailed and as consumers begin to shop for more specialized products. Open production works well in the marketing of generic commodities that are sorted into a few, broadly defined quality grades. But the system is becoming outmoded in the increasingly specialized U.S. food market.

The marketing of beef cattle reveals the shortcomings of open production. Most beef cattle destined to become steaks and roasts are grouped into one of three quality grades—prime, choice, and select.[9] Cattle feeders get a higher price for prime and choice cattle, which tend to produce juicier, more tender steaks than select cattle. To achieve the prime and choice grades, feeders often overfatten cattle, which boosts feeding costs sharply. Thus, by encouraging feeders to produce excess fat, the grading and pricing system has not only driven up production costs but also caused feeders to fall out-of-step with the shift in consumer demand toward leaner beef.[10]

Open production of beef cattle also exposes cattle feeders and beef processors to large price and quantity risks. Until the cattle are sold, cattle feeders are vulnerable to unexpected drops in beef prices.[11] Meanwhile, processors are vulnerable to unexpected shortages of fed cattle, which push cattle prices higher and hold processing volume in processing plants below the optimum level. Processing costs rise much faster in modern, high-speed processing plants than in older processing plants when processing volumes fall short of the optimum.

What are the alternative market structures?

Two other ways of coordinating the food market overcome many of the shortcomings of open production. Under *contracting*, firms bypass the open market and instead strike formal agreements that control the price, quantity, and quality of goods traded in a future transaction. Under *vertical integration*, previously separate stages of the food market are combined in a single firm. As a result, transactions that would otherwise take place in the food market are replaced with the internal administrative actions of a single firm.[12]

Contracting. The distinguishing feature of contracting is that it locks in marketing commitments before or during the production process. These commitments reduce the risks caused by variable price, quantity, or quality. Reducing these risks is a key to targeting new consumer niches.

The simplest type of contract, called a *market-specification* contract, sets the price, quantity, and quality of products to be traded in a future transaction.[13] A contract of this type between a cattle feeder and a beef processor, for example, controls price risks for the cattle feeder and the beef processor. In addition, the processor is ensured a steady supply of cattle to keep high-capacity processing plants running.

The *production-management* contract can give the food processor direct control of farm production methods. This type of contract is useful when farm production methods influence the quality of the food processor's product. The steady advance of farm and food technologies promises to make this type of contract more popular in the future. For example, say a beef processor wishes to market a new line of fresh, low-fat, low-cholesterol beef products. The processor may contract with a feedlot operator to feed cattle specifically for

the new product market. The contract may specify certain production practices, such as the mix of feed ingredients or the length of time on feed. The contract may even ensure compliance by dictating periodic inspection of the cattle and feedlot by the food processor. Ultimately, the contract helps ensure that the contracted cattle will yield the right beef products to reach the targeted consumer niche.

Processors can assume even tighter control over the quality of farm products with a *resource-providing* contract. With this contract, processors provide all or part of the inputs used to produce farm products. For example, a beef processor may provide cattle of a specific genetic makeup to be fed by a feedlot operator. The contract ensures that the cattle are fed to the processor's specifications. In exchange, the feedlot operator is guaranteed a reasonable return for feeding the contractor's cattle. The control of both the cattle placed on feed and the feeding process ensures the contractor that the cattle will meet strict quality standards when slaughtered.

Each of the contracts described above reduces risk by shifting control of production to the food processor. The farmer's relationship with the food processor gradually approaches that of an employee of the food processor, as the contractual agreement becomes more extensive. Vertical integration takes the sequence of control a step further.

Vertical integration. Vertical integration shifts complete control of farm production to the food processor.[14] Much of the uncertainty present in open production is eliminated, by ensuring greater control over product price, quantity, and quality.

Vertical integration is especially well-suited for controlling risks associated with investment in highly specialized assets.[15] Many new production and processing technologies require expensive investment in research or capital equipment. Because few other uses are available for an investment in such specialized property, the investment exposes the investor to substantial loss if the investment cannot be used as planned. For example, assume that a processor invests in a new technology for producing low-fat, low-cholesterol beef from cattle with genetically reduced fat levels. The processor may wish to own the cattle feeding operation in addition to the processing facility. Then a steady supply of cattle of the proper genetic makeup would be available to ensure the new processing technology could be used as planned.[16]

The food market structure of the future

Contracting and vertical integration are supplanting open production in the food market. Yet the three structures actually form a continuum rather than three distinct ways of coordinating the food market.[17] Contracting provides tighter linkages between separate stages of the market than open production, and vertical integration provides tighter linkages than contracting. Still, some forms of contracting differ only slightly from open production, and others differ only slightly from vertical integration. How far and how fast the food market will move along the continuum from open production toward vertical integration remain open questions.

Two opposing forces will influence the outcome. On one hand, advances in farm and food processing technology will encourage more contracting and vertical integration. On the other hand, new information technology will help extend the usefulness of open production.

The same technologies that make it possible to target consumer niches will also require improved communication among the various stages of the food market. The technologies

Table 2

Percentage of Farm Production under Contract and Vertical Integration

	Production and marketing contracts				Vertical integration				Combined			
	1960	1970	1980	1990	1960	1970	1980	1990	1960	1970	1980	1990
Broilers	93.0	90.0	89.0	92.0	5.4	7.0	10.0	8.0	98.4	97.0	99.0	100.0
Fed cattle	10.0	18.0	10.0	17.5	6.7	6.7	4.5	5.0	16.7	24.7	14.5	22.5
Hogs	.7	1.0	1.5	8.5	.1	.1	.1	6.0	.8	1.1	1.6	14.5
Feed grains	.1	.1	7.0	NA	.4	.5	.5	NA	.5	.6	7.5	NA
Food grains	1.0	2.0	8.0	NA	.3	.5	.5	NA	1.3	2.5	8.5	NA
Oil seeds	1.0	1.0	10.0	NA	.4	.5	.5	NA	1.4	1.5	10.5	NA

Source: Marion (1960 - 80) and industry specialists at the U. S. Department of Agriculture, the National Cattlemen's Association, and the University of Missouri (1990).

will also expose farmers and food processors to the risk of loss on huge fixed investments. Both contracting and vertical integration are better suited than open production for addressing the specific communication needs and special risks of the high-technology food market.

Developments in information technology, however, will slow the trend from open production toward integration. Advances in testing and grading techniques will allow processors to sort farm commodities quickly and reliably into a wide range of precisely defined categories. For example, new ways to test cattle may allow processors to identify exceptionally lean fed cattle when they are sold. As a result, the processor's need to control the feeding process through contracting or integration would diminish.

The outcome of these two opposing forces will differ markedly for different food products. Data on the current structure of the U.S. food market are limited. Thus, projecting future changes is difficult (Table 2).[18] Still, some general observations are possible. An almost complete shift toward contracting and vertical integration has already taken place in the broiler industry. Contracting is increasing rapidly in cattle and hog production. But open production still predominates in the grain and oilseed markets.

The drive toward contracting and integration in the broiler industry was spurred in the 1950s and 1960s by the need to keep pace with the high-tech developments of the day—feed formulation, poultry genetics, and mechanization (see the box in the next section). Later, the industry's high level of integration enabled the quick development of new poultry products to meet rapidly changing consumer preferences.

In the pork and beef industries, contracting between feeders and processors has grown rapidly in recent years. Processors have sought to keep high-capacity processing plants operating at peak efficiency. Advances in genetic engineering, processing, and transportation will result in a wider range of conveniently prepared red meat products tar-

geted at health-conscious consumers. The communication and control needs of the new technologies will encourage a further shift toward contracting and integration in the pork and beef industries.

Changes in market structure for grains and oilseeds will be slower. Continued government intervention in grain markets promises to keep grain supplies available at low cost. Grain processors have little incentive to contract for grain production when government policies ensure a steady supply of low-cost grain.

In addition, recent advances in testing techniques promise quick identification of grain and oilseed attributes for specialized uses. For example, near-infrared spectroscopy can now be used to analyze the composition of a grain or oilseed sample in less than two minutes (Hurburgh). The new testing technique will give grain buyers—both livestock feeders and grain processors—quick assurance that grain bought in the open market meets requirements for protein, moisture, and oil content. Thus, the new testing techniques could encourage the use of market prices, rather than contractual agreements, to ensure grain quality specifications.

Peering further into the future, advances in production and processing technology may eventually lead to more contracting and vertical integration in the grain industry. When it occurs, the drive to more contracting will likely be driven by two things. First, genetic advances will allow the precise targeting of grain or oilseed attributes for a specific food or commercial application. Second, the company that researches and develops the genetic improvement will use contracts or vertical integration to protect its investment in intellectual property. For example, a soybean processor may enter a joint venture with a plant science research company to develop a soybean variety with a high yield of a particularly valuable oil. Once developed, the processor would protect the investment by retaining sole control over the enhanced soybean variety, probably using exclusive production contracts to do so.

The United States, therefore, is likely to have two types of grain production in the future. The first will yield generic commodities, perhaps with somewhat more detailed market grades than in the past. The second will yield high-value grains and oilseeds for specific commercial uses. Bulk corn and soybean production, for example, are likely to dominate in the Corn Belt stretching from Columbus, Ohio, to Lincoln, Nebraska. But within that expanse will emerge several pockets where highly specific grains are grown under contract for processing. As scientists are able to engineer grains for more food and commercial uses, the pockets will expand and multiply, displacing more of the generic production.

The Consequences of a Changing Food Market

The trend to tighter vertical coordination appears likely to spread, with varying speed and degree, to more parts of U.S. agriculture in the 1990s. What effects will a more integrated food chain have for consumers, producers, rural communities, and farm policy? Since U.S. agriculture has a history of mainly open production, the answers are difficult to predict. One food industry segment that is already dominated by contracting and integration, the broiler industry, does offer some helpful insights into what may happen (see box).

Consumers come out ahead

Consumers appear likely to reap several

benefits from the changing structure of the food market. As discussed earlier, the consumer's more specific food demands are the real impetus for change in the food market. With new farm and food technologies and tightened market coordination, consumers will get the foods they want. For example, they will be able to select from generic beef, branded beef, preprocessed beef entrees, and fat-reduced beef products.

The bigger question is whether consumers will see food prices rise or fall as a result of a more tightly coordinated food market. The evidence from the broiler industry suggests consumers received a variety of convenient chicken products *and* were able to buy them at lower prices, at least in part due to the industry's tighter coordination. Since the 1950s, when the shift to contracting and integration began in the broiler industry, poultry prices have fallen more than half in real terms. Prices for pork and beef, where contracting and vertical integration have proceeded much more slowly, have fallen much less.

Will food prices fall in other food industry segments as vertical coordination tightens? The answer depends on whether the firms that gain greater control in one food segment also control competing products in the same retail food category. For example, eight firms now control 55 percent of broiler production and processing, a relatively high degree of concentration. Such market power might be used to keep retail chicken prices high. But that has not happened for two reasons. First, competition remains keen among the eight dominant broiler producers; and second, chicken products must compete with many other meats and meat substitutes (including beef, pork, lamb, seafood, and dairy). The firms that control the broiler industry do not control the competing meats. The consolidation in the broiler industry, therefore, has simply passed the lower costs of production along to consumers in the form of lower chicken prices. Whether this pattern holds true for other food industry segments remains to be seen.

Large farms gain, small farms lose

Greater vertical coordination will favor large U.S. farms, accelerating a long-standing trend toward fewer farms in the United States. Again, the broiler industry offers insight. Over the past 30 years, large broiler operations (those that sell more than 100,000 broilers a year) increased their share of total broiler production from 29 to 93 percent, while many small producers went out of business.

A similar trend may occur as contracting becomes more extensive in cattle and hog production. The relatively high fixed costs of administering production contracts encourages processors to contract with large-scale hog and cattle feeders. Moreover, as production and processing technologies become even more sophisticated, only the large-scale feeders are likely to have the technical means and management skills required to satisfy the exacting requirements of the processors. Feeders who can meet the more demanding requirements of the new food market will receive a premium price, while those that cannot will face a smaller market for their lower-priced generic production.

Likewise, increased contracting in grains and oilseeds production will likely benefit larger producers who are better able to meet contract specifications while minimizing the processor's administration costs. The industry's financial landscape may change markedly, as farms in pockets of high contracting activity enjoy the benefits of the special-purpose market, while farms elsewhere are limited to generic production.

For the large producers that remain, farm-

ing will be substantially different than in the past. Managing farm production will be more demanding with increased scale, greater use of complex technologies, and more exacting product quality requirements. Yet even as production oversight becomes more taxing, authority for many business decisions may shift to food companies down the food chain. What seed is used, when it is planted, and how the crop is harvested may all be decided by the firm that processes the crop. Historically, farmers have taken pride in their independence. If the broiler industry is a guide, producers will take on many attributes of contracted employees and give up many attributes of sole proprietors as contracting and integration increase (*Wall Street Journal*).

Small rural communities lose

Just as large farms gain and small farms lose, so the move toward tighter coordination in the food market benefits larger rural communities at the expense of smaller communities. Rural economic activity has been moving to larger market centers for a long time. Tighter vertical coordination will just accelerate the trend.

Contracting generally encourages a shift in production to larger rural communities in one region of the country. Broiler production, for example, has concentrated in South Central and Mid-Atlantic states while declining in the Northeast and Midwest. As production has migrated to states like Arkansas and Virginia, it has tended to locate near large rural towns that are home to the processing plants. Thus, small towns have been hurt, both in regions that gained production and those that lost it.

Increased agricultural production is clearly an economic plus to a large rural community, but the benefit may be less than expected. The firms controlling the production will be large and probably will obtain inputs and credit from large urban centers. Thus, farm communities may increasingly resemble "branch plant" towns, or places dependent on economic decisions made elsewhere.

New questions for farm policy

By reducing the number of farms and by changing the nature of the farm business, tighter vertical coordination in the food market may force a new debate on the goals and programs of agricultural policy. Current programs distribute benefits largely on basis of how much a farmer produces. Commercial-sized farms (those with annual sales greater than $100,000 a year) receive about 60 percent of commodity program payments despite Congressional attempts to limit payments to large farmers. A trend toward larger contract farming operations will only push this figure higher. Thus, taxpayers and Congress may ask why the public should support farm businesses that have higher income and more wealth than average citizens.

The trend to tighter vertical coordination in the food industry seems likely to result in a substantial exodus of small farmers. In the past, this problem has gone largely untreated by policymakers, partly because the farmers leaving agriculture were able to find new jobs elsewhere in the economy. In the 1950s and 1960s, for example, millions who left agriculture found high-paying industrial jobs. Most of the jobs created in today's economy, however, are in the service sector. These jobs may be more difficult for many rural emigrants to enter. Thus, vertical coordination may lead policymakers at federal and state levels to give more attention to retraining programs for displaced farm families.

The spread of contracting between food companies and agricultural producers may also reduce the need to stabilize farm prices through farm programs. Commodity programs have

been justified in the past because they stabilized otherwise volatile agricultural commodity prices. The advent of more contracting, however, will stabilize prices. In short, the food company increasingly shares the farmer's price risk, reducing the need for government intervention.

For policymakers concerned with rural development, greater vertical coordination in the food market may encourage new approaches to spurring economic growth in rural places. Farm communities will increasingly pin their economic growth on the performance of the food industry that may be located there, while depending much less on the production of bulk commodities. Thus, traditional farm programs—which are still aimed at commodities—will be increasingly out-of-step with the new economy of farm communities. In the place of farm programs, policymakers may look at ways to invest in rural infrastructure, train rural workers, and encourage rural business starts.

Conclusions

The steady evolution in consumer demand and in farm and food technology is driving the U.S. food market toward more contracting and vertical integration. While new consumer niches are evolving, new farm and food technologies are enabling food producers and processors to engineer foods for these niches. The new technologies require much tighter coordination, however, as raw farm products are transformed into retail foods. Both contracting and vertical integration tighten the coordination between food producers and processors, ensuring that new food products reach targeted niches.

While tighter coordination of the food market will help meet consumer needs, the changes will create winners and losers among farmers and rural communities. An increase in contracting will benefit larger farmers with the scale and technical means to meet rigorous product requirements.

Smaller farmers and those in areas without ready access to the specialty-product market, however, will find fewer opportunities for marketing their generic production. Economic activity will rise in some rural communities and fall in others, as contracting and integration create a new patchwork of specialty-product and generic production. The widening gap between the winners and losers may call into question farm programs aimed at bulk commodities. In their place, policymakers may turn to a broader mix of farm and rural programs designed to improve the skills of rural workers and encourage entrepreneurship.

The Case of the Broiler Industry

The broiler industry shows how consumer demands and innovations in technology can turn agricultural production and processing into a highly integrated and concentrated structure. This case study will briefly show how the broiler industry has changed and how each major player—consumers, farmers, and rural communities—has gained or lost.

The structure of the broiler industry in the 1950s severely limited its ability to grow. The surplus roosters of egg production, or spring chickens, made up most of the nation's chicken supply. This limited out-of-season chicken purchases to Sunday dinners and special occasions. To meet year-round demand, many small farmers began producing broilers. But retail chicken prices fluctuated widely, and markets were limited to urban areas.

Integration began as a reaction to these limits on production, but new technologies made the process possible. Mechanical innovations in equipment and housing design increased production efficiency and economies of scale. Biotechnological advances in breeding, feeding, and disease control cut feed consumption per pound by 50 percent from 1945 to 1972. In addition, new types of production contracts and ownership agreements helped coordinate each of the growing and processing stages. As large-scale production became attractive, technology was adopted faster. By the mid-1960s, vertical integration in the broiler industry was nearly complete.

In the early 1970s, the industry faced rapidly changing consumer demands. Consumers wanted a variety of convenient, nutritious, and high-quality products. In response, the large broiler integrators created new products from the basic whole broiler. They cut up broilers into parts and further processed them to add value. Processors began to use brand names and target market niches with diversified products. By 1987, cutup parts production accounted for well over half of total broilers processed, compared with 19 percent in 1965. The volume of further processed products (extending beyond the cutup stage) expanded even faster, accounting for 22 percent of the broilers processed in 1987, compared with 9 percent in 1979. This gain reflects an array of new products such as patties, fillets, and nuggets.

The most obvious beneficiaries of these changes in the broiler industry have been consumers. Their demands are met with a variety of more convenient, nutritious products at less than half the 1950s prices in real terms. Technological advances and lower cost integrated enterprises have lowered retail prices despite greater concentration among the largest broiler firms.

Whether growers have benefited from a more tightly integrated broiler industry is unclear. As the industry began to consolidate, processors chose to contract with larger, more efficient growers, forcing many small growers out of business. But even for the large growers that stayed in business, their incomes have not necessarily increased. Growers did reduce unit costs by expanding. Over time, however, unit costs have increased due to rising input prices. Meanwhile, revenues to contract growers have not increased as fast, leaving growers with declining profits.

Moreover, the large growers have seen the nature of their business change. With contracts setting the payments received per broiler, growers are not subject to the previous risks of

market prices. On the other hand, they now have more capital investment at risk while controlling fewer production decisions.

The effects on rural communities have been mixed. As larger broiler integrators have gained efficiency, production locations have shifted across regions. Broiler operations have concentrated in just a few states in the South and Mid-Atlantic regions. The operations have also converged on agribusiness centers within those states, resulting in benefits to only a few rural communities. The advantages of the southern states included a favorable climate, depressed agricultural conditions, and ample surplus labor from underemployed farmers willing to adapt to new technologies and methods.

Endnotes

[1] The Physicians Committee for Responsible Medicine advocates the four basic food groups be: whole grains, vegetables, legumes, and fruit (Physicians Committee for Responsible Medicine). The U.S. Department of Agriculture's standing recommended group of basic foods are: meat, fish, and poultry; dairy products; breads and cereals; and fruits and vegetables.

[2] Consumer concerns about the environment represent another major factor influencing food packaging. McDonald's for example, recently gave up its foam packaging in favor of paper products because foam cannot be recycled. This trend to "environmentally friendly" packaging seems certain to continue, but it will affect food processors much more than producers.

[3] A slight increase in spending is forecast for 75+ year-olds.

[4] Information technology will also be a major contributor in controlling agricultural production. Many biotechnologies will place new management demands on farm operators that will be met only with more sophisticated information technology.

[5] For a fuller discussion of biotechnology, its prospective adoption, and possible positive and negative effects, see Julie Stanley, "Agricultural Biotechnology: Dividends and Drawbacks" in this issue of the *Economic Review*.

[6] The food market is in fact an international market linking farmers, food processors, and consumers around the globe. Many food companies are multinational corporations. This article, however, focuses solely on the linkages among farmers, food processors, and consumers in the United States. Changes in foreign food supply and demand will affect the domestic food market, but the domestic changes described in this article will dominate. U.S. trade in farm and food products is relatively small compared to the overall size of the U.S. food market. In 1990, for example, U.S. imports of foods, feeds, and beverages ($26.6 billion) were less than 5 percent of consumer spending on food ($624.7 billion) (Survey of Current Business).

[7] In their much earlier, comprehensive study, Mighell and Jones define stages as "...any operating process capable of producing a salable product or service under appropriate circumstances." They also warn that "the image of chronological vertical succession is only a general symbol to aid our thinking; it should not be taken too literally."

[8] Marion summarizes the function and importance of the grading system in the food market. "Grades may reduce quality uncertainty and transaction costs, but their benefit may be limited if not based on the product characteristics that determine the product's value to the customer."

[9] The National Research Council, Chapter 5, provides a more detailed review of the beef grading system.

[10] The cattle industry has recently launched an initiative to lower the cost of producing beef and to make beef more attractive to modern consumers. An important part of the initiative is an effort to reduce the production of excess fat. See Barkema and Drabenstott for a more detailed analysis of trends in the beef industry.

[11] Price risks can also be hedged in commodity futures markets before marketing commitments are made.

[12] This is the generally accepted definition of vertical integration. According to Blair and Kaserman, for example, "...the distinguishing feature of vertical integration is the replacement of a market exchange by an internal (within the firm) transfer."

[13] The classification scheme outlined in this section groups contracts "...in accordance with the number of stages transferred from their traditional place with the farmer to the control of another firm" (Mighell and Jones).

[14] Integration can also occur between any other stages of the food market.

[15] Williamson (1979) argues that idiosyncratic investment is the primary motivation for vertical integration, stating, "More generally, the economizing problem includes choice between a special-purpose and a general-purpose good or service. A general-purpose item affords all of the advantages of market procurement, but possibly at the sacrifice of valued design or performance characteristics. A special-purpose item has the opposite features: valued differences are realized but market procurement here may pose hazards."

[16] Contracting can also protect the value of an idiosyncratic investment, but to a lesser extent than vertical integration. A long-term contractual agreement can tie two firms together almost as tightly as if they had merged into a single firm. The drawback of a long-term contract, however, is that it provides less flexibility than full ownership to meet unanticipated changes in market conditions. Thus, a high risk of loss on idiosyncratic investments tends to encourage vertical integration rather than contracting. See Williamson (1979 and 1986) for a fuller explanation of the relative merits of contracting and vertical integration.

[17] Other authors have recognized the continuum extending from open production through vertical integration. For example, Blair and Kaserman suggest, "the metric that varies as we move from the one end of this continuum to the other is the degree of control that one of the parties to the exchange exercises over the other."

[18] A comprehensive, up-to-date estimate of the current extent of contracting and vertical integration in the U.S. food market is a critical research need.

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FOCUS
ON VALUE-ADDED AGRICULTURAL PRODUCTS
Vol. 1, No. 6 Kansas State University Cooperative Extension Service Sept./Oct. 1991

For Some Food Processors, It's Back To School

"You're never too old to learn," stated Angel Flores, referring to the condensed 4-day Better Process Control short-course he was attending with 22 others from Kansas at the Lincoln, Nebraska, Hilton Hotel, September 30 through October 3.

Angel is the owner and operator of Angel's Del Santa Fe restaurant in Topeka where he serves his delicious homemade recipes of salsas and hot spicy dips. Angel's customers have been asking him to produce these dips on a larger scale and distribute them for sale in grocery stores.

An analysis of the products at the Value-Added foods laboratory at Kansas State University's department of Foods and Nutrition showed the Food and Drug Administration (FDA) would classify the dips as Acidified Low Acid Foods. Under the Code of Federal Regulations, CFR 114, all operators and processors of this class of foods must be under the supervision of a person who has been certified as having completed a specified course of instruction approved by the FDA.

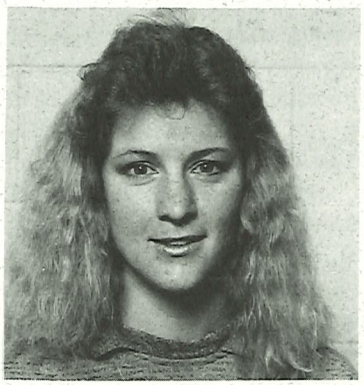
The certificate that Angel and the other attendees obtained is the first essential step in allowing them to commercially produce low acid and acidified foods in hermetically sealed containers.

Also passing the course were J.R. and Sandra Maike of Briarwood Farms, Alma; Jim Kientz of Kientz Market, Wamego; Glenn Bauman of Bauman Farms, Waverly; Shirley and Barry Stimpert of The Pickle Cottage, Bucklin; John Pendleton of Pendleton's Fresh Kaw Valley Asparagus, Lawrence; Anna Bonham of Hutchinson and Marilyn Riggs of Morland.

Kansas Food Packers, which operates a state of the art aseptic processing facility in Arkansas City sent six of its employees: Travis Worth, Keith Baker, Kim Baker, Fran Caudill, Reuven David, and Karen Coffman.

State specialists Karen Gast, Rolando Flores and Fadi Aramouni were also present in addition to Loreen McMillan from the State Board of Agriculture and Susan Goetsch, newly appointed manager of technical services at the Kansas Value-Added Center which paid the registration fees for all participants. ■

KVAC Adds Manager To Staff



Susan Goetsch is the manager of technical services for the Kansas Value-Added Center.

The Kansas Value-Added Center (KVAC) has recently added Susan Goetsch (pronounced Gates) to its staff to serve as manager of technical services.

Goetsch is originally from Brewster, KS. She received her bachelor's degree from Kansas State University in economics. She also received her master's degree from KSU in food science. Before coming to KVAC she was an assistant instructor for three years in the department of Animal Sciences and Industry

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INSIDE

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Americans and Food

1. What food showed the largest percentage gain in consumption over the past 20 years?

a) Yogurt
b) Low-calorie sweeteners
c) Fresh broccoli
d) Lowfat milk

2. In the late 1960s, turkey consumption totaled about 6.5 pounds per person per year. How much did Americans eat 20 years later?

a) 5.7 pounds
b) 13.3 pounds
c) 25.1 pounds
d) 37.8 pounds

3. How many eggs did the average American consume in 1989?

a) 78
b) 112
c) 234
d) 329

4. Cheddar is America's favorite cheese. What is number 2?

a) Swiss
b) Mozzarella
c) Parmesan
d) Provolone

5. What region of the country drinks the least milk per person?

a) Northeast
b) South
c) Midwest
d) West

6. What's America's favorite fresh fruit on a pounds-per-person basis?

a) bananas
b) apples
c) oranges
d) strawberries

7. Which of the following starchy foods did Americans prefer in 1988?

a) pasta
b) fresh potatoes
c) frozen potatoes
d) rice

8. Corn sweeteners (high fructose corn syrup, glucose and dextrose) accounted for 28 percent of caloric sweetener consumption in 1979. What was the share in 1989?

a) 30 percent
b) 45 percent
c) 53 percent
d) 73 percent

Answers on page 8

FOCUS
ON VALUE-ADDED AGRICULTURAL PRODUCTS

FOCUS is published bimonthly for Kansas agricultural processors, to promote quality and value-added food products. It is supported by funds from the Kansas Value-Added Center.

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where she worked with faculty to develop over 40 hours of video course work for continuing education.

Her primary responsibilities at KVAC include conducting follow-up work with former clients, answering client calls, attending conferences and promoting KVAC. She can help Kansas food producers with a variety of questions such as "How do I market salad dressing?" or "Where can I go to get a nutritional analysis of my food product?" One of her main areas of interest is food laws and regulations.

You can contact Goetsch at KVAC, (913) 532-7033. ■

Consumers Prefer Plastic Packages for Ice Cream

A recent consumer acceptance study comparing vanilla ice cream packaged in paper and plastic has found that the plastic containers were preferred by 77 percent.

The study was conducted by the National Food Laboratory for the Dow Chemical Company. The survey was conducted over a 4-week period in three different states — California, Minnesota and Georgia.

During the study, each respondent received two samples of the same brand of vanilla ice cream in plain white half gallon containers with identical product labels. The only difference was that one was made of paper and the other plastic.

Most respondents not only preferred the plastic containers but also concluded the ice cream packaged in plastic tasted better than the ice cream in the paper containers, although both products were the same. When polled, most respondents indicated they "definitely" or "probably would" buy the ice cream in the plastic container.

The primary reason the respondents gave for preferring the plastic ice cream containers included:

- sturdier, kept their shape better,
- resealed better and tighter,
- container was reusable,
- easier to open, and
- easier to scoop ice cream.

Other findings were:

- 78 percent considered the plastic container more of a premium product compared to the paper package, and
- 48 percent indicated they would be willing to pay a higher price for ice cream in plastic containers.

Plastic containers have been on the market for approximately 5 years. With the results of this study, promotions for the use of plastic in ice cream packaging will most likely increase. Dow Chemical is currently developing a new resin specifically to meet the needs of ice cream packaging applications. ■

Food Engineering, September 1991

Focus on Ingredients

Whipped Topping Concentrates

Whipped topping concentrates are spray-dried powders that offer flexible formulation and easy storage. The product can be mixed with a variety of liquids, including milk and water, for superb stability and overrun. These concentrates are said to have excellent mouthfeel and taste and can be used as a base to formulate powdered premixes for dessert toppings, mousse desserts, frostings and frozen desserts . A variety of combinations are available, including non-tropical and acid-stable, which can be used to formulate citrus desserts or acidic liquids such as wine or yogurt. ■

Food Processing, August 1991

Salt Substitute

Potassium chloride is custom blended with other ingredients for each application to maximize flavor and functionality. Applications for potassium chloride include low-sodium dietary foods, baked products, refrigerated doughs, curing of ham and bacon, beverages and other products. It is available in three grades: standard, free flowing and controlled particle size.

The standard grade has no specified particle size distribution and is claimed to be ideal for potassium chloride brining solution. Free flowing potassium chloride has a crystal size between 20 to 60 mesh and is resistant to caking and hardening up to 12 weeks. Controlled particle size product can be made to desired customer specifications. Potassium chloride and sodium chloride are also available in custom blends. ■

Food Processing, July 1991

Margarine/Butter Blends

A wide variety of specialty margarine/butter blends claim to have the taste and functionality of butter, but at a fraction of the cost. Specialty margarines function well in baked goods (cookies, pies, icings and Danish pastries) and are claimed to be excellent as a table spread, topping or butter sauce. Most specialty margarines are Kosher-certified. ■

Food Processing, June 1991

Caramel Donut Icing

Ready-to-use caramel donut icing is said to offer an attractive, long-lasting shine, rich caramel flavor and deep caramel color. Extremely tolerant, this icing is easy to apply and can be warmed for thinner coverage. The icing features excellent drying qualities and can be used as a donut dipping icing, as well as a sweet roll, Danish and pastry string icing. ■

Food Processing, August 1991

Beef and Chicken Flavors

The flavor of beef and chicken may be added to soups, gravies, sauces, dry mixes and other products with flavoring concentrates. Beef flavor concentrate claims to provide a rich beef flavor with roasted overtones, while the chicken flavor concentrate claims to offer the flavor of fresh-cooked chicken. These formulations contend to be lower in salt than bases and are highly concentrated, requiring one-third the amount of bases. Product labels may read "contains real beef/chicken" as the primary ingredient. ■

Food Technology, July 1991

Low-fat Chocolate

Low-fat (less than 1 percent) chocolate pieces and paste can be used in bakery products, confectionery, ice cream and dry mixes. The product is said to have a rich chocolate flavor and dark chocolate color; and a smooth and chewy texture with no graininess or crumbliness. Paste can also be made into fillings, toppings or sauces. Products are not heat sensitive and exhibit low oven-flow characteristics. Both products have low water activity, but mix completely with water or syrups. ■

Food Processing, July 1991

Soy Products

Natural whole soy products are produced by a proprietary process that removes the bitter flavor and inactivates the enzymes without the use of solvents or chemicals. Natural whole soy flour is highly functional as a low cost, partial replacement for eggs, milk and shortening in baked foods such as cakes, cookies, pancakes and muffins. It can be used to replace 20 to 40 percent of whole egg solids in many baked foods. One type of natural whole soy flour has a nut-like flavor and is recommended for applications such as nut pastes and foods that have a peanut or peanut butter flavor. ■

Food Processing, June 1991

Fruit Processing Enzymes

Fruit processing enzymes have been designed for the mash treatment of fruits such as apples, pears and tropical fruits. The product is also said to demonstrate efficiency in the maceration of grapes. Advantages to the processor include increased juice yields, improved extraction of late season fruit and improved filtration. ■

Food Processing, May 1991

Dust-Free Gums

Dust-free gums claim to provide a safer, healthier working environment for gum users. Gum dust and water can create a slick similar to ice on the plant floor. Dust-free gums, however, are said to reduce the chances of dust falling onto the plant floor and as a result improve plant safety. In addition, dust-free gums can provide a healthier working environment by reducing the plume of dust created when dumping full bags of gum. The manufacturer claims that operators should find no difference between dust-free gums and regular grade of gums. ■

Food Technology, September 1991

The use of trade names and brand names is not intended as an endorsement nor is criticism of unnamed products or firms implied.

Focus on Food Engineering:

Sanitation of Food Processing Equipment Should be Made Easy

The type of food processing equipment is very specific to the process. However, there are basic factors that apply to all processing equipment that can help in maintaining a sanitized plant. Among those basic factors are some that are related to the location of the processing equipment within the floor plan and others related to the design of the equipment.

Equipment Location

As a rule of thumb, the equipment should use no more than 20 percent of the floor area available. Also, unless it is a warehouse, dry storage should be less than 25 percent of the floor area. This distribution allows for the location of the equipment leaving transit areas without danger for the employees. There are several ways to locate the process flow; however, the most common and efficient way, from the cleaning and supervision point of view, is the straight line. Other arrangements commonly used for food processing equipment are the T, V, Y, M and U arrangements. The location of the food processing equipment within the plant should allow for at least 3 feet of clear working area around each piece of equipment and should be installed a minimum of 6 inches from the floor.

Materials

The type of material used in the manufacturing of food processing equipment should be stainless steel whenever it is practical or required by regulatory agencies. The specifications of stainless steel for food processing applications are 18.8 stainless steel with a carbon content less than 0.08 percent and the finishing surface should be of 125 grit. The type of surfaces used in the processing equipment should allow for easy maintenance that makes all the contact surfaces readily and thoroughly cleaned and sanitized. Surfaces in contact with food should be inert to food and also should be free of any type of creases, dead ends, open seams and gaps, crevices, protrusions and ledges, inside threads, rivets, etc., which will create suitable conditions for microorganisms to grow.

Disassembly

Food processing equipment should allow all parts to be removed for inspection and cleaning. There should not be any area of the equipment that is fixed and does not allow for complete removal. Every single part must have easy access for service. Conveyor guides and other types of safety guides should be easily removed or opened to permit cleaning.

Dirt Protection

Other types of equipment associated with a specific part such as hoods should be installed for easy cleaning and sanitizing when appropriate. Kettles and cookers should be provided with covers so there is no possibility of particles, or contamination of the product while in process.

All components used for the installation of equipment or their supports should be free of any type of crevices when angled, channeled or "I" beams are used. They should be placed to allow easy drainage and no chance for holding water, dust or dirt. This is why tubular types of support are recommended for most of the applications.

Cleaning Operations

In terms of cleaning mechanisms for the equipment, the most efficient way is to have "Cleaning In Place" (CIP) systems. However, this is not applicable in all cases. Yet, when the only alternative possible is "Cleaning Out of Place" (COP), enough area should be left for moving the equipment to the cleaning area. The cleaning area must have enough space for the workers to carry on a good cleaning operation.

Motors

Motors should be fully enclosed, explosion and splash proof, and sealed to prevent any entrance of moisture, dust or pests. Also it is not recommended to mount motors or drive mechanisms over food areas. Other types of components for transmission parts or bearings should be self-lubricated or sealed.

Summary

In summary, when deciding the layout of equipment and the construction of equipment components in a food processing plant, common sense should be used. It is important to provide the conditions for good plant keeping and sanitation, so the finished product is not affected by inadequate santitation practices which, in the end, will affect the profitability of the business. ■

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