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Public-Private Agreements for Emerging Technologies in Agriculture

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Land Grant Universities are partnering with private firms to fulfill the university mission. Public and private entities can come together in mutually beneficial activities, measured by fulfillment of each party's mission. Rules of engagement are discussed. Six actual agreements currently in operation between Kansas State University and private entities represent a range of types of public-private agreements. The principal components of each agreement are described and the benefits to each party enumerated in the context of organizational missions.

Key Words: biotechnology, commercialization, intellectual property, joint venture, Land Grant Universities, nonprofit corporation, patent licensing

Rapid change in biological, chemical, and communications technologies will transform agriculture fundamentally. Agriculture will be at center stage in developments in health products and pharmaceuticals, biodegradable materials, industrial chemicals, environmental solutions, and, of course, food for growing populations. Products of agriculture will penetrate many new markets, bringing a new set of production and marketing challenges of global scale. Most of these opportunities will take place at an industrial scale, and individual producers will find new ways to link with these industrial opportunities as qualified suppliers, franchisees, stockholders, partners, and joint venturers.

All public and private organizations involved in agriculture will adjust their operations in response to these changes. When mature organizations find themselves in a rapid-change environment, more flexibility can be gained by teaming up with relevant expertise than by generating wholesale reforms within the organization. The Land Grant University (LGU) is used as an example, mature, public institution seeking a set of partners to gain flexibility to serve its constituency in this time of change. LGUs are partnering with other universities, public agencies, and private firms to fulfill their mission. This paper considers only LGU agreements with private entities.

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The mission of the LGU is to generate and disseminate knowledge to students, citizens, industry, and communities. Non-LGUs increasingly are assuming outreach roles, too. This paper briefly describes the rules of the game for public-private interactions and then examines several operating models for public-private agreements.[1]

Public institutions are supported financially by all taxpayers, so the objective of public institutions is to enhance the welfare of the populace. Private institutions are supported financially by owners or groups of stockholders, so the objective of private institutions is to enhance the welfare of stockholders. As long as public and private entities can come together in mutually beneficial activities, measured by fulfillment of each party's mission, these activities are proper. If private entities can work with public institutions to strengthen stockholder returns—by access to technology, higher value products, or reduced cost—this is good for stockholders. If public entities can work with private institutions to strengthen the value of knowledge for the general public—by access to technology, access to resources, or lower costs—this is good for the public. One does not work for the other and one is not "selling out" to the other, but each seeks to fulfill its own mission more fully through joint collaboration.

The rules of engagement are emphasized here because public reaction is sometimes negative for joint ventures between public universities and corporations. When a corporation works jointly with a university, sometimes an impression is drawn that scientific objectivity succumbs to the interests of the source of financial or technology support. Actually, there are strong incentive safeguards against biased endorsement of inferior products. An investigator would have to violate good scientific practice to do so, which would be discovered on peer review and destroy the credibility of the public scientist. Similarly, the inferior product soon would be discovered to be inferior in the marketplace and the company's reputation would suffer. Successful public-private ventures demand adherence to rigid scientific standards, including peer review and objective inference, in the context of the respective institutional missions. Public-private agreements should be judged on their fulfillment of respective institutional missions, rather than on the source of funds.

The remainder of this paper describes six actual agreements currently in operation between Kansas State University and private entities. The principal components of each agreement are identified, and the benefits to each party are outlined in the context of organizational missions.

■ *Short-Flow Flour Milling Technology*

The first agreement example is a standard mechanism practiced by universities for decades: licensing of patents. Milling engineers in the Department of Grain Science and Industry at Kansas State discovered an abbreviated milling process which allowed construction of small sized mills, ideal for easy delivery to small countries.

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[1] The electronic journal, *AgBioForum*, Volume 2, No. 1, provides an excellent discussion of principles underlying public-private interaction for modern technologies. The journal is available online at http://www.agbioforum.missouri.edu/vol2no1/editor.html.

The intellectual property was patented through the Kansas State University Research Foundation (KSURF) and the patent was licensed to Kice Industries, of Wichita, Kansas, for a royalty agreement. Kice Industries now has the right to produce and market short-flow mills anywhere in the world. Kice Industries has built a new manufacturing plant in Wichita, devoted to building short-flow mills, employing numerous people.

In the beginning, the mill was called the "Kice Shortflow Unit" or the KSU mill, with prominent parts painted purple and white, the Kansas State colors. In addition to the publicity, Kansas State University gains by having the technology further developed and placed into application to generate economic returns for investments in public research, by the generation of royalty income, and by the creation of jobs in the Kansas economy—all benefits to the general populace. Kice Industries gains by having a new product to sell and potential additional profits for its stockholders.

- *Plant Breeding*

Kansas State University maintains plant breeding programs in wheat, grain sorghum, soybeans, canola, and alfalfa. Variety releases are made for wheat, soybeans, and canola. Kansas State has been working with two biotechnology companies to build herbicide resistance into wheat varieties. Under these agreements, Kansas State allows the companies to use proven varieties with which to attach herbicide resistance genes. Kansas State maintains ownership and foundation seed marketing rights on the original varieties. The companies maintain ownership of intellectual property rights on their respective herbicide resistance genes and market rights on herbicide-resistant varieties. No royalties for the use of these varieties are charged.

Wheat is a low-margin crop, and producers can save back seed for replanting of nonresistant varieties. It is likely that producers will only buy herbicide-resistant wheat (and pay the technology fee) for use on land with weed problems. Once the weed problem is arrested, producers likely will return to cheaper nonresistant varieties.

Kansas State University gains by providing access by Kansas farmers (as well as Oklahoma and Texas farmers) to herbicide-resistant technology at a much lower cost than a company could offer it if required also to produce a superior variety to carry the resistance. The companies gain by access to a broader market for their resistance gene and their control chemicals. Had Kansas State added a royalty fee for each unit of the variety, the fee would have been passed on to producers, adding to the cost of herbicide-resistant varieties; this would represent double taxation on producers who originally supported variety development through taxes and producer check-off contributions.

- *Farmland/Kansas State University Research Alliance*

In 1997, Farmland Industries and Kansas State University formed a joint-venture entity called The Research Alliance. Farmland Industries has operated a research

farm near Kansas City for many years, managed by its Feed Division. Kansas State and Farmland swine nutrition scientists were well acquainted and shared data. Feed Division management visited Kansas State University's nutrition program and concluded that 60% to 80% of what Farmland researchers were studying was being replicated at Kansas State. The Alliance was formed to gain efficiency and cost savings.

The Research Alliance is governed by a board of directors with three individuals from each organization. Five action teams are composed of scientists from both institutions, plus scientists from other universities and Farmland supplier companies, as appropriate. The five teams are swine nutrition, dairy nutrition, beef nutrition, meat product food safety, and feed manufacturing. Each team performs three functions: (*a*) identification of key industry issues in need of investigation; (*b*) sharing of research protocols, results, and plans; and (*c*) identification of research gaps where planned research fails to address key industry issues.

Research already planned by university researchers, with results immediately published, is referred to as public research. Research identified of particular interest to Farmland, and not on the university agenda, is referred to as contract research; these research projects are negotiated between Farmland and Kansas State as contract projects with intellectual property and indirect costs negotiated under standard contract research rules of the university. Under the Research Alliance agreement, Farmland makes a substantial annual unrestricted gift, which the university has directed to facility maintenance and improvement.

The Research Alliance has developed in unforeseen directions as greater familiarity was achieved. As scientists of the joint venture began working together, public research protocols were affected by Farmland suggestions where a few variables could be added to a project design with little added cost and a large informational gain. Some projects designed by Kansas State were implemented in Farmland space due to capacity availability; results still were made public. Farmland began hosting graduate student interns at its Colorado genetic improvement facility, resulting in a field lab for thesis research and industry experience for the students.

Ultimately, Farmland's reliance on the Alliance allowed the company to close several units of its research farm and sell much of the land. Farmland investigators were dispersed to technical service and other divisions, and the Research Alliance continues. Farmland executives have declared that company savings have far exceeded their Kansas State contributions.

Kansas State gains by increased resources to develop research facilities useful for public research, access to industry-scale genetic improvement facilities for research and graduate training, a continuous interaction with the applied industry perspective, a potential for contract research, and further development and application of research results. Farmland gains by maintaining access to a research capacity for product development with much less fixed costs in facilities and staff, and a very close connection with university research that promotes an understanding of research in progress and a first-hand review of research results.

- *The Farm Research Consortium*

A nationwide collaboration between the largest Cooperatives and Land Grant Universities is under construction, with the tentative name of The Farm Research Consortium. A committee of seven Cooperative CEOs and seven Land Grant University administrative heads of agriculture has been designing details of the organization. This planning group intends to propose The Farm Research Consortium as a partnership of Land Grant Universities and farmer cooperatives to conduct strategic research affecting the U.S. farm and rural sector. Co-ops and universities would work together to define and fund the research agenda, and assure continuation of a public, agricultural research capability. Membership will be open to those institutions which commit to long-term association.

The universities gain by a continuous association with a large group of stakeholders who will help clarify research needs in the farm sector, and through financial resource development to support research. The co-ops gain with an opportunity to affect the direction of strategic research, and by reducing the necessary size of their own, individual research capacities.

- *The Grain Industry Alliance*

In early 1997, a new nonprofit corporation was formed called The Grain Industry Alliance (GIA). This collaboration has its roots in the realization that Manhattan, Kansas, hosts numerous institutions devoted to grain storage and processing research, education, technical services, and training. Four institutions came together to market their expertise jointly.

Kansas State University has a unique capacity in post-harvest science and education for grains, including depth in storage and processing chemistry, engineering, and sanitation. Kansas State also works in cereal biotechnology, plant breeding, agronomic production, and marketing. The USDA-Agricultural Research Service (ARS) Grain Marketing and Production Laboratory, also in Manhattan, is a research institution with depth in cereal process engineering, grain quality, bakery science, and grain storage science. The American Institute of Baking is a private entity supported by the nation's baking companies, with capabilities in Hazard Analysis at Critical Control Point (HACCP) procedures and food safety audits in production plants, bakery employee training, and industry service. A private, national consulting firm, DPRA, Inc., with its home office in Manhattan, specializes in agribusiness feasibility and environmental assessment; this firm has branches in Washington, DC, Minneapolis, and Denver.

Each of the four institutions continues to seek contract work to fulfill its separate mission. However, the GIA joint organization has developed industry affiliates to discuss key areas of research, training, and service, which might be coordinated among the four institutions more effectively than any one organization could accomplish. The GIA markets the capabilities of all four organizations, offering one-stop shopping for a broad range of services related to grain agribusiness.

The university and ARS gain by greater access to industry leaders with real-world research questions, by increased potential for contract research, by increased potential that research results will be adopted, developed, and applied, and by greater efficiency gained by providing more complete services to clientele without having to develop the full range of capacities required to respond. The private partners gain by tying sales of services to a strong research base, by increased potential for contractual sales, and by increased potential for recognition for their expertise. The GIA is a collaboration of knowledge suppliers, joining together to provide more comprehensive knowledge services.

- *Commercializing University Knowledge with Start-up Companies*

Kansas State University also participates in formal commercialization of intellectual properties with incubator start-up companies. As mentioned earlier, the Kansas State University Research Foundation (KSURF) is responsible for intellectual property disclosure and patent processing. Kansas State, the State of Kansas, and the City of Manhattan have established a joint-venture nonprofit technology commercialization corporation, called Mid-America Commercialization Corporation (MACC). MACC has received seed funds from state and city government sources, and KSURF contracts with MACC to commercialize patented university technologies. MACC has incubator facilities in which several start-up companies reside during their infancy.

One of these companies started as FoodLabs, a food science venture providing laboratory food safety and shelf-life testing services. A Kansas State University food microbiologist is on 40% time leave-without-pay, and serves this 40% time as the technical advisor to the company. Once established, FoodLabs, Inc. was purchased by Steris Corporation. Steris remains in Manhattan, and the faculty member still works as technical advisor for 40% of his time. Other companies have started similarly, with faculty members bought out for partial appointments with the companies.

The university gains by having research results further developed and applied in industry, with associated growth in economic production and employment. The university also gains from faculty learning about the industrial environment and bringing that knowledge back to the classroom and the laboratory. The companies gain by access to technology upon which new products and services can be produced and sold with a potential profit.

Another relationship with industry is new to the MACC organization. Industry is donating patented technologies to MACC when the companies assess that market size, risk of further development, or time to market does not fit their strategic plan. MACC offers donated technologies to university researchers for further development in novel ways. The anticipated gains to the university include access to patented technologies with which to discover new uses, licensing these new uses to start-up or mature companies which would, in turn, provide royalty income to support university research. The gain to the donors of these technologies is at least some tax savings income.

Conclusion

In today's environment, collaboration makes sense. As long as managements of public and private organizations are true to their institutional missions and seek truly win-win solutions, public-private agreements can be highly productive. These agreements are not easy to establish, nor are they easy to operate. These agreements require participation by numerous individuals over a long period of time. Sometimes one side wins more than the other. Sometimes there are disagreements or misperceptions. Public-private agreements operate in a zone of the clash of cultures. Over time, however, collaboration allows each organization to specialize in what it does best while allowing all participants to gain the benefits. Public-private agreements are legal and productive, are beneficial to the general public, and should be encouraged.