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ORGANIZATION, FINANCING AND THE LATEST TRENDS IN AGRICULTURAL ECONOMICS RESEARCH IN THE USA

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A b s t r a c t. The objective of his article has been dictated by the interests of the agricultural economics profession in Poland as it adjusts to the ever changing system of public support of its research and teaching programs. Learning how similar issues have been approached by their colleagues in other countries offers insights into the applied solution and the adjustments required to effectively perform the two functions and continue to serve public at large, the food and fiber sector and policy makers.

THE LAND-GRANT UNIVERSITY SYSTEM

To understand the organization and financing of agricultural research including agricultural economics, one has to know a few facts about the history of research funding through the land-grant system, a unique approach to support and encourage research in agricultural sciences in the U.S. The land grant system was established in 1862 by the decision of the U.S. Congress. The Morrill Land-Grant College Act of 1862 [Kerr 1987] established one land-grant university in each state of the Union. The basis for establishing the university was a grant of federal land to each state. The allocated land or its part was sometimes sold and the proceeds applied to the construction and operation of the university. The sole objective of the land-grant system initially was to teach students in the area of agriculture and engineering – the two types of skills needed in the process of settling the interior of the country.

The teaching organization based on the land-grant university system was augmented by the Hatch Act in 1887, signed into law on March 2, 1887 by President Cleveland [Kerr 1987], which provided the federal funding of agricultural experiment stations in each state. The Hatch Act established the research system coexisting with the teaching system. The initial focus of research was agricultural production and ways to make it more efficient (least costly).

For more than two decades the two functions, instruction and research emphasizing agriculture, distinguished the land-grant universities. The cooperative extension service in each state was funded by the Smith-Lever Act of 1914 and its goal was to teach agriculture, home economics and related subjects to the public. The third function is known as the extension or outreach (pol. *doradztwo*).

The three functions, instruction, research and outreach, have created a unique system of teaching students, engaging faculty in research and sharing research results in classrooms, and transferring the research results through extension to the public. This mechanism contributed to the economic development and growth increasing incomes, lowering costs and improving welfare of rural and small town communities.

The Hatch Act of 1887 was amended by Congress on several occasions. The amendments broadened the funding base of the research at land-grant universities by requiring that the states also provide funds. Over time, the role of state funding has outweighed the allocation from the federal government. The decline in public funding from the federal budget has forced major adjustments in every land-grant university.

NATIONAL INSTITUTE OF FOOD AND AGRICULTURE (NIFA)

A federal agency within the U.S. Department of Agriculture was established in 2009 and replaced the Cooperative State Research, Education and Extension Service (CSREES), which was in existence since 1994 (and itself replaced the Cooperative State Research Service). NIFA was established as a result of the political process to lower the cost of financing research and introduce competition for research funds, among others. NIFA was officially re-organized as of October 1, 2010.

NIFA's mission is to advance knowledge for agriculture, the environment, human health and well being and communities by supporting research, education, and extension programs at the Land-Grant University System and other partner organizations (includes federal agencies within and outside the USDA; non-profit organizations; professional societies; private industry; citizen groups; foundations; regional centers; the military; and others).

Key mechanisms to accomplish NIFA's mission is the national program leadership under which NIFA identifies and helps states meet research, extension and education priorities in areas of public concern. Input into what constitutes a priority is received through multiple channels including government agencies, commodity groups, elected political representatives, agribusiness firms, and civic organizations.

NIFA provides federal assistance through the annual formula grants to land-grant universities and competitively granted funds to researcher and land-grant and other universities. Although in the past the assistance in large portion was directed to land-grants, this is no longer the case. Non-land-grant universities are increasingly competitive in obtaining federal funds from NIFA including private universities. The increased competition and the shrinking federal budget allocation force re-structuring of colleges of agriculture in land-grant universities. Among the re-structuring programs is the elimination or merger of agricultural economics departments with departments of consumer economics, management or statistics, while colleges of agriculture merge with colleges of consumer sciences. Such mergers lower the administrative personnel, but often are associated with

the reduction in faculty positions, usually through attrition because of the tenure system. However, earlier this year, Clemson University, a South Carolina land-grant university, terminated faculty prior to granting them tenure.

NIFA and its partners focus on critical issues affecting daily life of people and the society's future. For example, it responds to quality-of-life problems, e.g., revitalizing rural American communities, improving agricultural productivity, promoting sound human nutrition and health. This is accomplished through a network of state, regional, and county extension offices who respond to individual inquiries and conduct informal workshops, provide web-based and printed information materials, etc.

NIFA operates AFRI (Agricultural Funding Research Initiative) which is a competitive grant program. Within AFRI there are several research areas including "Trade and Marketing" which solicit grant proposals for funding. "Trade and Marketing" is the only program that aims primarily at agricultural and applied economists. The funding within that program is substantially smaller than in programs that address research priorities associated with plant or animal agriculture. Grant proposals submitted under the trade or marketing banner should be multi-institutional, multi-disciplinary, and, preferably incorporate research, teaching and outreach.

To gain insights about the fundamental shift in funding of agricultural research (including agricultural economics) it is necessary to account for public funding (mostly through the land-grant system) and private funding (which reaches all institutions of higher education, and is not limited to the land-grant system). Table 1. shows the funding originating in the public and private sectors over a period of several decades.

Because the new critical issues, for example nutrition, organic agriculture or genetic engineering, involve more than a single scientific discipline, the traditional links with the land-grant university system weakens as the search for expertise and solutions expands outside that system leaving potentially less funding for the land-grants. The increasingly competitive environment redefines the leadership in agricultural sciences and will likely influence the traditional agricultural economics research.

Agricultural research has been funded by private and public sectors. USDA and its agencies are the primary source of the public sector funding and the land-grant university system has been an integral part of the public research. However, there has been a gradual change in legal regulations permitting the patenting of plant and animal discoveries and products. Between 1930 and 2011, the regulatory environment in agriculture has changed. Plant patents, variety licensing, etc. have become possible and attracted private investment. Table 1 shows the funding of agricultural research over time. The trend towards the increasingly important role of the private sector funding is undeniable. Similarly, the last decade has witnessed a tendency to lower the public funding of agricultural research. The result is the attrition of human capital in land-grant universities' colleges of agriculture and the shrinking scope of research. The observed tendencies also affect agricultural economics research, teaching and extension. Retiring scientists are not replaced, fewer courses are offered and less research is completed. As a result, for example, in recent years there has been a need for specialists in farm management, but few young scholars are available. Yet, farm management is fundamental for agricultural production.

Table 1. Agricultural Research Funding in the Public and Private Sectors, 1970-2008

Year	Public R&D funding (nominal dollars)	Private R&D funding (nominal dollars)	R&D deflator (2001=1)	Public R&D funding (2001 dollars)	Private R&D funding (2001 dollars)	Total agricultural R&D (2001 funding)
1970	514,437,000	464,300,000	0.2037	2,525,485,639	2,279,351,956	4,804,837,596
1971	553,299,000	487,100,000	0.2154	2,568,465,525	2,261,163,597	4,829,629,122
1972	639,624,000	507,400,000	0.2256	2,835,113,009	2,249,034,340	5,084,147,349
1973	665,388,000	576,100,000	0.2393	2,780,215,396	2,407,140,029	5,187,355,426
1974	729,310,000	669,290,000	0.2574	2,832,916,771	2,559,776,316	5,432,693,087
1975	825,141,000	708,540,000	0.2763	2,986,760,271	2,564,700,000	5,551,460,271
1976	896,505,000	817,780,000	0.2941	3,047,997,907	2,780,343,365	5,828,341,272
1977	1,018,250,000	953,950,000	0.3064	3,323,455,118	3,113,587,047	6,437,042,165
1978	1,100,244,000	1,079,109,000	0.3243	3,393,069,235	3,327,890,495	6,720,959,730
1979	1,218,999,000	1,204,080,000	0.3481	3,502,116,990	3,459,255,524	6,961,372,514
1980	1,350,158,000	1,453,024,000	0.3788	3,563,893,243	3,835,419,570	7,399,312,812
1981	1,487,113,000	1,468,190,000	0.4151	3,582,386,731	3,536,802,095	7,119,188,826
1982	1,644,913,000	1,651,512,000	0.4481	3,670,783,322	3,685,509,632	7,356,292,953
1983	1,703,057,000	1,794,203,000	0.4743	3,590,998,088	3,783,184,909	7,374,182,997
1984	1,794,348,000	2,045,965,000	0.5012	3,580,036,679	4,082,056,404	7,662,093,082
1985	1,910,950,000	2,167,210,750	0.5287	3,614,525,574	4,099,237,907	7,713,763,481
1986	2,028,770,000	2,320,865,000	0.5577	3,638,046,068	4,161,838,843	7,799,884,911
1987	2,104,587,000	2,278,197,000	0.5920	3,554,797,331	3,848,036,985	7,402,834,316
1988	2,235,778,000	2,571,360,000	0.6153	3,633,762,310	4,179,176,579	7,812,938,889
1989	2,418,949,000	2,745,153,000	0.6492	3,726,270,696	4,228,771,743	7,955,042,439
1990	2,575,529,000	2,971,347,000	0.6843	3,763,520,027	4,341,913,425	8,105,433,452
1991	2,704,622,000	3,172,941,000	0.7145	3,785,537,679	4,441,022,705	8,226,560,384
1992	2,851,866,000	3,207,266,000	0.7380	3,864,299,527	4,345,869,156	8,210,168,683
1993	2,949,273,000	3,463,213,000	0.7705	3,827,512,073	4,494,493,920	8,322,005,993
1994	3,081,172,000	3,556,593,000	0.7962	3,869,958,025	4,467,087,726	8,337,045,751
1995	3,149,886,000	3,888,896,000	0.8195	3,843,572,829	4,740,451,149	8,584,023,978
1996	3,144,224,000	3,960,789,000	0.8428	3,730,735,640	4,699,619,583	8,430,355,223
1997	3,229,904,000	4,381,220,000	0.8668	3,726,261,923	5,054,507,274	8,780,769,197
1998	3,353,099,000	45,595,140,000	0.8936	3,752,480,817	5,102,589,819	8,855,070,636
1999	3,542,147,000	n.a.	0.9270	3,820,996,991	n.a.	n.a.
2000	3,796,192,000	n.a.	0.9592	3,957,756,456	n.a.	n.a.
2001	4,094,008,000	n.a.	1.0000	4,094,008,000	n.a.	n.a.
2002	4,477,435,000	n.a.	1.0305	4,344,848,941	n.a.	n.a.
2003	4,597,804,000	n.a.	1.0608	4,334,175,937	n.a.	n.a.
2004	4,790,690,000	n.a.	1.0967	43,358,383,864	n.a.	n.a.
2005	4,873,511,000	n.a.	1.1388	4,279,343,799	n.a.	n.a.
2006	5,296,333,000	n.a.	1.1901	4,450,492,360	n.a.	n.a.
2007*	5,285,128,000	n.a.	1.2367	4,273,401,371	n.a.	n.a.
2008*	5,240,433,000	n.a.	1.3008	4,028,504,672	n.a.	n.a.

Note: Data for 2007-08 are preliminary.
Source: USDA, ERS based on data from National Science Foundation, USDA's Current Research Information Systems (CRIS), and various private sector data sources. Data are adjusted for inflation using an index for agricultural research spending developed by ERS. See the documentation for details. http://www.ers.usda.gov/Data/AgResearchFunding/

RESEARCH FUNDING BY COMMODITY ORGANIZATIONS

The public mandate funding research in land-grant universities has been insufficient in view of farmers and farm organizations, who are often interested in research addressing specific needs arising in production or marketing of a particular crop. Farm or commodity organizations, for example American Cattlemen's Association, who unites interests of cattle producers, may be interested in short-term research projects seeking solution to an unforeseen situation. Although such organizations can and are lobbying for research funding in Congress, they can also raise funds for research. They are permitted to take action by specific acts of law and require a coordinated action on the part of members. Typically, members of an organization must vote in favor of any self-imposed fee scheme collecting funds. Regulations specify the procedures, set minimum percentage of members who participate in the voting, and the length of the time period during which funds are collected. In addition, general rules describe how and for what research projects the funds can be used.

Within a given commodity organization, for example American Cattlemen's Association, members establish a research committee that solicits, reviews, selects and funds research projects submitted by scientists from land-grant and non-land-grant universities, research institutes, companies, or individuals. The process is publicly announced and winning projects are named publicly. A typical commodity-funded research projects depends on the ability of the organization to raise funds from fees (a form of internal taxation). Most funded projects are small (funding of less than $10,000) and have a short-term time horizon, i.e., 12 months, requiring that scientists develop a feasible solution or, at least, show some tangible progress towards achieving a solution. Results are presented to the commodity organization as a written report, often also as oral presentations during an annual meeting. Many projects are highly applied and, sometimes, difficult to publish in peer-reviewed journals. Although the commodity organization is not interested in a publication, scientists in a university-setting are expected and evaluated on their publication record.

The typical fee is based on a weight or volume unit and collected at the first marketing stage. For example, in case of pecans, the buyer purchasing pecans from a grower is obligated to record the amount and transfer the collected funds to the designated unit. The funds, although small, provide an important outside funding to scientists and allow to leverage funds from other sources. It has to be noted that relatively few industry-funded projects focus exclusively on economics or marketing.

Table 2. summarizes advantages and disadvantages of commodity organization funded research. Such organizations can be geographically limited to a single state, for example, the Georgia Agricultural Commodity Commission for Cotton [www.georgiacottoncommission.org 2011]. Some commodity groups form marketing boards, which fund generic promotion of a commodity and research. However, in recent decade, the promotion function of marketing boards has been successfully challenged in court by growers who did not want to be forced to pay towards common promotion.

Table 2. Advantages and Disadvantages of Research Activities Financed by Commodity Organizations

Advantages	Disadvantages
Spending flexibility (different Accounting)	Very short-term focus
Small research projects	Too cozy relationships could lead to biased results
Allows leveraging of funds from other sources	Frequent leadership changes shift research focus
Links academia with industry	Highly applied research unsuitable for peer-refereed outlets
Fast publication of results in industry magazines	Potential for favoritism in terms of topic or scientists
Vocal supporter of applied research	May disregard fundamental research
Vocal supporter of outreach	Supports expeditious and practical, but un-publishable solutions

Source: own compilation.

PUBLIC ATTITUDES

Public attitudes have been increasingly important in the process of allocating budgetary funds prior to the recent global financial crisis. Competing agendas of lobbying groups, the increased importance of natural environment, the shrinking share of agriculture in the GDP, and the loss of jobs have disconnected the public and the food and fiber sector. Increasingly, rural residents depend on income from non-agricultural jobs including agritourism or eco-tourism. In Poland, the trend has been exacerbated by the recent changes in university education reflected in the wholesale change away from the 'agricultural university' to a 'university of life sciences.' Consequently, the public and, gradually, decision-makers in public and private sectors loose the understanding of the specificity of agriculture and the related sciences, including agricultural economics and agribusiness.

The change in public attitudes on a global scale has been related to food safety concerns. The concerns first emphasized the use of pesticides in food production and the potential residue contained by the consumed foods. Despite the concern, consumer attitudes, which influence purchase behavior, differ over time and across countries. For example, the acceptance of cosmetic blemishes appears to be low [Misra et al. 1991] although the consumers often express preference for limited use of pesticides or organic production methods. Later, the food safety concerns have focused on microbiological safety. The most vivid example was the mad-cow disease, but the most frequent microbiological contamination results from bacteria present in fresh vegetables. The contamination of fengurek sprouts in May 2011 in Germany demonstrated one of the ways the contamination can occur [Starling 2011].

The change in attitudes occurs rapidly in response to unforeseen events and encourages quick action on the part of the government and regulators. The decisions undertaken to address an issue or prevent it repeat lead to allocation of research resources. If the resources are re-allocated, i.e., shifted within the existing budget, there is a potential for disrupting ongoing research. Adjustments that are forced on the affected science programs are not cost-free.

More importantly, the plentiful food supply at a reasonable price and the declining share of food expenditures in the total household expenditures causes consumers to undervalue the contribution of agriculture and agricultural science, including agricultural economics, to the sustained societal well being. In the Republic of Korea for example, the public support for research on the staple, i.e., rice, has weakened after the country achieved self-sufficiency in rice production and the traditional Korean diet broadened to include more fruit, fats, dairy, and animal products. The research funding priorities indicated by the Korean urban women, the primary food shopper and meal preparer in Korean households, are fruits and vegetables followed by (Korean breed) cattle [Florkowski et al. 2006]. For a decision-maker unfamiliar with the nature of agriculture and agricultural science the public support means that funds should be re-allocated away from grain research to horticultural research and a sudden switch in funding disrupts grain research (where, breeding for example, is a long term research) and horticultural research because the sudden influx of funds requires a flexible and broad program that can effectively absorb new funds. Often times, however, the decision-maker chooses to permanently reduce funding for agricultural sciences including agricultural economics eroding the ability to address any unanticipated production or marketing problem in the future.

CONSUMER ACTIVISM

In recent years, in a format similar to the environmental movement, consumers have become involved in several other issues. The new groups focus on food or agriculture characteristics that have social rather than economic meaning. 'Fair trade' supporters promote products that assured the producers adequate earnings to support their households. Among 'fair trade' food products coffee and chocolate dominate. 'Food miles' propagators encourage consumers to buy local foods because, presumably, under the local production conditions the food is produced with lower energy input. In both cases, the verification of the economic principle of the lowest cost is ignored. In response to 'food miles' movement, studies have shown that once the total energy input is considered, 'close proximity' does not necessarily equal less energy [Saunders et al. 2006]. However, such examples of consumer activism create a short-term impression on the public and may influence resource allocation decisions or be used to justify a re-allocation decision. The decision implies moving funds away from agriculture-related research. Once the re-allocation takes place, it is permanent.

Changing background of students in agricultural sciences. The shrinking number of farmers and rural population leads to a change in the background of students entering colleges of agriculture at land-grant universities. The majority of students in the last 20-25 years switched from rural to urban background. New students lack knowledge of agriculture and farm livelihood. Furthermore many are deficient in understanding the link between the importance of timeliness of performing routine, daily tasks required by the biological nature of agricultural production (e.g., milk production) and the future stream of payments from sales of agricultural commodities. In recent years, many are interested in the environment-agriculture interaction and less in conventional agriculture, which is the key supplier of food and raw materials. Yet, agribusiness is a large contributor to the GDP and provider of a large portion of jobs.

Urban students without understanding of the functioning of the farm and rural livelihood often have unbalanced views of the impact of agriculture on environment. The simplistic view emphasizes a negative influence of agriculture, while it ignores the positive aspects of agriculture on the environment.

Another issue faced by the land-grant universities is the changing demographics and the persistence of high school drop-out rate in some regions or in households from low income classes. Such pattern is associated with limited social mobility and contributes to the cycle of low achievement and poverty. The impaired social mobility mechanism leads to high loss of societal welfare and allocation of resources to social programs away from investment in activities of higher return. The youth from rural counties in the United States performs poorer than their urban counterparts. Although in the short term the consequences often go unnoticed, over a long term the differences in education translate into the disproportionate political representation of rural interests, and, eventually, the weakening of the financial support of land-grant universities' mission.

PREDICTIONS?

The current problems faced by the federal government do not bode well for agricultural sciences and applied economics research in the short run. Paradoxically, when such research is really needed, the political support demonstrated by the elected representatives is particularly unpredictable. There is a real threat of further cuts in public research funding. Its real dimension is not yet fully known.

In the long run, as a result of short term funding problems, land-grant universities may be faced to consolidate departments and limit the scope of research in their colleges of agriculture. Cuts in personnel and graduate student support will follow unless additional and new forms of funding will be identified. Agricultural and applied economics will change its research scope and may lose its unique identity within the economics profession.

Agriculture will always remain an essential sector of global economy. The sustainable agricultural production, processing of agricultural commodities, food production and distribution requires a steady flow of knowledge to address ever emerging practical problems. Investment in research that supplies solutions originates in private and public institutions. In the last 150 years the role of public research was crucial for the economic performance of food and fiber system of the United States. The gradual creation of conditions securing private rights to discoveries encouraged private investment in areas traditionally dominated by the public sector including plant and animal breeding. Therefore, changes in law and regulations have a direct effect on the need and role of public research in agricultural sciences including agricultural economics. Profit motive of private breeding companies is, however, associated with areas where the risk of investment is relatively low. In those areas the private sector my crowed out the public sector, while ignoring areas of high risk or low return. It has been observed that the latter are often associated with high impact on society's welfare. Decision-makers must be exceptionally prudent when choosing what not to fund in the public arena because of the long time horizon it takes to accumulate skills, knowledge and experience to establish a reputable agricultural research facility. Or, the costs of progress will be highly uncertain.

The recent increase in agricultural commodity prices, which will eventually lead to higher prices (i.e., accelerated inflation) is not likely to reverse the observed trend. First, the budget deficit limits any increase in research funding from the public sector. Second, many view the current price increase as transitory in nature. Third, the flexibility of global supply system has not been fully tested. Finally, in the United States the rising food prices may help to tame the obesity epidemic. Agricultural economists at land-grant universities are forced to adapt under conditions of heightened funding uncertainties.

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ORGANIZACJA, FINANSOWANIE I NAJNOWSZE TRENDY W BADANIACH EKONOMISTÓW ROLNICTWA W USA

Streszczenie

W opracowaniu przestawiono ewolucję systemu finansowania nauczania uniwersyteckiego, badań oraz doradztwa w USA. Przedstawiono znaczenie środków z budżetu federalnego i budżetu stanowego oraz finansowanie przez organizacje producenckie, które mają możliwość finansowego wspierania badań z własnych środków.

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