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**THE ROLE OF NONMONETARY VALUES IN
INDUCED INSTITUTIONAL INNOVATION:
THE CASE OF THE STATE AGRICULTURAL
EXPERIMENT STATIONS**

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ABSTRACT

THE ROLE OF NONMONETARY VALUES IN INDUCED INSTITUTIONAL INNOVATION: THE CASE OF THE STATE AGRICULTURAL EXPERIMENT STATIONS

David B. Schweikhardt

[The role of nonmonetary values in the Hatch Act of 1887 is examined. The results demonstrate that the decentralized U.S. system of applied agricultural research is the product of a compromise between the values of scientists, legislators, and farmers. The institutional form chosen has enhanced the system's capacity to improve agricultural productivity.]

For nearly a century, public support for agricultural research in the United States has been delivered through a system of state and federal institutions. As part of this system, the state agricultural experiment stations are unique in that they combine (1) public financing of research not supported by private interests, (2) an emphasis on applied research, (3) interaction between the research of the stations and the education and extension activities of the land-grant system, and (4) a geographically and administratively decentralized system capable of addressing the research needs of farmers facing many different ecological conditions.

The rationale for such a system is apparent to the modern observer; the decentralized structure of the system is credited with a significant portion of the growth in U.S. agricultural productivity (Evenson, Waggoner, and Ruttan). However, this is an ex post assessment. The builders of these institutions had no coherent ex ante criteria for selecting the most effective system. Instead, the decentralized system of applied agricultural research was the product of a conflict of values. Values about the conduct of science, the type of research to be performed, and the appropriate relations between the federal government and the states influenced the Congress and, ultimately, the success of the stations at improving agricultural productivity.

This paper examines the decision that created the experiment stations, the Hatch Act of 1887. It considers the role of values, especially nonmonetary values, in that decision. The following two sections review the role of scientists and farmers in promoting agricultural research. Next, three sets of nonmonetary values that influenced the Hatch Act are identified and the conflict over the writing of the Hatch Act is examined in detail. Finally, the role of monetary and nonmonetary values in the Hatch decision and the affect of nonmonetary values on the performance of the experiment stations will be examined.

Farmer Support for Research

Widespread farmer support for agricultural research did not exist during the nineteenth century. Farmers, on the whole, were skeptical that science could improve production methods. Even if scientific agriculture was possible, they doubted the land-grant colleges could deliver a useful product. Following the Morrill Act, the absence of qualified instructors and a well developed science of agriculture made the colleges a target of derision in the farm community, "literary kites with agricultural tails" (Walters, p. 14). Farmers saw little use for the "book farming" offered by the colleges.

More importantly, the farming public did not comprehend that research was a non-profit venture. If scientists were truly advanced in their methods, farmers reasoned, then the "experimental" or "model" farms established at some colleges prior to the Hatch Act should show a profit. Only in a few states did the concept of non-profit research take hold before the Hatch Act. Connecticut and California established the first non-profit experiment stations in 1875, followed by five other states prior to 1887 (True, 1937 pp. 67-118). These stations were greeted with skepticism and anti-intellectualism; a rural newspaper demanded the New York station provide practical answers to farmers' questions, not "visionary schemes and pet theories, as valuable to the average farmer as to the man in the moon" (USDA, 1882, p. 23). Another insisted the station was nothing more than a haven for men "hating to work for their own living and determined to live off the government;" the editor demanded its abolishment (Hedrick, p. 416).

Such disillusionment led farmers to take action, especially in those states having agriculture colleges connected to "classical" state universities. The National Grange lobbied for separation of the agricultural colleges from these general universities where they believed that applied research and practical education for farmers were being ignored. In at least four states -- Mississippi, North Carolina, Rhode Island, and Connecticut -- they succeeded at achieving separation (Curti and Carstensen, pp. 470-71; Eschenbacher, pp. 17-43; Ross, p. 31; Scott, pp. 52-59). Furthermore, a resolution passed

by the National Grange in 1876 declared the colleges ought to be "under the exclusive control" of farmers and "as far as possible, separate and distinct schools" (Buck, p. 292).

The Grange would support the Hatch bill only if two amendments were attached. Their first amendment provided that, in those states having independent experiment stations (Ohio and Connecticut), the state legislature would have the right to designate which of the two institutions, the agriculture college or the independent station, would receive the Hatch appropriation. This amendment was a result of the dissatisfaction of the Ohio Grange with the state agricultural college and their success in establishing an independent station in Ohio (True, 1937 p. 128). The second amendment provided that, in those states where no independent experiment station existed and the agriculture college had "neglected agricultural education," the Hatch money was to be appropriated to the state board of agriculture. Furthermore, any independent station established thereafter was to be protected by ensuring that "the appropriation shall go thereto without the intervention by any college board or faculty" (Conover, pp. 43-44).

Scientists' Advocacy of Research

Agricultural scientists were divided over the issue of research organization. One faction, led by scientists Samuel Johnson and Wilbur Atwater of Connecticut, advocated experiment stations independent of the agricultural colleges. The second faction, composed primarily of administrators of the colleges of agriculture, insisted that the stations had to be controlled by the colleges.

Atwater maintained that researchers must be free to pursue knowledge without the constant educational and academic interruptions that would arise at a university. Surviving on small incomes, suffering from political interference, and plagued by the vocational demands of farmers, the colleges could not, in Atwater's view, provide the environment needed for successful research. There was, in his opinion, no alternative to permanently subsidized, free-standing stations (Knoblauch, Law and Meyer, pp. 19-24; Rossiter, p. 161).

Atwater's arguments in favor of independent stations lost ground to the opposing faction's political arguments for establishing stations under the control of the agricultural colleges. In 1881, the administrators presented a strong case for attaching the stations to the colleges. First, since the colleges owned farmland and some laboratories and employed the few scientists available, attaching the stations to the colleges would reduce the cost of the system. Second, in response to the vocational demands being placed on the colleges by farmers, administrators predicted research would have "great value to students as a means of practical education." Finally, they reemphasized the political implications of college stations; college stations would likely improve relations between the colleges and farmers, whereas independent stations would compete with the colleges for the loyalty of farmers and, ultimately, for state and federal funding (Knoblauch, Law, and Meyer, pp. 38-40).

In 1882, Professor Seaman Knapp of Iowa State wrote the first bill to establish experiment stations. Striking a compromise between the independent station and college station advocates, Knapp's plan provided \$15,000 annually to each state for support of a "national experiment station" located at the colleges of agriculture. The work performed at each station would be supervised by the U.S. Commissioner of Agriculture, the college president, and a professor of agriculture (True, 1929, p. 204).

Such separate but equal status for research was unacceptable to President Theophilus Abbot of the Michigan Agricultural College, who favored the Michigan system of part-time research done by educators. Citing cost savings and the need to improve the political popularity of the colleges, Abbot rejected the Knapp plan: "I do not think it well for the college, however it might be for the science of agriculture, to plant here an experiment station to be conducted independently of the various departments of the college" (emphasis in original) (Knoblauch, Law, and Meyer, p. 47).

With the support of other college presidents, Abbot convinced Illinois Congressman William Cullen to rewrite the Knapp bill for submission in 1884. The Cullen bill provided

that the stations were to be departments of the colleges and the Commissioner of Agriculture was forbidden from controlling or directing the work of the stations (Knoblauch, Law, and Meyer, p. 48). After a delay of two years, the Cullen bill became the basis for the Hatch Act of 1887.

The advocates of independent stations were scientists with the sole objective of advancing agricultural science. The administrators of the colleges, however, could not ignore the political effects of creating independent stations. Such an arrangement would threaten the educational mission of the colleges in the long run. If, on the other hand, a college-controlled station improved the standing of the college in the farm community, both the college and the station would prosper. The presidents were sympathetic to the need for an environment of freedom in which to perform research. Indeed, as indicated by the Cullen bill, the administrators reserved the right to plan and perform research for the colleges. Administrators were not opposed to scientific freedom; they simply wanted an institutional structure allowing them to exercise that freedom.

Nonmonetary Values Influencing the Hatch Act

Nonmonetary values are expressions, given in terms other than units of currency that describe the goodness or badness of situations, conditions, or things (Johnson and Zerby, p. 11). This section presents a survey of values that influenced decision makers in writing the Hatch Act. Historical materials are surveyed, similar values are aggregated, and a sampling of quotes is provided to demonstrate the expression of these values by decision makers.

The Values of Science

There are certain values, held primarily by scientists, which define a good environment in which to perform research. According to the scientific view, researchers must be free to follow any lead in the pursuit of truth if they are to make their maximum contribution to society; ideological, political, professional, or economic considerations must never distract scientists from their mission of acquiring knowledge. At the 1887

meeting of the Association of American Agricultural Colleges and Experiment Stations, scientists Samuel Johnson, Wilbur Atwater, and George Cook reminded their colleagues that individuality and freedom were the "first conditions" of successful research (Association, 1888, p. 30). One year later, U.S. Commissioner of Agriculture Norman Colman supported this view, warning that political manipulation of the stations would lead to "deterioration in the workers and the work" (White, p. 249).

Scientific freedom remained an essential value for scientists and administrators during the formative years of the experiment stations. Addressing the Association in 1909, President A. B. Storms of Iowa State warned a "dry rot" of efficiency and morale was certain to result from political interference in the operations of the stations (Association, 1910, p. 56). Director W. H. Jordan of New York agreed, adding that the scientist must remain "mostly within the atmosphere of inquiry," unhampered by duties "foreign to his general trend of effort" (Association, 1909, p. 115). Two years later, Jordan reiterated this value, claiming an investigator need not "smell of the soil" to be an effective researcher (Association, 1911, p. 159). Director J. L. Hills of Vermont echoed Jordan, likening the researcher to a marathon runner that must not be distracted by administration, teaching, or extension, and the station director to a "Cerberus who guards the inmates of his domain against the insistent demands of those who would withdraw them from their tasks for work in the outer world" (Association, 1911, p. 164).

The Values of Vocationalism

Vocationalism stresses the practical importance of science in improving the lives of workers. To the vocationalist, the increased productivity of workers is the sole source of utility that derives from a scientific discovery. This does not imply that a conflict of scientific versus vocationalist values is inevitable. Indeed, agricultural scientists were quite vocal in expressing vocationalist values.

The objective of research, according to the vocationalist, is to improve the material well-being of the working class, and in the case of the experiment stations, farmers in

particular. Farmers, of course, expressed this value; as one farmer complained at the 1882 meeting of the Wisconsin Agricultural Society, "We do not want science floating in the skies; we want to bring it down and hitch it to our plows" (Carstensen, p. 18).

Early agricultural scientists shared this attitude. The objective of inquiry, according to Pennsylvania-State College President George Atherton, was "to cheapen the means of subsistence and thus to give man more leisure" (Association, 1889, p. 33). Director Issac Roberts of Cornell was more blunt: "So long as teachers study science for science' sake the farmer will swear at the bugs for the bugs' sake" (Association, 1898, p. 70). His successor, W. H. Jordan, maintained this vocationalist tradition, claiming the stations should have "nothing to do with knowledge that cannot be brought into the service of humanity" (USDA, 1903, pp. 625-28, Blaisdell, p. 134).

The Values of Strict Constructionism

Strict constructionists insist that the Constitution is to be interpreted literally and, therefore, any rights not explicitly reserved for the federal government are to be exercised only by the states. This interpretation of the Constitution views the use of federal power in any area as leading to (1) the expansion of federal influence in all areas, and (2) an undesirable concentration of power in the central government.

Senator John Ingalls of Kansas spoke against the Hatch bill on strict constructionist grounds. The bill, he contended, was nothing more than the product of "a certain select class of self-constituted reformers," set on the "continual interposition of the National government in state and local affairs." A continuation of such efforts would result "in absolutely destroying the independence and freedom of individual conduct, and subverting the theory on which the Government is based" (U.S. Congress, 1887, pp. 723-24).

Administrators of the land-grant colleges were concerned that centralized control of station work would stifle researcher creativity. President Merrill Gates of Rutgers warned that the "awful dead weight" of a central office would crush out "the very life that machine was set up to foster" (Association, 1889, p. 63). President A. W. Harris of

Maine claimed, "Centralization of authority would multiply every error by an alarming factor," an evil, "worse than no central government at all" (Conover, p. 107). As the next section shall demonstrate, the values of strict constructionism were critical in the establishment of a decentralized research system.

Passage of the Hatch Act: Congressional Debate and Decision

By the time the Hatch bill was introduced in Congress in 1886, two questions remained to be answered: (1) Should states be provided the option of establishing independent stations? and (2) What degree of control should the USDA have over the stations? On the first question, the proposal offered by the colleges (only college-controlled stations should be established) differed from that of the Grange (the option of independent stations should be provided). On the second issue, the Hatch bill only allowed the Commissioner of Agriculture to establish standards of value for use in fertilizer analysis by the stations. The USDA supported this proposal, adding that a central office in the USDA should be established to collect and publish research results.

Introduced in the Senate by James George of Mississippi, debate on the Hatch bill began in July, 1886. The provisions of the bill included:

- (1) The objective of the bill was to "aid the USDA in acquiring and diffusing . . . practical information on subjects connected with agriculture;"
- (2) The experiment stations were to be departments of the land-grant colleges;
- (3) The stations were to be under the control of the trustees of the colleges and a director appointed by the trustees;
- (4) The U.S. Commissioner of Agriculture would determine a "standard of valuation of the ingredients of commercial fertilizers, upon which the analysis of fertilizers . . . shall be based;"
- (5) Each state would receive \$15,000 annually to support such stations (U.S. Congress, Appendix, pp. 120-21).

Senator Preston Plumb of Kansas offered the first amendment, an attempt to eliminate the Commissioner's power to set standards of valuation for fertilizer. Plumb's objection was that such a provision would give the Commissioner "the power to determine the commercial value of all the fertilizers in the markets of the United States." Rhode Island's Jonathon Chace stressed that the section was harmless, simply wanting to

establish, "not a standard of value in money, but to establish a standard of . . . chemical quality "(U.S. Congress, p. 722).

Joseph Hawley of Connecticut rejected this argument, claiming the federal government had no constitutional authority to establish standards for any articles: "Why not establish a standard hoe, . . . pill, or . . . anything else? We have a right to make these articles exactly as we please in spite of your law and in spite of your Commissioner of Agriculture" (U.S. Congress, p. 723). Finally, even proponents such as Chace expressed concern about "clothing the Commissioner of Agriculture with too much power over this matter," the amendment was accepted, and all references to fertilizer values were removed (U.S. Congress, pp. 721-28). This amendment marked the first victory of the strict constructionists; they had eliminated federal control over fertilizer standards and, in the process, had eliminated one form of USDA control over the stations.

George Edmunds of Vermont next offered an amendment requiring that 15 percent of the funds be used as the Commissioner of Agriculture directed. His stated purpose was to achieve "uniformity of methods and results," but the Massachusetts Grange also supported the amendment as a means of assuring that administrators could not divert all of the money to other uses. This amendment ran into opposition from strict constructionists. Senator John Ingalls of Kansas led the opposition, claiming no "bed of Procrustes" should be erected to fit the stations to the Commissioner's desires and that local institutions providing a "collision and contest between opposing views" would ensure "the greatest good for the greatest number." Again, the strict constructionist view dominated and federal control of the stations was avoided (U.S. Congress, pp. 721-24).

The last amendment offered by the strict constructionists also limited the role of the federal government by striking out all references to the USDA in the bill's first section, leaving its purpose to be only the acquisition and diffusion of knowledge, but not necessarily to aid the USDA in doing so. Furthermore, the wording of this section was changed from that which indicated the stations would be "connected to" the colleges

(which some thought referred to the location of the stations) to "under the direction" of the colleges (which referred to administrative control). Again, the colleges' control over the stations was strengthened, not because college-controlled stations were thought to be more efficient at improving agricultural science, but because the strict constructionists in the Senate wanted stringent constraints on federal control of these state institutions.

The final amendment was the Granger proposal permitting independent stations. Proposed by Senator John Spooner of Wisconsin and supported by M. C. Butler of South Carolina, two sites of intense Granger agitation, the amendment provided that Hatch funds could be used at previously established independent stations and at "distinctly agricultural colleges" that might be established in the future (i.e., agricultural colleges that were separated from the "classical" state universities). Explaining that Wisconsin farmers wanted a separate agricultural college because it was "impossible to secure the attendance of any large number of students of agriculture," Spooner pressed the case of the Grangers (U.S. Congress, p. 1043).

Justin Morrill of Vermont, author of the land-grant college act, objected on two counts. First, he claimed, "All these stations should be connected with the agricultural colleges, where they have a staff ready to do the work" (U.S. Congress, p. 1043). Second, Morrill rejected the vocationalists' contention that the colleges had only the goal of providing a vocational education for farm students: "It never was intended to force boys of farmers going into these institutions so to study that they should all come out farmers. It was merely intended to give them an opportunity to do so" (U.S. Congress, p. 1043).

Even the arguments of Morrill did not convince the legislators. The Granger amendment was approved, not out of respect for scientific freedom, but as a response to the unhappiness of farmers over the lack of vocational education being provided by the existing colleges.

In the House of Representatives, William Hatch of Missouri guided the Senate version to passage by a 152 to 12 vote with no amendments and minimal debate (three

pages in the Congressional Record). The sole complaint came from John O'Neill of Missouri, claiming that the interests of labor were being neglected while, "Every bill that has been presented to this House with the 'cow' brand upon it has been promptly considered and passed" (U.S. Congress, p. 2283). However, even O'Neill voted for the Hatch bill.

President Grover Cleveland signed the bill on March 2, 1887. In its final form, the Hatch Act provided that the experiment stations would be established under the direction of the land-grant colleges. If independent stations or colleges existed or were established in the future, the state legislature would designate which institution would receive the Hatch funds. The USDA had no control over the stations; it could only provide forms for recording experiment results.

The Role of Monetary and Nonmonetary Values in the Hatch Act of 1887

According to the induced innovation theory, changing relative input prices will induce both technical and institutional change (Binswanger and Ruttan, p. 341). Given that the ratio of annual farm wages to farm land prices rose from 7.32 in 1860 to 8.52 in 1900 (U.S. Department of Commerce, pp. 457, 468), the creation of the experiment stations (and the early research on fertilizer and soil quality done at the stations) could be interpreted as an institutional (and technological) innovation that occurred in response to changing relative input prices.

To understand the institutional form chosen, however, one must recognize the nonmonetary values that influenced the Hatch decision. The values of science and strict constructionism were, in a sense, complementary; both favored decentralized control of research and provided scientists with the freedom to conduct research. However, scientists were not totally unrestrained; the values of vocationalism clearly required the stations to conduct research on the problems of farmers in each state.

Conclusions and Implications for
the Land-Grant College System

One must recognize a certain degree of serendipity in the nonmonetary values and decentralized institutional form chosen. Evenson, Waggoner, and Ruttan have shown that a significant portion of the improvement in U.S. agricultural productivity is associated with the decentralization of research from the state station to the substation level (Evenson, Waggoner and Ruttan, pp. 1101-07). Commenting on these results, Bonnen has observed, "The economic logic of diminishing returns would suggest that the national to state segment of decentralization, if one were able to measure it, should generate an even stronger impact on productivity" (Bonnen, p. 43). While the large land base and diverse nature of U.S. agriculture would suggest the need for a physically decentralized system, nonmonetary values -- in particular, the values of science and strict constructionism -- produced a decentralized decision-making system that allowed scientists to respond to the research demands of farmers in thousands of specific ecospheres in the U.S. The conclusion one can draw is that, in determining the institutional form chosen, nonmonetary values influenced the stations' ability to improve agricultural productivity.

Furthermore, in the process of contributing to the knowledge-based industrialization of American agriculture, the land-grant system has also helped create new values that now come into conflict with those embedded in the original system. One group, labelled the externalities/alternatives coalition by Hadwiger, are questioning the value of scientific freedom and progress on a number of issues, including animal rights, chemical use, environmental quality, farm worker displacement, consumer safety and corporate/college relations (Hadwiger, pp. 156-58; Meyerhoff, p. 11; Mason and Singer, p. 93; Berry, p. 156; Hightower). Another group, the National Academy of Sciences, which places high value on scientific freedom and basic research, has criticized the stations for neglecting basic science, repressing the freedom of scientists, and politicizing research planning decisions (Wade, pp. 45-47).

The externalities/alternatives groups and the National Academy of Sciences have both placed the land-grant system on the defensive. A conflict between the values of science, vocationalism, and various public interest groups seems inevitable. The resolution of this conflict will constrain, if not determine, U.S. public policy toward agricultural research and, therefore, the type of technologies and knowledge the agricultural research system will produce in future years.

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