ATTEMPTS TO CONTROL ACCESS TO THE LITERATURE OF AGRICULTURAL ECONOMICS

By Gerald R. Ogden

Computer applications are the most recent advance in the man-machine relationship in agriculture. In the past decade, these applications have grown phenomenally, especially in the areas of research, development, and experimentation. The use of the computer has led to a corresponding growth in the publication of literature reporting findings of research accomplished. Attempts to control this literature through secondary services are discussed. A brief history of influences determining the output of agricultural economics literature is presented, and early efforts to establish bibliographic control over these publications are reviewed. More recently, however, publication of research findings has far exceeded attempts over their control, and this has become a problem. Results of much research are not reaching potential users. Thus, it becomes increasingly difficult to justify funding of projects that do not find practical application. This problem may partially be overcome by supporting efforts to provide secondary services. Ultimately, it will require greater attention to and funding for computerized bibliographic control of literature.
Keywords: Agricultural economics, computer, literature, bibliography.

Computer applications to agriculture cover a wide spectrum of subject areas and touch upon many disciplines. Few areas are so underutilized, so misunderstood, and so little noticed, however, as the application of the computer to literature retrieval. Investigators should know and will find value in understanding how this literature is captured, controlled, and accessed, for not only will they obtain a clue to a valuable source of information, but they will learn what type of literature can be accessed.

My purpose is to focus on the problems of literature retrieval by computerized techniques in the field of agricultural economics. The experiences involved in the preparation and maintenance of a computerized bibliographic service in this field are not unique. To the contrary, such problems are widespread. But even in the early stages of development of a discipline, a lack of control over the literature emerges. This fact will be illustrated through a historical sketch of the beginnings and growth of the agricultural economics profession. I then examine the impact the computer has had on the profession, relate briefly the trends occurring in the types of studies conducted by economists, and demonstrate how these trends have influenced literature control. Next, efforts exerted to control the literature will be summarized. I will conclude by suggesting that because bibliographic services, in general, have such a low priority in relation to other aspects of research, it is improbable that complete secondary control of publications will be achieved in agricultural economics. And this likelihood, I fear, will act detrimentally to the development of research.

BEGINNINGS AND GROWTH OF THE PROFESSION

The profession of agricultural economics is a child of the 20th century, although its origins can be traced to the waning years of the 19th century. According to Henry C. Taylor, in 1897 Liberty Hyde Bailey of Cornell University and 10 other educators gathered at a meeting of the American Economic Association at Johns Hopkins University to form a seminar on the question, "Is there a distinct agricultural question?" (*21*)[1] The report of this meeting, and thus one of the original publications in agricultural economics, was subsequently published by the Association in its Economic Studies Series (*4*, pp. 52-67). Further studies followed. In 1903 a group met at a joint session of Section 1 of the Association for the Advancement of Science and the Society for the Promotion of Agricultural Science in St. Louis, Missouri. It was the 20th annual meeting of the American Economic Association (December 1907) that served as the genesis of the profession, however. The first "round table" was held at this gathering, and as a way of endorsing the new field, the American Economic Association published the discussions in its proceedings (*2*, pp. 59-82). From this date forward the field of agricultural economics, and its literature, began to expand.

It took several years before formal organization was accomplished and research papers were published under the auspices of an association. In the meantime, the American Economics Association continued to harbor an interest in the subject, and periodically, to 1912, sponsored sessions at its annual meetings. A parallel development occurred at the same time. Professors of farm management at various universities began independent studies in economics, and in 1910 several of these researchers joined together to form the American Farm Management Association.

There were other organizations interested in the subject of agricultural economics, but from 1913 to 1916,

[1] Italicized numbers in parentheses refer to items in References at the end of this article.

the principal players in this drama were the Farm Management Association and the National Conference on Marketing and Farm Credits. In 1916 these two bodies combined and formed a new organization, the National Association of Agricultural Economics. But this was a temporary union. By 1919 the National Conference on Marketing and Farm Credits withdrew, and the National Association of Agricultural Economists and the American Farm Management Association grouped to form the American Farm Economics Association, the predecessor to the American Agricultural Economics Association. In the same year (1919), the first issue of the *Journal of Farm Economics* was issued.

Three observable facts emerge from a retrospective look over the 20-year period educators and researchers spent legitimizing the field of agricultural economics. First, persons from an array of disciplines, such as agronomy, farm management, animal husbandry, and general economics, among others, became interested in the application of economics to agricultural problems. Their membership in the Association thus determined, even at the beginning, that the field would be interdisciplinary in nature. As a consequence of the multisubject area orientation, the literature output on the subject of agricultural economics has been predestined to appear in virtually hundreds of publications.

For scholars, bibliographers, and librarians, the uncertainty associated with irregular publication (especially prior to 1919) and the appearance of articles in a wide variety of publications, many of which were ephemeral, led to difficulty in capturing information. The problem was further compounded by the interdisciplinary nature of agricultural economics. In brief, it became a problem not only of being aware of, but then locating materials. Also, subjective judgment influenced the type of literature included in various bibliographic lists. Needless to say, these two problems are with us today. Now, however, they are multiplied many times over as a result of an increase in the output of publications and of subject areas covered by agricultural economics research.

Librarians made early attempts to control the literature. The most outstanding example was a series of bibliographies compiled by Mary G. Lacy of USDA's Bureau of Agricultural Economics. Comprised of a limited number of pages, they were, as S. von Frauendorfer, founder and editor of the World Agricultural Economics and Rural Sociology Abstracts, states, modest documents (*12*, p. 99). But they were prestigious, for they are the first of such publications of which we are aware. The bibliographies became a regular publication, *Agricultural Economics Literature*, in 1927, testifying that the literature of agricultural economics was growing both in numbers and stature. This publication was replaced in 1942 when the National Agricultural Library assumed centralized control of all library operations within the Department and initiated publication of its own bibliography.

Lacy also compiled other lists of references, especially on the literature of statistics and farm management. Few similar compilations appeared during World War II, however, as the rigors of war restricted the library's resources. In the postwar period, bibliographic services were taken up on an international scale. Meanwhile emphasis on the control of agricultural economics literature in the United States languished.

NEW IMPACTS

Two post-World War II developments, a significant increase in the output of literature in the social sciences and the adaption of the computer for civilian use, challenged scholars and researchers. The number of publications produced worldwide expanded so rapidly as to defy retrieval through traditional secondary access points, such as bibliographies, book reviews, and book notes in journals. The introduction of the computer for civilian use compounded this problem. Because much of the computational work done by hand in economics was removed, research efforts expanded. This allowed researchers more time to pursue additional projects, and the output of literature increased substantially.

In a recent survey conducted to establish the size, growth, and composition of social science literature, investigators determined that between 1820 and 1930 the number of current serials increased from 22 to approximately 1,000 (993). There followed but a slight increase in serial growth during the early depression years of the thirties. But, between 1935 and 1970, the publication rate exploded: it increased from 1,134 to 3,490, or over 300 percent (*16*, p. 129). Through use of a conversion factor of 36 articles per title, the authors estimated that the number of articles published in 1970 equaled about 140,000, while the number of monographs totaled approximately 130,000 (*16*, p. 126).

Over the same timespan there occurred a corresponding increase in efforts to establish bibliographic control of the literature. In fact, such emphasis was placed upon this aspect of publishing that secondary services, historiographies, book lists, descriptive abstracts, and the like, increased considerably faster than did the literature. For example, the ratio of primary journals devoted exclusively to secondary services, estimated at 42:1 in 1920, declined to 35:1 in 1940, 19:1 in 1960, and 15:1 in 1970. American scholars and researchers benefited appreciably from the increased services, for of all the primary journals published, nearly 31 percent originated in the United States. But the access problem was not solved. The ratio of review articles published in social science journals to primary articles totaled only 1:133 (in contrast to the physical sciences where the ratio was 1:45) in 1974 (*16*, p. 143). Also, the exceedingly large growth in secondary services output was itself beginning to defy impositions of control.

The advent of the computer added appreciably to the

bibliographic control dilemma. In retrospect, Ludwig M. Eisgruber recalls that, following World War II, economists became interested in the "analytical potential of mathematical programming models and in their various special forms, in particular linear programing and transportation models" (*10*, p. 930). Such applications were delayed, however, until 1949 when mathematicians T. C. Koopmans, George B. Dantzig, and others developed linear programing techniques (*15*, p. 74; *6*, pp. 299ff).

As might be expected, governmental units and universities formed the vanguard in the use of linear programing for research, although it took the better part of a decade before its practical application became widespread. In 1950 only one agricultural economics department in the United States used linear programing in research work, no courses were offered on the subject, and no use was made of it in adult education. Then, beginning with Frederick V. Waugh's pathfinding article, "The Minimum Cost of Dairy Feed: An Application of Linear Programming" (*6*, pp. 299-310) in August 1951, a number of studies, 50 to be exact, appeared over the next decade (*10*, pp. 393-400). These, too, spurred interest. Subsequently, throughout the sixties, various symposiums, sponsored by International Business Machines, were held, and a number of conferences initiated by government agencies and universities. The agricultural press also took an interest, and a substantial amount of literature was generated on the subject of linear programing. New intellectual approaches to computer utilization resulted, and dynamic programming, simulation, management games, and automated budgeting came into being. Increased application stimulated output, and the published results added to the mounting body of literature.

A survey conducted for 1961-63 demonstrated the magnitude of the problem. Agricultural economists through this period published an average of 2,500 publications a year. Of this number, 51 percent were classified as research and professional papers; 44 percent, as informational or popular literature; and 5 percent, as miscellaneous. Title dispersement was large. Some 577 articles, for example, appeared in 119 research periodicals, and 1,815 articles, in 347 information or trade periodicals. Nearly 48 percent of the publications were monographs, either in series or singles (*17*, p. 59; *1*, p. 9).

The rate at which various secondary services indexed or abstracted this output was, in contrast, far from complete. Only 45 percent of publications on agricultural economics were included in the 8 major services surveyed. And, as might be expected, the publications most readily available to the researchers and to which they might have already been exposed—such as the leading journals and more familiar government documents—were most frequently indexed. Articles appearing in research and professional journals were indexed once or more, 80.5 percent of the time. Research monographs in series enjoyed a 72.1 percent coverage, and U.S. Government documents were indexed 65.3 percent of the time from 1961 to 1963. Publications emanating from universities and colleges, totaling more than one-half (53.76 percent of all economics literature output, suffered appreciably from lack of control. Secondary services included these documents in their files less than one-half the time (*17*, pp. 77, 29, 40; *1*, p. 10). As the title dispersement expanded and as literature became more esoteric, the risk increased that items would not be included in secondary sources. Articles appearing in trade or information periodicals, information reports or circulars not in series, unnumbered talks, papers, and research reports were rarely indexed or abstracted.

Duplication also occurs as secondary services often choose identical titles to include in their files, especially of journal articles and Government publications in series. Additional items chosen appear to be randomly selected and less frequently are duplicated. There is seldom demonstrated, therefore, a marked degree of consistency in indexing and abstracting. Researchers thus may be forced into the awkward position of searching two or more secondary sources to obtain needed information, and even then, there is no guarantee of the completeness of the results.

Certain farsighted persons within the American Agricultural Economics Association early recognized that agricultural economists needed indepth exposure to the literature in their field, and that at the same time they required emancipation from the burden of spending hours of research time searching for information. To satisfy these requirements, a group of individuals, headed by Harry Trelogan, then Administrator of USDA's Statistical Reporting Service, began in the spring of 1961 to organize an effort to establish a secondary service. Its mission, they envisioned, would be to collect, document, and disseminate information on literature produced by agricultural economists in the United States and Canada. It took nearly 9 years to achieve this goal. Standing committees were appointed, such as the Committee on Retrieval of Agricultural Economics Literature; unsuccessful efforts were extended to gain support from the National Science Foundation; conferences were held; and a study was commissioned to establish the necessity and feasibility of the proposed project. These efforts bore fruit. In January 1970, an American Agricultural Economics Documentation Center was established as a cooperative venture between the American Agricultural Economics Association and various agencies within the U.S. Department of Agriculture.

CURRENT TRENDS AND OUTPUT

The Documentation Center was established none too soon, for agricultural economists continued to expand the subject areas for research, and the use of the computer became commonplace. These researchers, of course, maintained an interest in livestock feeding opera-

tions and farm accounting; areas in which the computer was originally applied in agricultural economics. As a result, models became increasingly sophisticated, included the spectrum of livestock types, and, perhaps more importantly, found some application in farm management situations.

Irrespective of these efforts, the emphasis in agricultural economics remains one of research, development, and experimentation. Increasingly, agricultural economists have drifted away from the traditional areas of study, such as production, marketing, and farm accounting, to meet new challenges. A random sample of publications received by the Documentation Center reveals, for instance, that researchers are considering such matters as retirement planning for farm families, estate management problems, the labor market for agricultural graduates in India, and budget allocation models for large hierarchical research and development organizations (*14*; *10*, pp. 177-186; *20*; *5*, pp. 59-70). Other agricultural economists using input-output analysis, examine the economic impacts of resource use, particularly as they relate to changing agricultural land uses. Input-output analysis is also applied to study the impacts of urban growth on local government costs and revenues (*22*, *19*). Still other researchers study problems resulting from the open space concept in land use; they seek out the impacts of environmental policies and programs; and they examine questions relating to transportation and the training of transportation specialists at the college level (*7*, pp. 23-34; *13*, pp. 71-77; *3*). Also it is not uncommon to find, among the various reports received, feasibility studies relating to the locating of processing plants for agricultural products (*8*).

No empirical evidence exists to support the claim that there is a direct correlation between the extension of agricultural economics research and an increase in the number of publications produced. Similarly, no existing evidence draws a direct correlation between an increased use of the computer and a rise in publication output. On the other hand, such a correlation does appear likely, as a recent Economic Research Service in-house report indicates. That study reveals that the Agricultural Economics Documentation Center is currently receiving over 5,100 documents per year for input into the data file. The author of the report concludes, however, that this is but a portion of the publications extant on the subject of agricultural economics; that there exists somewhere beyond our immediate capability to capture as many as 12,600 such publications (*18*). If so, then in a period of a decade and a half, or since 1961-63, publication output has increased fivefold.

Monographs, as in the earlier period, still comprise the bulk of this output. But title dispersement has also increased to an unmarked degree. This fact, coupled with the expanding publication population, has increased the burden of providing secondary services, which, in turn, seriously affects decisionmaking processes concerned with setting priorities for resource use. Experience has taught us, for example, that bibliographic services generally suffer from a low priority within a management system. Progressive managers will admit to their value, and they usually support projects, if only with moderate funding. But given the circumstance when an information explosion takes place, as now, serious questions are raised regarding the allocation of resources. The foremost considerations are: to what extent is the data file used? How much is enough; will as many of the materials as are practically available be put into the file, or must limitations on input be set? And, if input is limited, who will choose the materials to be entered, and what will comprise the selection criteria?

These are legitimate questions and must be posed by managers. They result, however, not solely from current conditions but from the fact that satisfactory answers to unexplored questions were not pursued with sufficient vigor before the initiation of the various projects. Planners of secondary services initiated a decade or more ago could not have foretold how dramatically the output of publications would rise. Yet it remains a fact that, today, published materials do exist *en masse*, and they remain virtually uncontrollable with current resources. How do managers, then, approach this problem?

One way is by discriminating in selecting information to be entered into the system, and by changing the emphasis of the projects by encouraging increased user participation. Selective input results from choosing materials from publications found, by study, to consistently contain pertinent information of interest to users. Littleton discovered, for instance, that a bibliographical service in agricultural economics "can cover about 90 percent of the periodical literature by indexing and abstracting about 50 percent of the periodicals in which agricultural economists publish" (*17*, p. 59). Once these periodicals are identified, and studies completed to determine the allocation requirements for their capture and conversion into machine-readable form, a major portion of the resource allocation problem can be resolved.

A more fundamental problem exists with realining attitudes and emphasis directed toward the operation of secondary services. With the opportunity of establishing computerized information files, planners all too frequently stress input and maintenance functions while suppressing or ignoring users' needs. End users are seldom educated in the existence, purposes, benefits and limitations, or contents of information systems. Nor are they provided opportunities to interface interactively with files to any degree. Generally these activities are relegated to an intermediary, a terminal operator. User intimacy with systems is, therefore, rarely established. It is not uncommon to find secondary services underutilized for this reason. And this malady can be traced directly to the lack of emphasis given to the education of users.

CONCLUSION

Literature retrieval is a necessary function of research. In the past, when the output of research articles and monographs by agricultural economists was modest, access to the literature was gained through the "old buddy" system, or by manually searching a pertinent, but a limited number of publications. In recent years manual searching for bibliographic references has become increasingly time consuming and costly, and it proves of limited value because of the veritable explosion that has occurred in the publication of agricultural economics literature. To overcome these problems, various organizations adopted computer techniques to establish bibliographic control over these documents, envisioning as they did so that, by centralizing secondary services and increasing the speed of the retrieval process, the needs of researchers would be more fully met.

In theory, computerized bibliographical services have met the test. Online literature retrieval of surrogate documentation of agricultural economics literature has proven rapid, cost-effective, and reliable. Conversely, programs designed to maintain these systems are beset with difficulties, thus reducing the effectiveness of the services. Because of the population size of the literature extant, information systems seldom contain complete coverage of current publications while limited resources restrict input still further. And, for the reason that few efforts have been extended to educate users in interfacing with information systems, many files remain underutilized. Maximum utilization of information files as an aid in research, however, remains the *raison d'etre* of every system. Emphasis must be placed, therefore, on user education, since this will result in increased user demand. In turn, increased demand prompts the allocation of increased resources, and a broadened, increasingly sophisticated information system will result.

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IN EARLIER ISSUES

Statisticians are constantly trying to make their methods more precise, not only because of their scientific interest but also to meet the ever-increasing load which modern society throws upon statistical measurement.

Emerson M. Brooks
Volume I, Number 2, p. 37
April 1949

How complete is a "complete" census? About the only answer is "As nearly complete as the agency taking the census can make it with the resources and ingenuity at its disposal."

Charles F. Sarle
Volume I, Number 2, p. 62
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