Writing and the Productive Agricultural Scientist

LaRae M. Donnellan
Susan M. Ross

At a Northeastern land-grant university, 87% of Experiment Station scientists thought that writing was part of their responsibility as scientists. Eighty-three percent thought that it was important to publish for peers; only 50% felt a responsibility to publish for lay readers. Self-labeled productive scientists, compared to their colleagues, worked longer hours, spent more time writing, published more, and considered themselves successful writers. Writing skills, practice, a positive attitude, and graduate instruction in writing significantly influenced writing output. Station administrators must encourage scientists (through rewards and support) to communicate results with both the public and their peers.

Introduction

Many studies show that tenure, promotion, and salary decisions at universities depend heavily on quantity and quality of publications, especially those directed toward scientific audiences (Crane, 1970; Gastin, 1970; Hagstrom, 1971; Meltzer, 1956; and Siegfried and White, 1973). However, scientists at land-grant colleges, with their Agricultural Experiment Stations and Extension Services, have an obligation to do agricultural research and to disseminate that information to the public.

Dr. E. W. Allen, one of the early chiefs of the national Office of Experiment Stations, argued that Station scientists are obligated to publish the results of their research clearly, for both scientists and the public (cited in Cooperative State Experiment Station Service, USDA, 1962). F.D. Farrell, director of the Kansas Experiment Station, went one step further by arguing that Station scientists must publish for lay audiences because the general public, inevitably, pays the Station bill:

LaRae M. Donnellan *is Extension Associate Professor and Acting Head, Office of Information, at the University of Vermont. She holds a Ph.D. in communication and rhetoric from Rensselaer Polytechnic Institute (RPI). She has been an ACE member for 14 years, recently serving as Director of the Northeast region.*

Susan M. Ross *is Assistant Professor of Communication at Clarkson University. She is a doctoral candidate in communication and rhetoric at RPI.*

However irksome it may be to station people to take the pains consciously to popularize experiment station work, the necessity of doing it seems inescapable. To secure the desired popularization requires the devotion of time, effort, and money to activities which are in no sense experimentation or research....It is doubtful whether the American people ever make a better investment than they make when they appropriate funds to support agricultural experiment stations. But this fact is unknown to most of the people for whom and by whom the stations are maintained (cited in Cooperative State Experiment Station Service, USDA, 1962).

Nature of our Study

The question remains, however, as to how significant writing is in the eyes of Experiment Station scientists. To partially answer that question, we surveyed all 78 of the Experiment Station scientists at one Northeastern university during 1984-85 and received 62 usable responses. We included all Extension, Station, and teaching faculty on campus within the College of Agriculture. Our rationale for choosing these subjects was that we assume that faculty within a department probably were evaluated by a common set of criteria, although exceptions undoubtedly would be made in certain cases.

This faculty study was part of a larger study of research productivity that also involved agricultural college department chairs and administrators, plus university-wide administrators involved with the tenure-and-promotion process (Donnellan and Ross, unpublished).

We pretested our questionnaire at a neighboring land-grant college with a population similar to our final audience. Data from the Likert-like and short-answer questionnaire were analyzed statistically and textually. Measures of central tendency were determined where appropriate, and the following tests were performed: Spearman's rho, Kendall's tau, Mann-Whitney, Kruskall-Wallis, and Wilcoxon Rank. Most of the quantitative results are not discussed in this paper.

Focus

This paper focuses only on those study results that deal with the Experiment Station scientist as a writer. Whether scientists like it or not, research productivity usually is defined in terms of publications: work does not become "a work" until it is published (Fox, 1983).

We will discuss the different definitions of productivity, the importance of writing to our population of Experiment Station scientists, qualities of self-labeled productive versus unproductive scientists, factors affecting productivity, and ways to improve productivity. We will argue that Station administrators and editors must encourage Experiment Station scientists to write often, develop writing skills, and adopt positive attitudes toward writing. Scientists also need time, support, and rewards for writing well to both peers and the public.

Findings

Definitions of productivity. We found definitions of how research productivity should be measured differed, depending upon where one fit within the university hierarchy. University-wide administrators tended to emphasize the importance of a national reputation and publication in refereed journals. College of agriculture deans, department chairs, and faculty, however, tended to support a variety of outputs related to the mission of the college.

All university and college administrators emphasized the need to publish in order to be productive. Department chairs agreed, although they qualified their answers by saying that there were other ways of being productive. And yet they ranked refereed articles and books (items with a presumably broader audience) more highly than any other type of output, such as presentations, Extension publications, or departmental monographs (Table 1).

However, nearly one-third (32.8%) of the faculty said that it was possible to be a productive scientist without publishing. For example, someone might teach, consult, do other types of communicating, or be a nonwriting member of a research team. In addition, one respondent pointed out that occasionally Experiment Station scientists do research about which they are restricted (because of funding or copyright reasons) from publicizing.

When asked to define a productive scientist, the faculty tended to use other measures than publication, such as the quality of research, personal characteristics (e.g., highly organized, creative), or other communication outputs (Table 2).

Importance of Writing

About 83% of our respondents said that publishing results of their research for their peers is important to them. Only 50%, however, felt that it **was** important to publish their results for lay readers; about 37% said that it **wasn't** important to them.

Theoretically, Experiment Station research may be disseminated to the public through Extension Service and on campus classroom instruction. And yet, only 63% of our respondents said that it was important to share their research results with Extension and teaching faculty; 17.4% said that it was not important to them.

We also asked the faculty whether they thought that writing the results of their research was part of **their** responsibility as a scientist (rather

Table 1.
Average ranking of publications/productivitymeasures by department chairpersons (1=highest).

Type of publication/criterion	Rank
Professional review/peer recognition	1.0
Books	1.0
Refereed journal articles	1.3*
Publication in all appropriate places	2.0
National/International presentations	2.5**
Other, nonrefereed journal articles	3.0
Station publication	3.0
Conference proceedings	4.0
Popular press	4.0
Extension publications	4.5
Departmental monographs	5.0
Abstracts	6.0

*One chairperson attributed this measure to the university Faculty Affairs Committees, rather than to him/herself.

**International presentations were ranked higher (2.0) than national presentations by one chairperson.

than that of a staff writer). Nearly 87% said yes.

Qualities of Productive vs. Unproductive Scientists

Overall, 39 respondents (63%) rated themselves as productive scientists, 12 rated themselves as scientifically unproductive, and 11 gave qualified responses. In addition, 60% thought their colleagues considered them productive while 76% thought people outside the university considered them productive. Many of those who rated themselves as unproductive "scientists" said that they were not scientists but rather Extension workers or artists. One respondent argued that he was considered unproductive by his colleagues because he did work in an unpopular area.

To create a portrait of the self-described productive scientist (here we excluded all Extension Service faculty), we used several statistical tests to calculate correlations between and among several variables that may be related to productivity. We found that self-described productive scientists, as compared to those who described themselves as unproductive:

- devote more time to their jobs each week (49.5 vs. 39.8 hr) (p=.02);
- devote more hours each week to research (18.7 vs. 5.8 hr) (p=.0043);
- devote more hours each week to writing (6.4 vs. 1.7 hr) (p=.016);
- consider themselves successful writers (p=.014);
- publish more refereed journal articles (5.8 articles within the 6-year study period vs. 0.5) (p=.0002);
- publish more Experiment Station publications (p=.0083);
- give more invited presentations to professional societies (p=.0514);
- give more invited presentations to special interest groups or to the general public (p=.0138);
- supervise more theses (p=.04);
- seek more outside grants (p=.0044); and
- believe that someone can be productive without publishing (p=.013).

This last finding is particularly interesting, considering that self-described productive scientists **do** publish more than their self-described unproductive colleagues. None of this latter group indicated that you could be productive and not publish.

When asked what makes someone a successful writer, respondents gave several answers (Table 3). The greatest number (41.7%) dealt with

Table 2.
College faculty definitions of a productive scientist.

Criterion	Number of responses	% of total
Research	63	31.7
Personal qualities	62	31.2
Publications	37	18.6
Teaching	12	6.0
Presentations	9	4.5
Other (e.g., consulting)	9	4.5
Grants	7	3.5
Total	199*	100.0

*Total responses are greater than the number of respondents (n=62) because most respondents defined productive scientists as having many qualities.

having writing skills and practicing those skills. One scientist explained it this way: "Writing should be clear, concise, and understood. These [qualities] are essential to knowing how to write." Another 31% of the responses dealt with having a positive attitude toward writing, or, as one respondent said, "Not being intimidated by the thought of writing."

Factors Affecting Writing Productivity

In this section we discussed two sets of data. The first is opinions by the faculty as to what affected their ability to write. The second is an analysis of selected variables identified in the literature as supposedly affecting research productivity.

When asked how they learned to write technical manuscripts, respondents listed "practice" as the major way (Table 4). Interestingly, 63.2% of our respondents who considered themselves to be productive scientists used this method of learning to write while only 18.2% of the self-described unproductive group did.

Table 5 looks at a slightly different question. Here we asked faculty to tell us who most influenced their writing style. Graduate school advisers and professors lead the list, but a surprising number of respondents mentioned family members, especially mothers.

Many researchers (e.g., Clemente, 1973; Simon, Clark, and Galway, 1967; Zuckerman, 1967; Segal, Busse, and Mansfield, 1980; and Pelz and Andrews, 1976) have identified variables that supposedly influence productivity. However, the following variables did not seem to influence the publication of refereed journal articles published by our respondents in the 6-year study period (Note: 6 years is the standard time during which a junior faculty member may attain tenure):

- publishing one's first refereed

Table 3.
Qualities of a successful writer, according to faculty.

Quality	% of total responses
Writing skills, practice	41.7
Personal qualities (motivation, good attitude)	31.3
Knowledgeable, good data	14.6
Other (e.g., having a mentor)	6.9
Time management skills	4.1
Reputation, associated with a well-known colleague	1.4
TOTAL	100.0

Table 4.
How faculty said they learned to write technical manuscripts

How learned to write	% of total responses
Practice	28.8
Graduate school	22.1
Writing courses	17.3
Role models	13.5
Critiquing by associates	8.7
Help from Station editors	4.8
Don't write technical manuscripts	4.8
TOTAL	100.0

journal article before earning a Ph.D.;
- having a tenured or tenure-track position;
- holding a degree from the university at which you are employed;
- doing a post-doctorate;
- working at a university right after receiving a Ph.D.;
- being a man opposed to a woman;
- working in a perceived high quality department;
- using an outline in writing; and
- considering oneself to be a successful writer.

(Note: Self-ranked "successful" writers published an average of 6.06 articles during the 6-year period. That was twice the number (3.03) published by self-ranked "unsuccessful" writers, but the difference was not significant at the .05 level.)

On the other hand, the attitudes people hold about their own productivity, plus the number of hours they work each week and the time they spend doing research, are more important in influencing output of refereed journal articles.

Ways to Improve Productivity

When asked what changes they would make in their environment that would enable them to write more or better, respondents focused primarily on the need for a shift in demands on their time (Table 6). Less than 3% of the responses addressed the need for more money or space.

Conclusions

The productivity of Experiment Station scientists, like that of other university faculty, is evaluated on the basis of quality and quantity of publications. Because of the mission of land-grant colleges, however, Experiment Station scientists are mandated to share their information with the general public as well.

Our findings indicate that Col-

Table 5.
Sources of influence on faculty writing styles.

Influence	% of total responses
Graduate school advisors, professors	32.4
Miscellaneous (family members, books)	26.8
Station editors	11.3
English teachers	9.9
Colleagues, respected writers	9.8
Journals	9.8
TOTAL	100.0

Table 6.
Changes faculty would make in their environment to enable them to write more or better.

Change	% of total responses*
Shift in demands	32.0
Miscellaneous (more writing workshops, new administration)	17.5
None	13.6
More secretarial support	13.6
Encouragement	13.6
Team research	13.6
More space, money	2.9

*Total exceeds 100% because some respondents gave more than one answer.

lege deans, department chairs, and faculty, in general, support the importance of publications as a measure of research productivity. Other methods of communicating, such as video, TV, or radio presentations, popular publications, presentations to conferences or groups, classroom teaching, and consulting also are considered valuable.

In fact, the self-described productive scientists do both what the university administrators say they want (publish in refereed journals) and what college administrators and faculty say is the unique mission of the land-grant college (disseminate information to scientific peers and the public through a variety of media).

However, Experiment Station faculty may not be doing as good a job in communicating with the general public as they should. Our results show that Station faculty are less inclined to publish anything for a lay audience.

College and university administrators must do what they can to encourage faculty to write often, develop writing skills, and adopt a positive attitude toward writing. One way would be to shift demands on faculty so that they would have more time to do research and write their results. A second and often overlooked option would be to reward faculty for sharing their results with the public. As noted earlier, even college administrators rank refereed publications much more highly than they do popular publications or presentations.

Finally, Experiment Station administrators and editors should note the importance of role models and instruction (both faculty and editorial) in the training of future writers. Efforts should be made to make sure that existing faculty have good writing skills and attitudes and that future scientists are taught such skills and attitudes.

References

Clemente, F. (1973). Early career determinants of research productivity. American Journal of Sociology, 79 (September), 409-419.

Cooperative State Experiment Station Service, USDA. (1962). State agricultural experiment stations: A history of research policy and procedure. (Miscellaneous Publication No. 904). Washington, DC: U.S. Government Printing Office.

Crane, D. (1965). Scientists at major and minor universities: A study in productivity and recognition. American Sociological Review, 30, 699-714.

Fox, M.F. (1983). Publication productivity among scientists: A critical review. Social Studies of Science, 13, 285-305.

Gaston, J. (1970). The reward system of British science. American Sociological Review, 35, 718–732.

Hagstrom, W. (1971). Inputs, outputs and prestige of university science departments. Sociology of Education, 44, 375-397.

Meltzer, L. (1956). Scientific productivity in organizational settings. Journal of Sociological Issues, 12, 32-40.

Pelz, D.C., & Andrews, F.M. (eds.). (1976). Scientists in organizations: Productive climates for research and development. Ann Arbor, MI: Institute for Social Research.

Segal, S.M., Busse, T.V., & Mansfield, R.S. (1980). The relationship of scientific creativity in the biological sciences to predoctoral accomplishments and experiences. American Education Research Journal, 17 (Winter), 491-502.

Siegfried, J.J., & White, K.J. (1973). Financial rewards to research and teaching: A case study of academic

economists. American Economic Review, 63, 309-315.
Simon, R.J., Clark, S.M., & Galway, K. (1967). The woman Ph.D.: A recent profile. Social Problems, 15 (Fall), 221-236.
Zuckerman, H. (1967). Nobel Laureates in science: Patterns of productivity, collaboration and authorship. American Sociological Review, 32, 391-402.