

Grower Communication Networks: Information Sources for Organic Farmers

Abstract

This article reports on a study to determine which information sources organic growers use to inform farming practices by conducting in-depth semi-structured interviews with 23 organic farmers across 17 North Carolina counties. Effective information sources included: networking, agricultural organizations, universities, conferences, Extension, Web resources, personal experience, books, organic buyers/certifiers, and consultants. Results suggest that grower-to-grower networking is a highly effective information-seeking behavior for organic growers. Recommendations for Extension personnel include reshaping educational programming for organic growers to include peer-to-peer information sharing, as well as increased investment to graduate and undergraduate programs that train future Extension agents in organic production approaches.

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Introduction

There is an increasing need for accessible information sources that help organic growers learn about and implement alternative agricultural practices. Organic production, which emphasizes environmental stewardship through mandated practices for those farmers choosing to be third-party certified, is expanding rapidly as the market demand for organic products continues to rise among consumers (Kremen & Greene, 2003; Middendorf, 2007).

The national Cooperative Extension System has been an integral part of the Land-Grant University system and conduit of information for education, interpretation, and application of research-based knowledge since its inception (Park & Lohr, 2007). The flow of information among researchers, Extension, and growers is intended to be a dynamic and interactive process. Information exchange between organic, as well as conventional, growers and Extension has been analyzed, and numerous examples of how Extension can modify farming practices exist in the literature (Ingram, 2010; Kroma,

2006; Piaskowski, Weddell, Fuerst, Roberts, & Carpenter-Boggs, 2013; Warner, 2006).

There is limited data available regarding resources used by organic growers to learn about production practices, and no known studies offer growers' perspectives specific to the southeastern United States. Informal networks are understood to be a key way in which organic growers create their own dynamic information-sharing communities, leading to innovation in their agricultural production techniques (Kroma, 2006; Miller, 2006; Warner, 2006). For example, networks may arise through regional organic conferences, farm tours, online communities of practice, and newsletters, all increasingly common information sources for the organic community. Both technical scientific knowledge, as well as applied knowledge based on personal experience have been shown to be critical for successful management of organic and alternative cropping systems (Coughenour, 2003; Eshuis & Stuvier, 2005; Lentz & Nerbonne, 2003). Because it appears that organic growers often use several sources of information to adapt information to their own farming context, understanding how farmers rank them in importance, as well as behaviors used to access them, are particularly critical for Extension personnel (Middendorf, 2007; Sligo & Massey, 2006). Knowledge of the behaviors used by organic farmers to seek information, and the specific information sources used, would be tremendously useful in designing stronger Extension education programs to serve the organic sector.

The study reported here addresses the need for improved understanding of how information flows among organic growers, resulting in data that can inform organic agriculture Extension programming. Our objectives were to:

1. Rank the degree to which organic growers in North Carolina use various information sources, and
2. Determine the drivers, including organic farming history and experience, production status, farm scale, farming region, and innovativeness, of some information sources over others.

Methods

Qualitative and quantitative methods were employed for the study described here. Grounded Theory (Glaser & Strauss, 1967) guided both the research design and study implementation. Field research was conducted from March 2010 to May 2010 at sites across 17 counties throughout North Carolina. Grower data were collected through use of semi-structured interviews, field observations, and demographic and agricultural databases.

Selection of Grower Respondents & Field Sites

Growers were recruited for study participation at regional grower events and through email requests to three regional email lists. An initial group of approximately 70 potential respondents was compiled in January 2010 and narrowed to 23 growers based on geographic range, variety of production methods, willingness to participate, and project guidelines. Most of the original set of 70 growers were willing to participate yet did not fit our project guidelines, with those not willing stating they were too busy to accommodate the interview. Because growers were recruited using events or lists generally subscribed to by many organic growers, this introduced a source of bias to our selection pool.

Field sites were distributed across North Carolina attempting to cover ecoregions varying by

seasonality, temperature, rainfall, elevation, and soil type. Counties in which interviews took place are shaded gray (Figure 1). The variations in climatic conditions across the state were addressed through purposeful respondent selection and geographically neutral interview questions. Because organic growers vary in their production practices, we focused our interview questions on how farmers learn the practice of cover cropping, a common technique used among many scales and geographic regions in North Carolina. Cover cropping is the practice of using non-market crops for the purpose of improving soil fertility, building soil organic matter, reducing erosion, suppressing weeds, retaining soil moisture, and retrieving nutrients in the soil (Magdoff & Van Es, 2009). Thus, growers were ultimately selected based on the following criteria, in addition to the selection biases introduced by the grower listserv and attendance at conference events:

1. Use of cover crops in an organic farming system
2. Production of at least one acre intended for market
3. Willingness to participate in on-farm interview

Figure 1.

North Carolina Map Indicating Counties of Farm Field Site Locations Visited for Organic Grower



Interviews

Interview Process

Interviews were conducted at each respondent's farm location and ranged in approximate duration from 20 to 90 minutes, using open-ended questions regarding information sources used by respondents to learn about organic methods, and cover cropping in particular. For qualitative analysis, we implemented methodologies adapted from Miles and Huberman (1994). Interviews were digitally recorded and transcribed, and final versions were sent to each respondent to verify accurate representation. Interview transcripts were uploaded to Atlas.ti (v 6.1.2) Qualitative Data Analysis Software, and a list of descriptive codes were developed based on specific interview questions, grower responses, and general interview themes. All pertinent data organized by thematic code (Not shown; Glaser & Strauss, 1967; Rogers, 1983).

Information Collected During Grower Interviews

Grower information assessed at the time of interviews included:

- Years of organic farming experience,
- Organic farming history (originally organic or transitioned from conventional),
- Certification status (certified organic or non-certified organic),
- Farm size
- Geographic region in North Carolina, and
- Ranking of relative level of innovativeness as determined by interviewer based on grower use of unconventional production methods, on-farm experimentation, or involvement with alternative agricultural research projects.

Each grower was also asked to cite the specific most effective and least effective information source or information-seeking behavior they have used via an open-ended questioning strategy. An information source (Table 1) was identified and coded based on grower referencing of the source. "Frequency of mention," or mean number of times an information source or behavior was mentioned spontaneously in a given interview, was determined to indicate usefulness of behaviors or sources that may be used across different learning scenarios (Figure 2). For example, "networking" with farmer peers might be used to learn about cover-cropping strategies and about cover crop seed sources, thus it would be quantified as two "mentions." If a grower used a "book or published material" acquired by Extension, or mentioned "organizations" and their associated "conferences," and named both, both were quantified. Means comparisons made across all sources and behaviors within grower sub-groups (Table 2). All data were analyzed using JMP (Version 9.0 Pro SAS Institute, Cary, NC). Responses in tables with different letters indicate statistically significant differences at the 0.05 level of significance, using the Tukey-Kramer Honestly Significant Difference test.

Table 1.
 Descriptions of Information Sources and Seeking Behaviors Cited by Grower Respondents

Source	Description
Networking	Face-to-face interaction with other growers, individuals, neighbors, or family members; classified as direct dialogue with other growers.
Organizations	Non-profit outreach and education centers, growers' associations, local foods groups, grower support, and land conservation organizations.
Organic Buyers/ Certifiers	Organic buyers occasionally providing information to growers and requesting production of specific crops. Organic certifiers involved in information exchange with growers.

Conferences	Attendance of structured agricultural conferences with the purpose of sharing knowledge, not limited to organics.
Universities	Formal coursework or internships associated specifically with a school, university, or college.
Personal Experience ("self")	On-farm trial and error, grower experimentation.
Books/Published Materials	Textbooks, magazines, journal articles, seed catalogues, and other published written materials.
Farm Consultants	Individual hired to provide advice on a respondent's farm, or associated with sales of particular commercial products.
Cooperative Extension Services	Extension institution, individual Extension agents.
Online resources	General agriculture-related searches, specific websites, blogs, and email list serves.

Results & Discussion

Information sources and seeking behaviors identified by growers are shown in Table 1.

Frequency of mention (FoM; Figure 2) data shows networking, organizations, universities, and books to be among the most frequently mentioned sources and behaviors used by organic growers. Networking had the highest FoM, significantly higher than online, personal experience, certifiers, and consultant sources and behaviors, while organizations, university, and books were statistically indistinguishable from networking. Organic certifiers and consultants were mentioned fewer times than all other sources and behaviors except online sources and self.

Networking

Across all respondents, networking was mentioned most often and was also identified as the "most effective" source of information," with seven respondents suggesting networking activities when prompted to provide what they thought to be the most effective information source for them (Figures 2 & 3). Although not significant, innovative growers were more likely to mention networking over other sources and behaviors, with a mean FoM of 1.7 times per respondent (Table 2).

The following respondent statements are representative examples of overall comments about networking as an effective information seeking activity.

"I would say more than anything these days, I get information just from conversations."

"Well of course, talking to other organic farmers, you learn a lot. You hear people talking about—'this is my main source for building my soil'—from another farmer."

"I've got a network of people that I personally start pulling from who know[s] what's going on. I think it would be better if we had ... everybody connected on the same page—hey, this is looking really great, or this isn't working, or this is going to change."

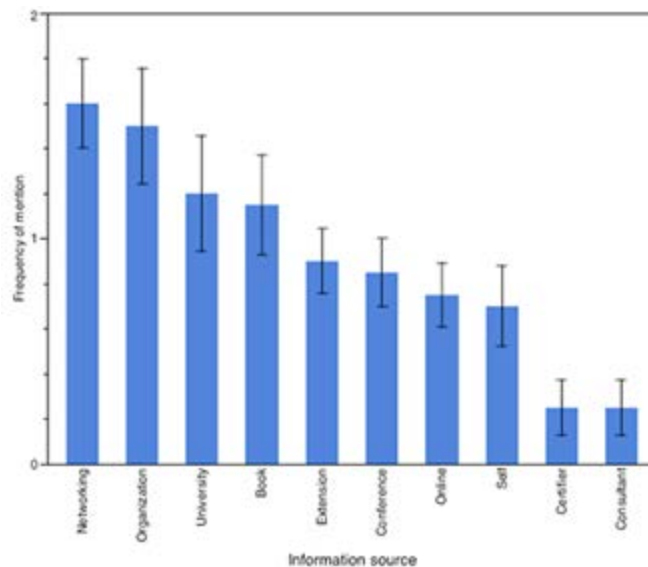
The importance of peer interactions and personal relationships in information transfer has been observed to be a key learning activity for private forest landowners using sustainable and alternative practices as well, where 90% of forest owners in sample of 1,767 were stated to obtain information through personal relationships, including peers and professional foresters (Sagor & Becker; 2014). This evidence that peer interaction is an important learning tool for alternative natural resource management approaches provides compelling opportunities for Extension to build programming that includes peer-to-peer activities for organic growers.

We predicted that grower networking would be especially important for novice growers and those transitioning to organic production. However, when asked to identify the most effective information source or behavior, no novice growers specifically listed networking, where instead novice growers most frequently mentioned organizations (three of the 10 novice growers). Interestingly, the only mention of organizations as the "most important" source came from growers with fewer than 10 years of experience. This may be because the ability to network may come only after meeting other organic growers, learning which ones can serve as valuable information sources, or new farmers have a full orientation to the topic, as suggested here:

I think I got some basics [from books]...That's important to orient you with anything. Then once you know something about it, you can have conversations with people about it on a deeper level if you already have experience or education on it.

Figure 2.

Mean Frequency of Mention for Each Information Source (n=20)



Organizations

Organizations, including commodity growers' associations and regional and national non-profit groups, were the second most frequently mentioned information source across all growers (Figure 2). There was an association between novice growers with 10 or fewer years of experience and those with more than 21 years, mentioning organizations more frequently (FoM's of 1.6 and 1.8, respectively, Table 2) than those with moderate experience levels of 11-20 years (FoM of 0.75).

Reasons for the frequent mention of organizations as a commonly used information source is possibly due to the diversity of channels through which these organizations serve organic growers, including social opportunities, conferences, and technical training, capturing some of the diversity of resources specifically mentioned by farmers and quantified in our study and captured by the FoM data under these corresponding activities that organizations support as well as the organizations themselves. This support system is likely appealing to a novice grower. One grower explained that he finds workshops conducted at one particular organization to be especially helpful:

I just have a lot of confidence in the experience of others and those who conducted the workshop who touted the benefits of it. I feel like I'm reaping those benefits although I don't have them quantified yet.

University Resources

Across all interviewed growers, 3 cited university resources as being the most effective (Figure 3). University resources included formal academic programs and training, coursework, internships, often associated with, but not exclusively, including credit-bearing activities. Although Extension is part of the Land Grant University system, Extension resources were quantified separately. College/University training was not quantified, and thus university resources might cross formal and informal boundaries. Of the 16 growers who were originally organic, rather than having transitioned from conventional

agriculture, were found to not rely primarily on information gained via university resources, with only 1 citing university resources as the most effective resource compared to 2 of the 3 transitioned growers (data not shown). Interestingly, farmers who had taken advantage of university resources were most often categorized as "regular", as opposed to "innovative" growers. In terms of FoM, originally organic growers mentioned university resources only 1 time, compared to the transitioned growers' mean of 2 (Table 2). Many of the transitioned growers reported that they had been trained in traditional agriculture programs at academic institutions.

We found less of knowledge gained via university resources by originally organic producers. This suggests that these growers may have less access to programs where they can learn about novel organic production techniques. Such courses and programs have only began to emerge in the academic system a few decades ago and may become a more common way for growers to learn about organic production.

Region of the state in which one was farming was associated with the value farmers placed on university resources. Universities were more often cited as the most effective resources in Central (2 growers) and Eastern NC (1 grower) than in Western NC (0 growers) (data not shown). North Carolina's Land Grant institutions including North Carolina Agricultural & Technical State University (NCA&T) and North Carolina State University (NCSU) are located in Central NC, possibly driving this observation.

Table 2.
Mean Frequency of Mention for Each Information Source

RESPONDENT TYPE	Innovation		Experience (yrs)			History		Organic Certification status		Scale (acres) *No farms 51-100 were recorded in sample set			NC Region		
	Innov. (10)	Reg. (10)	0-10 (10)	11-20 (4)	>21 (6)	Org. (16)	Trans. (4)	Cert (11)	Non (9)	1-10 (11)	11-50 (5)	*101+ (4)	East (6)	Central (9)	West (5)
Networking	1.70 a	1.5 a	1.5 ab	1.75 a	1.66 ab	1.5 a	2.0 a	1.73 a	1.44 a	1.82 a	1.0 a	1.75 a	1.83 a	1.78 a	1.0 ab
Organizations	1.4 ab	1.6 a	1.6 a	0.75 ab	1.8 a	1.37 a	2.0 a	1.82 a	1.11 ab	1.27 ab	2.0 a	1.5 a	1.83 a	1.0 abc	2.0 a
Books	1.3 ab	1.0 ab	1.5 ab	0.5 ab	1.8 a	1.31 a	0.5 a	1.18 ab	1.11 ab	1.18 ab	1.2 a	1.0 a	1.0 a	1.22 ab	1.2 ab
Conferences	1.0 ab	0.7 ab	0.7 abc	1.0 ab	1.0 ab	0.87 ab	0.75 a	0.91 ab	0.78 abc	1.0 abc	0.8 a	0.5 a	0.67 a	0.78 abc	1.2 ab
University	0.9 ab	1.5 a	1.5 ab	1.0 ab	0.83 ab	1.0 ab	2.0 a	1.45 ab	0.89 abc	1.18 ab	0.4 a	2.25 a	1.67 a	1.1 abc	0.8 ab
Extension	.70	1.1	1.1	1.25	0.33	0.87	1.0 a	0.82	1.0	1.1	0.6 a	0.75 a	0.67	1.11	0.8

	ab	ab	abc	ab	ab	ab		ab	abc	abc			a	abc	ab
Online	.70 ab	0.8 ab	0.9 abc	0.75 ab	0.5 ab	0.87 ab	0.75 a	0.64 ab	0.89 abc	0.72 bc	0.6 a	1.0 a	0.67 a	0.89 abc	0.6 ab
Self	1.0 ab	0.4 ab	0.3 bc	1.0 ab	1.16 ab	0.69 ab	0.75 a	10. ab	0.33 bc	0.27 bc	1.4 a	1.0 a	1.17 a	0.44 bc	0.6 ab
Certifier	0.3 b	0.2 b	0.2 c	0.0 b	0.5 ab	0.12 b	0.75 a	0.45 b	0.0 c	0.09 c	0.4 a	0.5 a	0.5 a	0.0 c	0.4 ab
Consultant	0.3 b	0.2 b	0.2 c	0.5 ab	0.16 b	0.12 b	0.75 a	0.45 b	0.0 c	0.27 bc	0.4 a	0.0 a	0.17 a	0.44 bc	0.0 c

Note: Responses with different letters indicate statistically significant differences at the 0.05 level of significance within columns using Tukey-Kramer Honestly Significant Difference.

Conferences

Small-scale grower conferences for organic producers are common throughout the U.S. and were the 6th most mentioned effective information source and behavior across all growers (Figure 2) in terms of the number of times it was mentioned.

Interestingly, growers with more than 10 years of experience cited conference information and attendance of conferences as the most effective information source and behavior more often than did novice growers, who did not cite conferences as most effective in any of our interviews. This association was supported by FoM data (Table 2). This finding was surprising, as many offerings at regional organic agriculture conferences are geared toward novice farmers, thus making conferences an expected effective source of information for novice growers.

Only one of the total 11 small-scale growers (fewer than 10 acres) rated conferences as the most effective information source, while no medium to large-scale growers rated conferences as the most effective, possibly driven by the fact that many conferences emphasize horticultural production practices often found in small acreages. The trend in FoM data supported these findings, with increasing FoM of conference programming as farm scale decreased (Table 2). Recently in North Carolina, conferences focused on commodity crops, tobacco, and livestock, have been established and are predicted to be a successful networking opportunity for growers from larger scale operations.

Two of the five growers in Western NC rated conference attendance as the most effective information source and behavior used compared to growers elsewhere in the state, who did not mention conferences being effective at all (0 for both; data not shown), likely driven by a prominent conference, which is held annually in the western region of the state.

Extension

Extension was mentioned specifically as a least effective information source for seven of the total interviewed growers and the most effective for two (Figure 3). Use of Extension as the most effective tool for learning about organic production practices was found to be higher as farm size increased, yet

this trend was not supported by FoM data.

One interviewed grower with more than 21 years of experience cited Extension as the most effective information source and mentioned Extension in interviews an average of only 0.33 times (Table 2). This was compared to the 14 farmers with 0-20 years experience, one of whom cited Extension as the most effective source, yet mentioned Extension an average of 1.2 times each (Table 2). Specific explanatory data was not collected regarding why more novice respondents commonly mentioned Extension in their interviews, yet did not find them to be the most effective source. This apparent contradiction might be due to quality of information received from Extension agents regarding organic production, or variation in agent expertise, with some agents being more helpful than others.

Individual agents' organic production knowledge and general acceptance of organic production are varied within Extension. The majority of interviewed growers provided mixed opinions on the role of Extension within organic production, and many respondents identified specific agents who have far surpassed expectations and have assisted them tremendously.

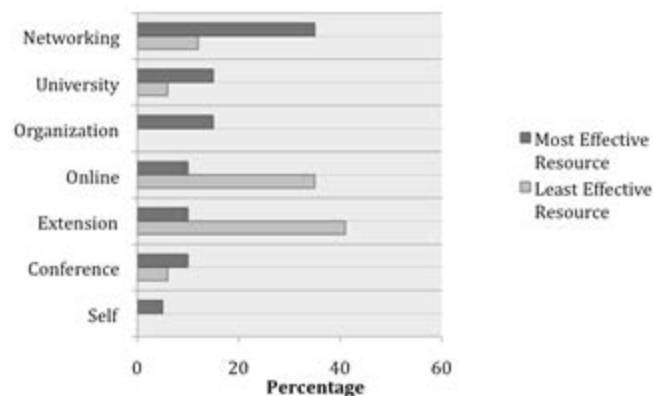
I guess I haven't gone to Extension as much. I do work with Extension on the conventional side [of my operation]. I guess on the organic side, they don't have as much information to give on that. They've been focused on conventional farming. When I'm the only organic farmer in [x] county, they can only devote so much time to learning what I'm doing.

I'm a lifelong learner, so I do get information from our county Extension agent. We have a fantastic agent here who works with all our alternative crops and alternative growers and he has some good information.

While a very knowledgeable agent might provide useful information to a grower and be mentioned several times in an interview as a source for different types of information, they might not be the most effective source for information among all of those available to organic growers.

Figure 3.

Responses to "What Is the Most and Least Effective Resource You Have Used?" (n=20).



Online Resources

Online resources were generally cited as a less effective information source overall (Figure 3) and were mentioned only occasionally as a supplemental information source among organic growers (mean of 0.75 times mentioned per respondent; Figure 2). This was surprising, because existing data suggests that organic growers may have had increased Internet access before conventional growers, where in 2004 almost 78% of organic growers had Internet access (Walz, 2004), while in 2007, only 57% of *all* growers nationwide had Internet access (USDA Census of Agriculture Organic Survey, 2008).

Recently, important alternative online resources have begun to emerge, such as the eOrganic online community that is part of the national online Extension eXtension service. The goals of eOrganic include engagement of farmers, agricultural professionals, and other members of the organic agriculture community with timely and relevant science-, experience-, and regulation-based information in a variety of media and educational formats (eOrganic, 2012).

Personal Experience

One interviewed grower specifically mentioned himself/herself as the most effective source of information (i.e., "self"; Figure 3), with a FoM of 0.7 times per respondent (Figure 2). Often in reference to on-farm experiments and trial-and-error, this was an important indicator of innovativeness. Some growers relied heavily on their own previous experience:

"I have to. There's no one to follow the lead. I'm trying to make my own leads."

"Really, my best teacher has been doing it. I guess just the practical approach."

Conclusions

Our data provide strong evidence that organic growers place more value on interactive learning, with the most frequently mentioned and most effective information sources generally involving interactive exchange of information rather than a linear transfer of facts. Networking was highlighted as the number one information source and behavior through which the farmers in our sample learned, agreeing with other studies demonstrating that farmers and natural resource managers value social learning and networking for development of their management practices (Sagor & Becker, 2014; Millar & Curtis, 1999; Roling & Wagemakers, 1998).

Our findings suggest that organic growers view Extension as a supplementary, rather than a primary, source of information. Due to the dynamic state of knowledge about organic agriculture production, other scholars have suggested that an organic knowledge base has yet to be fully instituted within Extension (Ingram, 2010; Park & Lohr, 2007; Warner, 2006). The question remains as to the degree to which organic growers do or will use the growing number of organic agriculture resources available through Extension (Ingram, 2010). Our research suggests that Extension has an opportunity to not only provide research-based information to growers, but more importantly evolve training activities to

include peer-to-peer learning as part of their facilitated activities so that growers can then share information and experiences, resulting in negotiated production and management approaches used on the farm (Bonny, Prasad, Narayan, & Varughese, 2005; Ingram, 2010; Miller, 2006).

So how can Extension be reimagined to play a stronger and more useful role in the organic community? Because results suggest that organic growers tend to transfer information through face-to-face networking, specific targeting of this behavior is warranted. For example, Extension agents might present information about Extension resources at regional organic meetings, or create facilitated social gatherings focusing on a particular production challenge or opportunity. Recently in the Southeast, new Extension agent hires with previous experience in organic agriculture have had great success building community among growers and facilitating transfer of information through activities such as inviting farmers to discuss their farming operations with others on-farm, designing and promoting websites synthesizing information relevant to organic production, or organizing symposia where regional experts are invited to present evidence-based data in a farmer-friendly format. One of the key features of these agent hires is that they come to the organic community with solid experience in organic approaches and a genuine interest in organic agriculture. Most have gained this experience via graduate programs at Land Grant institutions where they conducted research in organic agriculture, others have had significant on-farm experience. This suggests that investing in the hiring of such individuals, as well as the graduate programs that train them, is a key feature in building stronger ties between organic growers and Extension programming.

Further research is warranted to determine which Extension education approaches increase organic farmer learning, as well as grower preference of Extension personnel; do growers prefer learning from other growers over Extension educators, or vice versa? If Extension is going to play a major role in organic education, how are Extension staff members trained in this arena?

Our work also suggests strong grower interest in further data collection regarding perceived cultural barriers between the organic and conventional agricultural communities. Although outside the scope of the study reported here and not quantified directly, most interviewed growers commented that they did not feel agents understood their own "organic" perspective, and thus they sought other information sources to help guide their production practices. The mention of this cultural divide was consistent among respondents and is worthy of further investigation to learn how this perception might impact Extension education. Our findings demonstrate great potential to increase the role of Extension in organic and sustainable agriculture. To achieve this goal, Extension must continue to evolve with innovative activities that come from trusted individuals with organic experience.

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