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**A NEEDS ASSESSMENT OF AQUACULTURE EXTENSION AGENTS, SPECIALISTS,  
AND PROGRAM ADMINISTRATORS IN EXTENSION PROGRAMMING****Michael H. Schwarz**

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**Abstract**

*The purpose of this study was to identify continuing education and training needs of aquaculture Extension agents, specialists, and program administrators on the list serve AQUA-EXT. Ten competency areas were evaluated regarding perceived importance, and need for continuing education or training. In addition, 14 resources on the Aquaculture Network Information Center (AquaNIC) Web site were evaluated from this population for frequency of use and recommended improvements. Data were collected with an online survey conducted via the interactive and encrypted Web site [www.survey.vt.edu/](http://www.survey.vt.edu/). A majority of Extension agents, specialists, and program administrators did not require significant continuing education or training to accomplish their work effectively. However, general agreement among the three groups was for continuing education in the areas of program evaluation, information technologies, and human development. Regarding the AquaNIC Web site, 52% of Extension agents, 71% of specialists, and 81% of program administrators reported having used AquaNIC, however, use was infrequent. Recommendations to enhance Web site utility focused on requests to update and incorporate more comprehensive and in-depth information for all resource areas. Demographics indicated mean ages for Extension agents, specialists, and program administrators were 47.9, 50.5, and 51.5 years respectively. Sixty three percent of agents indicated having master's degrees, and 63% and 72% respectively of specialists and program administrators indicated having doctorates. Means for years in their present position were 13.4, 13.2, and 8.4 years respectively for Extension agents, specialists, and program administrators, and 16.6, 16.1, and 15.5 respectively regarding total years in Cooperative Extension or Sea Grant.*

**Introduction**

Aquaculture is defined as the culture of aquatic organisms under controlled or semi-controlled conditions (Stickney, 1996). According to the Food and Agricultural Organization of the United Nations (FAO; 2003), total world fishery production in 2002 was 133 million tons, of which 41.9 million tons came from aquaculture. In the United States (U.S.), per capita consumption of seafood rose to a record 16.3 pounds of fish and shellfish per person in 2003 ("Seafood consumption," 2004). However, due to many inherent aquaculture production issues in the U.S. such as environmental regulations and high labor, land, and energy costs, much of

this seafood is cultured overseas and imported. This contributes to a national seafood trade deficit in excess of \$7 billion annually (National Marine Fisheries Service, 2004). The largest trade deficit for any agricultural commodity, it is second only to petroleum for any natural product (U.S. Department of Agriculture/Agricultural Research Service Aquaculture Action Plan, 2003).

In an effort to decrease this trade deficit, reduce our reliance upon imported foods, enhance food biosecurity issues, and provide for new employment opportunities in rural America, governmental agencies such as the National Oceanic and Atmospheric Administration (NOAA), the U.S. Department of Agriculture (USDA), and Sea Grant under the Department of Commerce (DOC) are working together to enhance aquaculture as a viable agricultural sector in the U.S.. According to Swann and Morris (2001), outreach education via the Cooperative Extension Service (CES) is a core component toward the long-term development of an economically and environmentally sound aquaculture industry in the U.S., and recently the CES has been identified by various federal agencies as a viable and effective system for integrating research, outreach, and clientele.

The Cooperative State Research, Education, and Extension Service (CSREES) is the federal partner in the CES and is responsible for distributing the annual Congressionally appropriated formula funding to supplement state and local funds (CSREES, 2004). These funds are leveraged with state and local funds and directed through land grant colleges and universities to implement Extension programming with the end user or clientele. Within this model, clientele needs are identified and communicated to researchers at land grant institutions as appropriate, with science-based results then disseminated back to the clientele via Extension in an appropriate and user-friendly format. At the grassroots level, aquaculture Extension agents work directly in the field and interact as needed with aquaculture producers, educators, other interested parties, and the public. To assist with aquaculture Extension programming at the local level, as well as to address specific subject matter issues, aquaculture Extension agents team with aquaculture Extension specialists. These specialists have strong subject matter experience in aquaculture and interact on a more frequent basis through home department affiliations in their institutions and directly with university researchers. These specialists establish the indirect linkage of CES between clientele and land grant university-based research and appropriately interpret needs and disseminate information (Taylor & Summerhill, 1994).

As compared with other agricultural commodity groups in the U.S., aquaculture production was slower to develop in the U.S. and did not come into prominence until the 1960s (Stickney, 1996). While aquaculture is still considered an emerging industry as compared to other agricultural sectors, it has since grown to a 3.5 billion dollar industry (National Marine Fisheries Service, 2004). As such, many issues related to the needs of clientele, as well as those of aquaculture Extension agents, specialists, and program administrators are not well known. To better understand these relationships, the USDA and CSREES conducted a national questionnaire of Extension and Sea Grant Extension educators in 2003 (Jensen, Murray, & Mayeaux, 2005). The questionnaire for this study was broad-based and solicited information in the following areas: position, career, professional growth and development, Extension, information and technology, research, regional and multi-state, national, international, clientele, accomplishment reporting, extramural funding, and future and emerging issues (Jensen & Murray, 2003). This initial survey provides an effective baseline from which to begin more in-depth studies.

### **Problem Statement**

Aquaculture Extension programming through the CES and Sea Grant is an integral programming component for U.S. federal, state, and local governments seeking development of aquaculture as a viable industry. Uniquely positioned at the grassroots level, the aquaculture Extension agent and specialist are at the very heart of aquaculture Extension programming. The joint USDA/NOAA national aquaculture survey from 2003 establishes a baseline of data and information for future assessments (Jensen, Murray, & Mayeaux, 2005). However, we still require a firm understanding of what Extension agents, specialists, and program administrators need to effectively enhance programming initiatives. In addition, the Aquaculture National Information Center (AquaNIC), supported by the USDA, NOAA, and Sea Grant, was established to be a gateway to the world's electronic resources for aquaculture information. While this Web site is designed to assist aquaculture Extension agents, specialists, and program administrators in their respective programming initiatives, an evaluation of this Web site from the perspective of this particular user group has never been conducted.

### **Purpose**

There are increasing pressures for CES and Sea Grant, as well as other government agencies, to enhance program efficiency, productivity, and accountability, and to address the rapidly increasing national aquatic foods trade deficit through increasing domestic seafood production. The CES has historically been instrumental in assisting agricultural development in the U.S.. Likewise, aquaculture Extension programming and outreach education has been an integral programming component for federal and state governments in development of an economically and environmentally sound aquaculture industry (Swann & Morris, 2001). Uniquely positioned at the grassroots level, the aquaculture Extension agent and specialist is at the very heart of aquaculture Extension programming, and according to Swann and Morris (2001), outreach and education with an emphasis on Extension is a key component to further development of sustainable aquaculture in the U.S. The joint USDA/National Oceanic and Atmospheric Administration (NOAA) national aquaculture survey from 2003 established a baseline of data and information for future assessments (Jensen, Murray, & Mayeaux, 2005). However, we still need a firm understanding of what Extension agents, specialists, and program administrators need to effectively enhance programming initiatives.

In addition, evolution of the Web is impacting most every facet of our daily lives. Some aspects of the Web include almost immediate access to vast amounts of information and other individuals. With the evolution of aquaculture in the U.S., an information and technology transfer need has developed. To address this need, AquaNIC was developed at Purdue University. This information and learning resource is Web-based and designed to help prospective and active aquaculturists learn additional information, access knowledge, and link with other aquaculture Web sites and databases on the Web. The Aquaculture Network Information Center (AquaNIC) is a Web-based information and learning resource that is one of the nation's first network information centers to serve as a gateway to the world's electronic aquaculture resources. Given the relative newness of aquaculture as an industry (Stickney, 1996), the complexity of issues limiting further expansion of aquaculture production in the U.S., and the significant challenges facing aquaculture Extension programming, identification of continuing education and training needs of aquaculture Extension agents, specialists, and program administrators is of paramount concern. In addition, given today's reliance upon computers and electronic media, a specific emphasis on identification of information technology (IT) training needs for this group is appropriate (Swann & Morris, 2001). Furthermore, the rapid emergence of the Web provides the capacity for immediate access to information and

resources, resulting in an increased reliance upon this medium by Extension for information. As such, an evaluation of these needs is appropriate to determine if the AquaNIC Web site is satisfactorily addressing these needs.

### **Objectives**

The specific objectives of this study were:

1. To identify perceived continuing education and training needs of aquaculture Extension agents, specialists, and program administrators in 10 identified competency areas, as well as a perceived relative importance of each. Eight of the general competency areas were identified in the 1968 National Policy Statement on Staff Training and Development, as cited in Gibson and Hillison (1994). These were:

- Extension organization and administration,
- Program planning, development, and implementation,
- Communication,
- Research,
- Human development,
- Educational processes,
- Social systems, and
- Effective thinking.

For the purpose of this study, the competency areas were expanded to include the following:

- Program evaluation, and
- Information technologies (IT).

2. To determine electronic information resources presently utilized by aquaculture Extension agents, specialists, and program administrators within the AquaNIC Web site and identify those which need to be improved upon to enhance Web site utility to this population.

3. To identify demographics of Extension agents, specialists, and program administrators within the AQUA-EXT listserv, and how these may relate to individual education and training needs.

### **Theoretical Base**

Extension personnel are well suited to identifying continuing education and training needs that would benefit them in their positions. Gibson (1992) found varying degrees of training requirements in the areas of research, program planning, and extension organization, for groups with different appointments in extension, while all groups identified program planning as very important. Jensen and Murray (unpublished), as well as (Radhakrishna & Martin, 1999), found a similar ability of extension agents to be able to self-evaluate continuing education, training, as well as information needs required to enhance program effectiveness. However, in the U.S., a firm understanding of what aquaculture Extension agents, specialists, and program administrators need to effectively enhance programming initiatives for an emerging aquaculture industry hindered by a complexity of emerging issues is still required.

### **Methods and Procedures**

#### *Population*

The population for this study was the entire list of subscribers to the Cooperative State Research, Education, and Extension Service (CSREES) mail group listserv entitled AQUA-EXT (N = 223). This listserv is an electronic database containing the email addresses of individuals with

some form of appointment or responsibility in aquaculture Extension programming, and is managed by Dr. Gary Jensen, National Program Leader for Aquaculture, United States Department of Agriculture (USDA) - CSREES. The use of these email addresses was granted and provided by Dr. Jensen.

### *Instrumentation*

The survey was conducted online via the interactive, encrypted Web site <http://www.survey.vt.edu/>. Each individual at the onset of the survey identified themselves by their email address. This email address was not associated with survey response data to maintain confidentiality, but rather utilized to identify those who submitted and those who did not submit the online questionnaire. This allowed discernment between respondents and nonrespondents (Gregg & Irani, 2004; O'Neill, 2004). Once identified, non-respondents were followed up with additional email prompts, and as needed, subsequent telephone calls (Dillman, 2000; Ilieva, Baron, & Healey, 2002). The researcher's email address, telephone number, and cell phone number were made available to the population in the event any questions or unexpected problems arose at any time.

### *Data Analysis*

The first objective of the study was to identify the perceived relative importance and continuing education and training needs of aquaculture Extension agents, specialists, and program administrators in 10 identified competency areas, with an emphasis on situation analysis, program design, implementation, and evaluation.

### *Procedures*

Perceived relative importance and continuing education and training needs of aquaculture Extension agents, specialists, and program administrators for the 10 competency areas were identified utilizing a self-rating interval scale of one through four, and were determined utilizing means and ranking.

The second objective of the study was to determine electronic information resources presently utilized by aquaculture Extension agents, and program administrators within the Aquaculture Network Information Center (AquaNIC) Web site, and identify AquaNIC resources which needed to be added or improved upon to enhance Web site utility to this population.

### *Procedures*

Utilization of electronic resources on the AquaNIC Web site were evaluated utilizing an interval scale of one through five, with one representing "never use," followed sequentially up the scale with "once or twice a year," "approximately once every 3 or 4 months," "approximately once a month," and "more than once a month." These results were expressed utilizing means and ranking. AquaNIC resources which needed to be enhanced or new resources to be added were identified via open-ended questions, with results grouped into similar categories and reported as percentages.

The third objective of the study was to identify demographics of aquaculture Extension agents, specialists, and program administrators and how these might relate to individual education and training needs.

### *Procedures*

Selected demographics for the AQUA-EXT listserv were age, highest level of education attained, and years of work experience both in their present position as well as in the field. These

data were reported as means and percentages for the population. Analysis of Variance was utilized to determine statistical differences in means of self-rated skills identified in objective one, with demographic categorization as independent variables. Tukey's HSD was then utilized for comparison of means.

## Results and Findings

### *Response rate*

Out of a population of 223 listserv members, 174 useable responses were collected, generating a final response rate of 78%. Out of 174 responders, 44 (25%) identified themselves as Extension agents, 70 (40%) as specialists, 27 (15%) as program administrators, and 33 (19%) as "other." The "other" group was comprised of individuals not fitting into the aforementioned three profession areas, or without a greater than 49% effort, and were excluded from further analysis.

**Objective one.** Only IT received a mean perceived-relative-importance score lower than 2.5. With regard to continuing education and training need, no competency area received a mean score greater than 2.5. However, the competency area of program evaluation was the highest ranked need by means for both specialists and program administrators, and the second highest by Extension agents. Extension agents ranked IT as the greatest continuing education and training need.

Individual analysis of the 10 competency areas provided more insight. As a general trend, individual competency-area subcomponents received higher mean scores in perceived importance than they did in the need for continuing education and training. For example, seven of nine subcomponents of Extension organization and administration received mean scores above 2.5 in perceived importance, whereas every single subcomponent of Extension organization and administration was given a mean score below 2.5 by all three professional groups in the need for continuing education and training. Within this competency area, National Extension policy and how it is formulated was ranked the highest by both Extension agents and program administrators.

The second competency area was program planning, development, and implementation. For each subcomponent of this competency, program administrators identified a greater need for continuing education and training than did either Extension agents or specialists. Program evaluation was rated relatively high across all subcomponent areas, with the greatest needs in continuing education and training expressed by specialists and program administrators. Within this competency, the interaction of research and Extension in Extension programming was ranked the highest by Extension agents and specialists, with understanding situation analysis identified as the greatest need by program administrators.

In program evaluation, the area in which Extension agents claimed most to need continuing education and training was understanding evaluation study design in Extension education. Specialists claimed to need education and training most in evaluation of Extension programs, and program administrators in correlation between program results and program accountability.

Within the communication competency area, both Extension agents and specialists claimed most to need continuing education and training in the ability to conduct Web-based education programming. Program administrators identified the ability to interact effectively with the media as the greatest need.

Extension agents and specialists identified knowledge of procedures for applying research results to clientele as the research competency component in which they most needed continuing education and training. Program administrators identified the ability to conduct surveys.

Human development was the sixth competency area evaluated. Within this competency area, Extension agents, specialists, and program administrators alike identified the development of leadership abilities as the component in which they most needed continuing education and training.

Extension agents identified knowledge of principles and procedures in teaching adults as the educational-process component in which they most needed continuing education and training. Specialists and program administrators alike identified how people are motivated as their greatest continuing education and training need.

Social systems was the eighth competency area evaluated. In this competency, both Extension agents and specialists identified understanding the interactions of individuals within groups as their greatest continuing education and training need. Specialists ranked this component equally with understanding the functions of agricultural organizations as their greatest continuing education and training need.

Extension agents identified understanding of problem-solving methods as their greatest continuing education and training need within the effective-thinking competency component. Specialists and program administrators alike rated knowledge of techniques for developing effective thinking in Extension groups as their greatest continuing education and training need within effective thinking.

The final competency area evaluated under objective 1 was IT. Within this competency, Extension agents identified the ability to use computer publishing software to generate extension reports as their greatest continuing education and training need. Both specialists and program administrators alike identified the ability to implement computer-based Extension as their greatest continuing education and training need.

**Objective 2.** The second objective of the study was to determine which electronic information resources are presently utilized by aquaculture Extension agents, specialists, and program administrators on the AquaNIC Web site. Fifty-two percent of Extension agents, 71% of specialists, and 81% of program administrators reported having used AquaNIC. However, the average number of times individuals in each group accessed individual AquaNIC resource areas was reported to be less than once every 3 to 4 months. The AquaNIC resource with the highest access rates by all three groups was publications. Species had the second-highest access rates by each group.

The following individual AquaNIC resources were never used by more than 50% of the user population: (a) discussion groups, (b) job services, (c) newsletters, (d) calendars, (e) classified ads, (f) online courses, (g) media, (h) educators, and (i) news. The AquaNIC resource with the highest access rate in the “once every three or four months” category was species, which 23% of the user population accessed that often.

**Objective 3.** The third objective of the study was to identify demographics of aquaculture Extension agents, specialists, and program administrators within the AQUA-EXT listserv and to see how these relate to individual education and training needs. The largest percentage of each professional group fell into the “50–59”-year age group. Fifty-nine percent of Extension agents had Master’s degrees. The majority of specialists and program administrators, 63% and 72% respectively, had earned doctoral degrees. The mean number of years Extension agents had held their present employment positions was 13.4. Specialists and program administrators had spent means of 13.2 and 8.41 years, respectively, in their present positions.

The last demographic evaluated was the total number of years in either the Cooperative Extension Service (CES) or Sea Grant. Extension agents had spent a mean of 16.6 years in service to

one or the other. For specialists and program administrators, the means of total years in either CES or Sea Grant was 16.1 and 15.5 respectively.

From these demographics, the typical profession profiles were generated for the AQUA-EXT population: a) the majority of aquaculture Extension agents are in the 50 – 59 year age bracket, have a master's degree, have been in their present position for 13 years, and in CES or Sea Grant for a total of 16 years; b) likewise, most aquaculture Extension specialists were also in the 50 – 59 year age bracket, have been in their present position for 13 years, and in CES or Sea Grant for a total of 16 years; and c) typical aquaculture Extension program administrators were also in the 50 – 59 year age bracket and had a doctorate degree, however, had only been in their present position for eight years, and in either CES or Sea Grant for a total of 15 years. No meaningful results were obtained regarding how these demographics related to individual continuing education and training needs.

### **Conclusions and Recommendations**

Of significance was identification by all professional areas of a strong need for continuing education and training in program evaluation, despite a lower ranking by all groups with regard to perceived importance. This is likely due to the perceived greater importance of the program planning, development, and implementation, as well as human development competencies on a day-to-day programming basis when compared with program evaluation. However, with recent trends of increasing emphasis on program accountability, the program evaluation competency has risen to the top with regard to perceived need for additional education.

Of additional interest was identification by all profession areas of IT as among the lowest ranked competency areas with regard to perceived importance, however among the highest competency areas with regard to perceived need for continuing education and training. With today's rapidly increasing reliance upon computers as well as computer software programs, as with the program evaluation competency area, this may be indicative of new trends which are yet to be recognized as important, but already identifiable as components utilized on a daily basis which all profession areas perceive as areas they could benefit from continuing education and training.

The following specific continuing education and training needs were identified for the population of Extension agents, specialists, and program administrators on AQUA-EXT. To be included on this list, the competency component had to be rated with a minimum of 2.0 as a perceived need by all professions, and have had a mean from the three profession areas greater than 2.25.

1. Evaluation in Extension programming
2. Understanding correlation between program results and program accountability
3. Correlation between program results and accountability
4. Conducting of Web-based education programming
5. Effective interaction with the media
6. Development of leadership abilities
7. Use of computer publishing software in generating Extension reports
8. Implementation of computer-based Extension programming

With regard to the AquaNIC Web site, greater than 50% never used most resource areas, and when utilized, use was infrequent. Recommendations provided by respondents to enhance Web site utility to them were to update it, be more comprehensive and timely, and incorporate in-depth materials in all resource areas. The following specific recommendations were identified for individual resource areas of the AquaNIC Web site:

1. Discussion groups: knowledgeable oversight.
2. Species: more species-specific information.
3. Job services: structural hierarchy, as well as an email service to notify subscribers when new positions are posted.
4. Contacts: greater Extension personnel representation.
5. Publications: keyword search.
6. Media: searchable database.
7. Educators: youth-education section.
8. Classified ads: categorization of posting.
9. Online resources: greater linkage to other online materials.

### **Practical Importance**

Information technologies was ranked lowest in overall perceived importance by all three profession areas, but was ranked high with regard to perceived need for continuing education and training, likewise, program evaluation was not ranked high under perceived importance, but was also ranked high with regard to perceived need for continuing education and training. This is an excellent representation of the effect of modern times, and the emergence of changing continuing education and training needs. The perception of the importance of these skills is still low, but the emerging need for additional training is great with regard to the ability to conduct Extension work effectively.

Given these results, program evaluation should be given a high priority by Extension across the board for Aquaculture Extension agents, specialists, and program administrators alike. Furthermore, the perceived need for IT needs to be addressed as well to enhance Extension's ability to conduct programming effectively and efficiently. The focus of program evaluation should be on: a) design of evaluation studies in Extension education; b) evaluation of Extension programs; and c) correlation between program results and program accountability. With regard to IT, the focus of continuing education and training should be on use of computer publishing software to generate Extension reports, and implementation of computer-based Extension programming. Given the relatively high level of education in the AQUA-EXT population, this continuing education may likely be conducted effectively with a variety of mediums at an accelerated instructional pace. National meetings such as the annual World Aquaculture Society Aquaculture America meetings, or the National Aquaculture Extension meetings which occur every few years may serve as excellent opportunities to engage these aquaculture Extension populations

Furthermore, there is an apparent aging of all aquaculture Extension profession populations. This could have significant negative ramifications in the near future as individuals near retirement and insufficient numbers of agents, specialists, and program administrators are available to replace them.

With regard to the AquaNIC Web site, results from this study indicated that very few aquaculture Extension agents, specialists, or program administrators utilize this Web site. The identified reasons for this lack of interest and use were a perceived lack of up-to-date information, a lack of professional oversight regarding content, and a general lack of emerging information regarding production species and systems. If a goal of AquaNIC is to serve as a viable information resource for Extension agents, specialists, and program administrators, then a significant increase in effort and funding will likely be required to accomplish this goal.

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