

MARKET STUDY OF SUNFISH AND WALLEYE HYBRIDS

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Funding request: \$48,000

Duration: 2 years (September 1, 1999 - August 31, 2001)

Objective:

Evaluate the potential “supply” and “market” for hybrid walleye (female walleye × male sauger) and sunfish (female green sunfish × male bluegill) fillets relative to comparable fish.

Sub-Objectives:

1. To analyze information on the consumption and “supply” of comparable fish in the U.S. and NCR.
2. To provide a technical comparison of the qualities and attributes of hybrid walleye (female walleye × male sauger) and sunfish (female green sunfish × male bluegill) fillets with those of substitute fish.
3. Assess consumer (supermarket/consumers and restaurant/consumers) perceptions and likelihood of purchasing hybrid sunfish and walleye fillets relative to substitute fish.
4. Evaluate the likelihood (and conditions ,e.g., supply available, fillet sizes, price) that wholesaler, institutional buyers, and major fish retailers will add hybrid walleye and sunfish to their product lines.
5. Assess the potential interest and perceived barriers to the commercial production of hybrid sunfish and walleye.
6. Estimate the “supply” and “demand” for hybrid walleye and sunfish fillets.

Proposed Budgets:

Institution	Principal Investigator(s)	Sub-Objective(s)	Year 1	Year 2	Total
Michigan State University	Edward M. Mahoney Ronald E. Kinnunen	1,2,3 & 6	\$6,950	\$11,158	\$18,108
Illinois State University	Patrick D. O'Rourke	1,3,4,5 & 6	\$14,614		\$14,614
North Dakota State Univ.	William C. Nelson	1,3,4,5 & 6	\$6,258	\$9,020	\$15,278
TOTALS			\$27,822	\$20,178	\$48,000

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JUSTIFICATION

The bottom line in any business is profit. The only way to achieve profits is to sell enough of the product you produce at a price that generates a profit. Estimates of market demand (i.e., quantity sold and price paid) and production costs are the starting point for a successful business, not an after thought. The U.S. aquaculture industry is a relatively disorganized market compared to nearly every other livestock sector. Beef, pork, and poultry have formally set quality standards, future markets, and publicly reported prices and production estimates. In addition, these items are primarily sold based on agreed upon quality standards, not by name of species within the livestock type; certified Angus Beef is an exception. However, this is not the case for aquaculture producers. Product acceptability cannot be assumed, and it is difficult to develop estimates of "demand."

Aquaculture is a unique industry in the sense that species name is the primary way by which consumers identify and evaluate quality. Consumers also develop fish eating habits, and some are reluctant to try new species and sometimes even new products from the same species (e.g., fillets versus breaded nuggets). As a consequence, launching and positioning new fish products requires concerted "push and pull" marketing directed at both intermediaries (e.g., wholesalers and retail distributors) and final consumers. Also, information on prices and quantities of fish produced and purchased is reported a considerable time after transactions take place. This makes it difficult to monitor market conditions or make projections of demand and it places domestic aquaculture producers at a major disadvantage in the marketing function. The different analyses comprising this study will estimate both aspects of market demand, quantity, and price, in order to provide aquaculture producers with the information and preliminary estimates to make investment and production (i.e., different fish species and quantities) decisions.

It is essential for the future of aquaculture in the North Central Region (NCR) that marketing research be conducted concerning the future potential of all farm-raised food fish, particularly sunfish and walleye hybrids which are thought to have high potential in the NCR. Biological research on these species is expensive and the required investment to establish a food-fish operation is significant enough that prudence suggests that market feasibility assessments should be performed to access the wisdom of continued research for the commercial potential of these farm-raised food-fish hybrids. This research will use accepted marketing research methods in an effort to provide reasonable estimates and scenarios in conjunction with biological-production related information on sunfish and walleye hybrids (the specific sunfish hybrid is the female green sunfish × male bluegill whereas the walleye hybrid is the female walleye × male sauger).

RELATED CURRENT AND PREVIOUS WORK

Demand for fish is expected to continue to rise in the United States. The National Fisheries Institute (NFI) set a goal of 20 pounds per capita consumption by the year 2000. The NFI anticipates the increased consumption to come mainly from aquaculture. In 1990, about 15% of U.S. seafood consumption came from fish farming, but the percentage could easily rise to 25% by the year 2000.

Most Americans have positive views of fish because of its nutritional value. Most varieties are low in calories, fat, and cholesterol, especially when compared with other meats according to the Frozen Food Digest (Anonymous 1992). The increasing U.S. population will also help ensure strong demand for seafood.

The Department of Agricultural Economics at Purdue University (Anonymous 1993) conducted a study regarding a market for farm raised fish. Survey respondents were asked their most popular fish species in terms of restaurant sales and walleye was 9.6%. The data revealed that catfish, perch, salmon, and walleye, species for which aquaculture production research is being conducted in the NCR, are already established species in the Indiana restaurant market. This study also revealed that about half of the respondents would consider offering farm-raised fish.

Halbrendt et al. (1995) indicated farm raised fish are safer than wild harvested fish according to half of the consumers and 60% of seafood retailers surveyed in the Mid-Atlantic region. This study also found that freshness and price were the most important factors to retailers. A marketing study reported by Oha (1991) in Water Farming Journal of restaurant managers on cooperative farm raised fish resulted in several

characteristics of trout being very important: contamination free, uniform taste and quality, freshness, dependable supply, and uniform size.

According to Food Trends (1998), a 1996 survey showed that restaurant participants were serving 52% more fish than the previous year. Sales of beef and pork menu items don't appear to be increasing as dramatically. An article by Kane (1993) was optimistic concerning the future of fish farming. Feed efficiency was the major reason with conversion ratios of feed to meat of 7/1 for beef, 4/1 for pork, 2.25 for poultry, and 2/1 for fish.

Engle (1997) describes the need for marketing fish to consumers. Consumers need to be educated at the retail level about fish, its quality, and freshness. Advertising space is needed in order to introduce products. The catfish industry has several programs and vendors that support their product by advertising, particularly in supermarkets, which includes detailed literature on seafood counters, demonstrations, taste tests, and sales people to explain the benefit to the consumer of a farm-raised, cleaner, better product.

ANTICIPATED BENEFITS

Markets are made, not born, and the successful introduction of aquaculture produced walleye and sunfish will require focused and coordinated marketing strategies. The four "Ps" of marketing, "product" positioning, "pricing," "promotion," and "place" (distribution systems) are essential components of developing a market plan for any differentiated product. Much of the information to be gathered and analyzed in this project is intended to do more than provide estimates of market potential. It also provides guidance for developing marketing mixes to competitively position the new products in wholesaler, buyer, and consumer markets. The comparisons will provide potential producers and wholesalers with preferences and evaluations against other (substitute) fish to guide their "entry" marketing strategies. The information will also be useful for potential operators who may need to secure outside financing to be able to produce these species.

The study will also identify real and perceived potential barriers to commercial production and successful introduction of farm-raised sunfish and walleye hybrids. This information will be useful in designing educational materials and technical assistance aimed at producers and marketing channels. The purpose is to provide market indicators that would-be sunfish and walleye hybrid producers can incorporate as part of their feasibility assessments.

University researchers, extension specialists, and industry leaders agree that there is a need for more scientific, analytical, and integrated approaches for assessing "feasibility" of aquaculturally raised fish. The approach and methods that will be employed in this study will be evaluated for potential application with other "new" aquaculture raised fish. The integration of market (product) tests, results from the production tests, and supplier interest in these products could provide a framework for use with other aquaculture raised fish.

OBJECTIVE

Evaluate the potential "supply" and "market" for hybrid walleye (female walleye × male sauger) and sunfish (female green sunfish × male bluegill) fillets relative to comparable fish.

Sub-Objectives

1. To analyze information on the consumption and supply of comparable fish in the U.S. and NCR.
2. To provide a technical comparison of the qualities and attributes of different sizes of hybrid walleye (female walleye × male sauger) and sunfish (female green sunfish × male bluegill) fillets with those of substitute fish.
3. Assess consumer (supermarket/consumers and restaurant/consumers) perceptions and likelihood of purchasing hybrid sunfish and walleye fillets relative to substitute fish.

4. Evaluate the likelihood (and conditions ,e.g., supply available, fillet sizes, price) that wholesaler, institutional buyers, and major fish retailers will add hybrid walleye and sunfish to their product lines.
5. Assess the potential interest and perceived barriers to the commercial production of hybrid sunfish and walleye.
6. Estimate the “supply” and “demand” for hybrid walleye and sunfish fillets.

PROCEDURES

The study will estimate producer interest in raising (supplying), and the market (consumer, wholesaler, institutional buyers, and major retailers) potential for sunfish and walleye hybrids raised by commercial aquaculture operations in the NCR. This study will also evaluate the market potential for various sizes of sunfish and walleye, and hybrid sunfish and walleye fillets.

The combined results from the different components will provide: (1) different measures of the potential and feasibility of producing and marketing the two hybrids, (2) information for developing "market entry" strategies and, (3) the basis for technical assistance.

The study will undertake the following:

1. Analyze the historical trends of finfish in the region and nation with an emphasis on comparable species.
 - a. Per capita consumption of fish by region.
 - b. Specific types of fish consumption by region.
 - c. Amount of fish and type of products produced/available from different sources (e.g., aquaculture, commercial catch).
 - d. Price variability by type of fish (e.g., fresh, frozen, etc.) over time.
2. Determine and compare selected quality characteristics of fillets taken from walleye and sunfish relative to fish that are similar in terms of flavor and taste including wild-caught walleye, yellow perch, aquaculture-produced trout, and other firm white flesh fish.
3. Consumer analysis.
 - a. Evaluate consumer perceptions and potential acceptance for aquaculture-raised walleye and sunfish.
 - b. Assess willingness to pay (i.e., acceptable price range) for aquaculture-raised walleye and sunfish.
 - c. Develop rough estimates of current walleye and sunfish consumption ("demand").
 - d. Identify and assess the preferred product attributes (e.g., size and product form).
 - e. Conduct product/sensory tests on flavor, color, texture, and size to determine consumer acceptance of walleye and sunfish relative to other fish harvested from wild sources and from aquaculture including yellow perch and rainbow trout.
 - f. Determine how regular walleye consumers evaluate the hybrid walleye on different attributes.
4. Wholesaler and buyer analysis.
 - a. Identify seafood brokers and distributors, institutional buyers, and major fish retailers in the seafood business.
 - b. Determine types of fish and fish products they distribute/purchase.
 - c. Conduct product/sensory tests relative to flavor, color, texture, and size to determine acceptance levels for farm-raised walleye and sunfish.
 - d. Determine the preferred product size and form.
 - e. Identify fish for which walleye and sunfish substitute.
 - f. Assess willingness to pay for sunfish and walleye hybrids.
 - g. Analyze consumption and price trends for the fillets.
 - h. Determine volume needed for suppliers to carry and market these products.
 - i. Identify the desired delivery schedules.
 - j. Identify if there is a variation in the product size and form demanded for supermarkets versus restaurants.

5. Aquaculture businesses with the potential to produce sunfish and walleye hybrids will be surveyed to:
 - a. Determine their familiarity and perceptions (e.g., production requirements, markets) of the hybrids.
 - b. Identify perceived barriers to production and marketing of the hybrids.
 - c. Evaluate their potential interest in producing the hybrids.
6. Market and supply potential.
 - a. Develop indications of potential market “demand” for use by businesses (e.g., business plans).
 - b. Identify and assess the implications (i.e., price, market penetration, brand recognition) of different “supply” scenarios (i.e., amount of product, number, and location of producers).
 - c. Identify opportunities and barriers associated with commercial production.
 - d. Design workshops for potential producers and wholesalers to communicate the findings to aid in realistic assessments (i.e., market, production, costs) of the commercial potential of sunfish and walleye hybrids.

This study will incorporate different research methods to collect information from: (1) consumers, (2) fish wholesalers, brokers, and institutional and retail buyers, and (3) aquaculture businesses. The research team will include personnel from North Dakota State University (NDSU), Michigan State University (MSU), and Illinois State University (ISU). The three research partners will participate in all phases of data collection and together will jointly develop data collection protocols and instruments (e.g., questionnaires, focus group interviews). The investigators from the three universities have a variety of experience and contacts with the aquaculture industry in their own and nearby states.

There are two primary benefits from the partnership of the three universities. First, information will be collected from consumers, wholesalers, buyers, and aquaculture businesses representing at least four states including North Dakota, Minnesota, Michigan, and Illinois. Sensory tests of consumer and industry preferences will be conducted at two sites in each participating state. Focus groups of industry representatives will occur at sites in at least three states where sufficient industry exists and at annual meetings of state aquaculture associations. This will provide an opportunity to produce separate regional analyses and determine regional differences in potential “demand” and “supply” for sunfish and walleye hybrids. Second, using the same protocols and instruments will insure that the information gathered can be aggregated and analyzed using the same statistical methods.

NDSU will take the lead in the fish consumption trend analysis, technical comparative analysis of the attributes of fish fillets, and developing questionnaires and protocols for the consumer analyses (i.e., store intercept interviews, sensory testing). Together, MSU and ISU will lead the wholesaler and buyers and the aquaculture business components of the study.

The different components and sequencing of the research process are diagramed in Figure 1. Work to be completed during Year 1 will include fish consumption, product and price trends, consumer store intercept interviews, and interviews of wholesalers, buyers, and aquaculture businesses. In Year 2 consumer taste testing, and combined taste testing and focus groups with wholesalers and institutional and retail buyers will be completed. Results from work completed in Year 1 will be input for data collection conducted in Year 2. For example, findings from interviews and taste testing by consumers, and wholesalers and buyers, will be incorporated as part of focus groups with aquaculture businesses. Information produced by parallel studies being conducted on the biological aspects of raising sunfish and walleye hybrids (e.g., production requirements, cost to final product) will also be included in these focus groups.

The basic approach to achieving the proposed activities is to conduct a set of coordinated interviews, product/sensory tests, and focus groups. Table 1 below describes the: (1) target/subject for analysis and data collection, (2) types of analyses that will be performed, and (3) research and data collection methods.

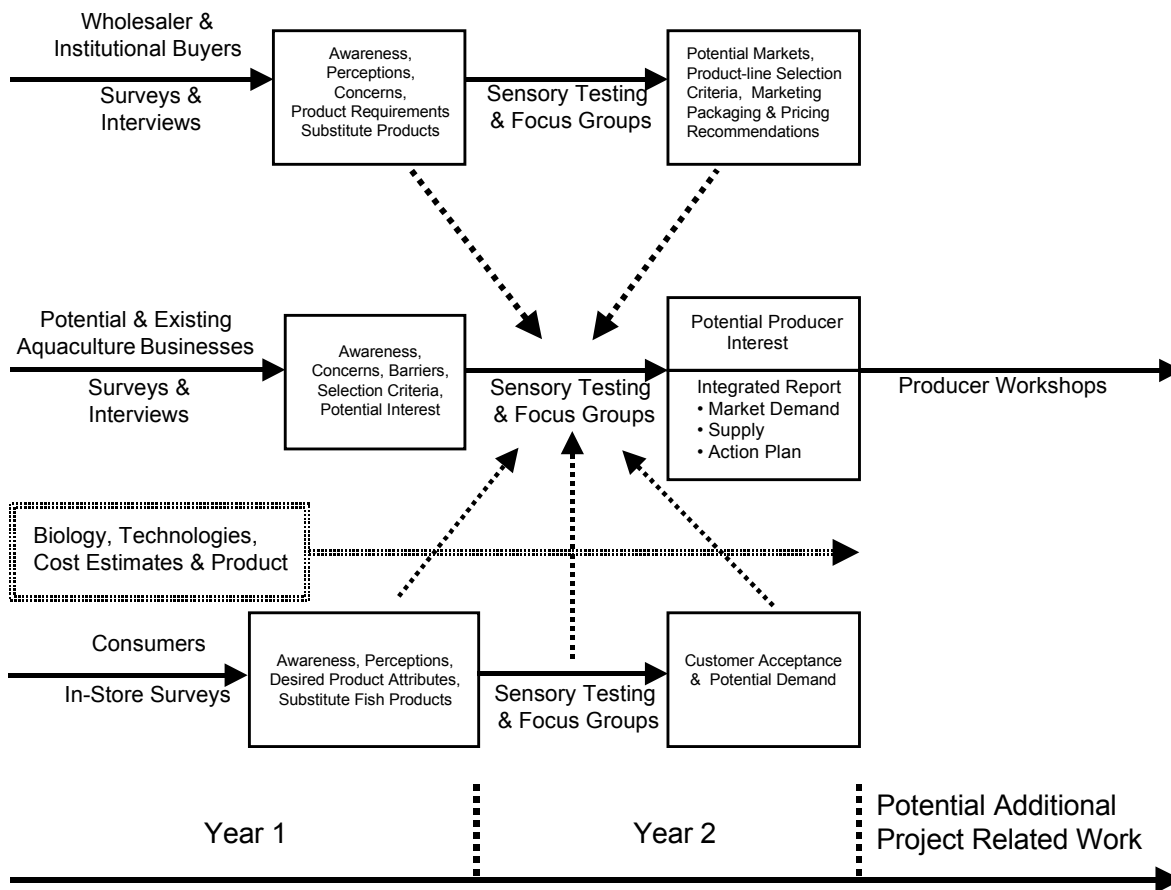
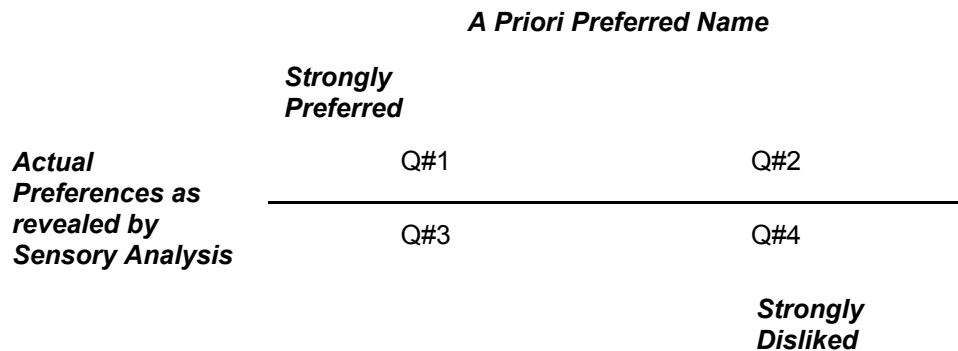


Figure 1. Steps comprising the proposed research process.

Table 1. Research targets, analyses, and data collection methods.

<u>Target</u>	<u>Analysis Type</u>	<u>Method</u>
Historical and Current Market Conditions	<ol style="list-style-type: none"> 1. Trend Analysis 2. Product Evaluation 	<ol style="list-style-type: none"> 1. Statistical 2. Consumer and Industry Preferences 3. Evaluation of Currently Available Products
Consumers	<ol style="list-style-type: none"> 1. Awareness and Preferences 2. Product Evaluation 	<ol style="list-style-type: none"> 1. Store Intercept Interviews 2. Blind Taste Tests 3. Taste Test Follow-up Survey
Wholesaler and Institutional Buyers	<ol style="list-style-type: none"> 1. Awareness and Requirements 2. Product and Delivery Criteria 3. Price Requirements 4. Product Evaluation 	<ol style="list-style-type: none"> 1. Interviews 2. Blind Taste Test 3. Focus Groups
Aquaculture Businesses	<ol style="list-style-type: none"> 1. Awareness and Perceptions 2. Price Requirements 3. Interest in Producing 	<ol style="list-style-type: none"> 1. Interviews

Each of these activities will assist in forming the product positioning of walleye and sunfish and developing future demand and supply estimates. For example, if the majority of responses from both Sensory and Preference tests indicate strongly preferred, quadrant Q#1, the future demand estimates will be high.



However, if the majority of responses fall in quadrant Q#3, this would indicate that the species has a positive reputation but the actual objective measures yielded a negative result. The appropriate conclusion is that product development/modification is necessary to assure continued growth in consumer demand. Results centered in Q#2 indicate an excellent product but a poor perception of the product by consumers. Education and promotion are necessary to increase demand. Responses centered in Q#4 would indicate a change in product is warranted, in other words, forget trying to develop a market for a poor product and look for a product that fits in Q#1 or Q#2. A detailed description of each research procedure follows. Each of the activities will be achieved through proven, established research procedures, and data collection methods.

Historical and Current Market Analysis (Sub-Objective 1)

NDSU (Lead), MSU, and ISU

Trends

Historical trends in fish consumption will be obtained from the U.S. Department of Agriculture (USDA), National Agricultural Statistics Service (NASS) of USDA, U.S. Department of Commerce, Bureau of the Census, USDA food consumption statistics, and contact with persons within the respective industries. Results from the 1998 U.S. Aquaculture Census that is being conducted by the Census Division of NASS will also be utilized.

Available data will be used to project future trends in quantities and prices. The outcome of this step will be to provide quantitative demand projections of various classes of fish. It is not expected that walleye and sunfish will be able to be separated from other fish using secondary data. The projections will provide the industry data within which walleye and sunfish will be positioned.

Technical Analysis of Fillet Attributes (Sub-Objective 2)

NSDU

Comparative Analysis

Evaluate and compare selected quality characteristics of fillets taken from wild-caught and aquaculture-produced walleye and sunfish relative to three to five other fish species harvested from wild source(s) and from aquaculture.

Ten fillets from each source of fish will be evaluated for the following characteristics:

1. Size. The dimensions (length, width, and thickness) of each fillet will be determined. An average and standard deviation will be calculated for each dimension.
2. Color. The color of uncooked fillets will be determined using the Lab scale on a Gardner Model XL23 colorimeter. Following cooking in a 163°C (325°F) oven with plastic oven bags, each fillet will again be tested for color with the colorimeter.
3. Tenderness. Three 4-cm (1.6-in) squares will be cut (one from each end and one from the center) from the cooked fillets and evaluated for tenderness by means of an Instron Universal Testing Instrument Model 1011.

This analysis will provide an objective basis for describing the attributes of walleye and sunfish currently available from aquaculture and wild sources. It will provide comparative information for the product/sensory tests and the consumer and industry preference surveys. It also will assist in positioning walleye and sunfish within the fish market.

Consumer Analysis (Sub-Objective 3)

NSDU (Lead), MSU, and ISU

Store Intercept Interviews

Consumer interviews will examine reactions of members of different market segments and assess feelings toward walleye, sunfish, and comparable fish, and identify preferred product size and form. These studies will use mall or grocery store intercept methods (with samples drawn from the general population) conducted in North Dakota, Minnesota, Michigan, and Illinois. Judgment samples will be used and an expected sample size of 1,000 (specify level of precision, e.g., if proportions ± 0.05 and confidence level, e.g., 95%). Information will be collected in grocery stores in two urban centers in each of these four states.

Product/Sensory Analysis

To compare acceptance of hybrid walleye and sunfish relative to other fish harvested from wild sources and from aquaculture, fillets of each variety of fish from wild sources and from aquaculture will be baked in a 163°C (325°F) oven in plastic oven bags placed in a glass dish. The fish will be considered done at 63°C (145°F). The fillets from each source will be broken up somewhat, and the pieces will be mixed to give each taste panelist a representative sample. Each panelist will be asked to indicate his/her opinion of the color, flavor, mouth feel, and general acceptability of the fish using a hedonic scale. The fish will be identified with 3-digit random numbers.

If it is found that the flavor and other characteristics are very similar regardless of the source, a triangle test may be used to see if taste panelists can tell them apart. In this case, the preparation would be the same as that described above. However, each panelist would be given three samples (one from wild and two from aquaculture, or two from wild and one from aquaculture). The panelist's task is to indicate which sample is the single different sample. Statistical analysis of the results will indicate if panelists are able to differentiate the samples. A sample survey for walleye is included as Appendix A.

Two consumer product/sensory tests will be conducted in Illinois, Michigan, and North Dakota. Each test will consist of 30+ consumers and three to five species of comparable (i.e., flesh firmness and color) fish will be evaluated. The purpose of the test is to position sunfish and walleye relative to the competition.

Consumer Surveys

Studies of basic information processing to gain insight into consumer reactions to aquaculture-raised walleye and sunfish, wild-harvested walleye and sunfish, and comparable firm white flesh fish will be conducted. For experimental control purposes, the initial studies will be conducted on the NDSU campus; initial sample size will be 75 students and faculty. The studies will employ research paradigms commonly used in information processing and attitude research. Individuals involved in the product (sensory) test part of the study will be asked to take part in a second phase of the study. That is, after individuals have completed the taste-test and related taste-test questions, they will be asked to complete questions assessing their feelings about sunfish and walleye (e.g., see Appendix B and Appendix C) and other fish. These questions will assess feelings toward sunfish and walleye (e.g., bad-good, healthy-unhealthy), personal relevance, purchase intentions, feelings about price, and general thoughts about farm-raised fish and wild-harvested fish. Further, they will be asked to complete a "need-for-cognition" questionnaire (see Appendix C). Research by Haugtvedt and Petty (1992) and Petty et al. (1995) on personality focuses on differences in need-for-cognition (i.e., whether higher and lower need-for-cognition individuals differ in processing product-related information). For example, certain individuals may pay more attention to product specific cues (e.g., farm-raised walleye has a different taste and different nutritional benefits than wild-harvested walleye) than other individuals, or some individuals may be more distracted by non-product cues, such as attractive endorsers, than others. Jones and Haugtvedt (1996) found that higher need-for-cognition individuals use more complex decision-making rules, and process product-related information more carefully than lower need-for-cognition individuals. It is expected that higher need-for-cognition individuals will have different attitudes toward farm-raised walleye than lower need-for-cognition individuals. Further, it is believed that personality differences in individuals affect the way they react to content and presentation of product information. If the study findings support these assertions, then retailers might try to develop different promotion campaigns that target different personality types.

The cognition and personality profiling elements can be conducted in conjunction with the product (sensory) testing at very little additional cost. Correlating this information with the results from the product test will provide additional insight that will be useful when developing a marketing positioning and communications strategy for these two products. It may also identify the need for different marketing strategies for different regions.

Findings from these studies will help with market potential and problem identification, and lead to additional work in problem solving (i.e., product enhancement, price, distribution, and promotion). Further, results from this research will allow a better understanding of the image of sunfish and walleye in the minds of consumers and the fit of product package information (e.g., farm-raised versus wild-harvested). If it is found that the

image of sunfish and walleye are not positive for market segments, then recommendations will be made about possible repositioning and marketing communications strategies.

The outcome of this portion of analysis will assist in positioning sunfish and walleye within the market for fish and provide needed information for market plan and market communications development.

Wholesaler and Buyer Analyses (Sub-Objective 4)

MSU and ISU (Lead), and NDSU

During the first year the focus will be on determining wholesaler, restaurant, and institutional buyers': (1) experience with walleye or sunfish, (2) perceptions of farm-raised sunfish and walleye including perceived positive and negative (e.g., food, processing) attributes, (3) fish products for which walleye and sunfish could be a substitute, (4) criteria (e.g., price, guaranteed supply, product attributes) for carrying/purchasing new fish products, and (5) potential barriers associated with market entry and introductory marketing of these products. The information will be collected through a combination of telephone interviews and personal interviews conducted at state and national trade shows.

At the same time, additional information will be collected on: (1) the size and capabilities of their operations, (2) their current markets/customers, and (3) amount and types of fish products distributed/purchased. This information will assist in determining wholesalers and buyers with the greatest potential (e. g., interest and volume of product distributed/purchased).

A list of major fish wholesalers and buyers for major retail chains, restaurants, and institutions will be compiled through industry referrals, Internet searches for seafood and/or meat businesses in the Midwest, and the NFI membership directory and suppliers guide. Initial contacts will be made through letters and telephone calls to explain the study and enlist their cooperation. The three research partners will use the same telephone and personal interview instrument.

A similar approach is being utilized in a study on tilapia marketing for the North American Fish Farmers Cooperative in North Dakota which will be completed shortly by NDSU researchers who collected marketing information by interviewing seafood suppliers, wholesalers, distributors, and retailers. The sample consisted of 247 seafood and/or meat businesses in North Dakota, South Dakota, Minnesota, Wisconsin, Illinois, Colorado, Kansas, Missouri, and Iowa.

The information obtained through these interviews will be compiled into a report. The report will focus on the potential marketability of sunfish and walleye hybrids including willingness to pay, product quality requirements, and type and amount of "product launch" marketing that will have to be implemented. The findings will be presented as part of the focus groups participated in by aquaculture businesses and in workshops.

In Year 2 a sample of the wholesalers and buyers will be recruited to participate in taste testing of both hybrid sunfish and walleye prepared with different formats and several substitute fish species. They will also be asked to complete a questionnaire to compare taste, texture, and appearance of the different fish comprising the test. This taste testing will be followed by a focus group discussion of the: (1) appropriateness of the fish for different uses, (2) likely acceptance by different markets, (3) prices they would be willing to pay for sunfish and walleye hybrids, (4) packaging, and (5) quantity and delivery related issues.

Assessment of Interest of Aquaculture Businesses to Raise Hybrid Walleye and Sunfish (Sub-Objective 5)

MSU and ISU (Lead), and NDSU

Existing and potential aquaculture operations, including but not limited to those that produce and market similar species, will be identified and interviewed. As part of the interview the producers will first be provided with findings from the product/sensory tests, consumer cognition and personality profiling, and the wholesaler and buyer interviews (e.g., perceptions, awareness, concerns, desired product attributes).

The purpose of the interviews will be to determine: (1) producer awareness and perceptions of hybrid sunfish and walleye including fish characteristics, e.g., ability to grow faster and easier to handle than their purebreds especially as it relates to walleye, (2) perceptions related to the requirements and technology needed to successfully raise these fish, (3) financial feasibility, (4) potential markets, marketability, and issues associated with marketing these products to wholesalers and institutional buyers, and (5) their opinions regarding the relative primary advantages and disadvantages associated with raising hybrids.

The majority of these interviews will be conducted at meetings of state aquaculture organizations. Telephone interviews will be employed to reach those producers who do not attend these meetings. The three research partners will administer the same interview/questionnaire to aquaculture businesses in their states.

Estimates of Potential "Supply" and "Demand" and Technical Assistance Follow-up (Sub-Objective 6)

NDSU, MSU, and ISU

Historical fish consumption information and case studies (e.g., sales after introduction, marketing strategies) will be integrated with findings from consumers, wholesalers, and buyers to estimate the potential market for sunfish and walleye hybrids. The results for the analyses of aquaculture businesses (e.g., capabilities, interest) will provide the basis for preliminary estimates of the potential supply of sunfish and walleye in the NCR.

All the analyses and findings will be reviewed to develop recommendations for "*launch/introduction*" marketing strategies including segments to target, positioning attributes, pricing, and marketing communications (e.g., themes and media). The recommendations will include cooperative approaches and partnerships for introducing the two hybrids to wholesalers, restaurant, institutional buyers, and retail consumers.

In Year 3, after the studies are completed, the researchers will conduct workshops at state aquaculture association meetings to present and discuss the integrated findings from production and marketing components of hybrid sunfish and walleye studies. The purpose of the workshops will be to objectively present research results to assist potential producers assess the production, market, and financial feasibility of hybrid production and marketing. Extension specialists and NCRAC Industry Advisory Council members would be invited to attend the meetings in hopes that they would convey the information to producers in their areas. These workshops will be conducted by the research team as part of their extension service

FACILITIES

All three institutions participating in this project have access to extensive libraries with literature pertinent to the project, have excellent contacts with the aquaculture and fish buying industries, have access to computers and information processing technologies, have food sciences laboratories, and are involved actively with extension outreach programming. O'Rourke has conducted and participated in economic and marketing studies for tilapia, walleye, and yellow perch in the past six years and his expertise in ascertaining potential economic viability of proposed aquaculture production and processing operations is widely respected. Mahoney and Kinnunen have been actively involved with the multi-million dollar Great Lakes commercial fishing industry on various marketing projects. Mahoney has also conducted taste testings and focus groups to assess the market potential of lake herring products. He has also assisted in development of start-up marketing strategies for hundreds of businesses in Michigan. Nelson has been involved with numerous economic feasibility studies, international and domestic marketing of differentiated products, and economic development.

REFERENCES

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- Anonymous. 1992. Aquaculture industry laying groundwork for future growth. *Frozen Food Digest* 8(1):42.
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- Haugtvedt, C.P., and R.E. Petty. 1992. Personality and persuasion: need for cognition moderates the persistence and resistance of attitude changes. *Journal of Personality and Social Psychology* 63: 308-319.
- Jones, J.M., and C.P. Haugtvedt. 1996. Pride of Dakota and the impact of state of origin information: operationalizing the elaboration likelihood model's multiple roles for variables postulate. Page 177 in *Proceedings of the American Marketing Association Winter Educators' Conference*, February 7, 1996.
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- Oha, P. 1991. New York co-op betting on new closed system, restaurant survey. *Water Farming Journal* 6(8):13-14.
- Petty, R.E., C.P. Haugtvedt, and S.M. Smith. 1995. Elaboration as a determinant of attitude strength. Pages 93-130 in R.E. Petty and J.A. Krosnick, editors. *Attitude strength, antecedents and consequences*. Mahwah, NJ: Erlbaum Associates..

PROJECT LEADERS

<u>State</u>	<u>Name/Institution</u>	<u>Area of Specialization</u>
Illinois	Patrick D. O'Rourke Illinois State University	Agriculture Economics/Marketing
Michigan	Edward M. Mahoney Michigan State University	Natural Resource Economics/Marketing
Michigan	Ronald E. Kinnunen Michigan State University	Aquatic Resources/Fisheries/Aqua- culture Extension
North Dakota	William C. Nelson North Dakota State University	Agriculture Economics/Marketing

PARTICIPATING INSTITUTIONS AND PRINCIPAL INVESTIGATORS

Michigan State University (MSU)

Ronald E. Kinnunen
Edward M. Mahoney

Illinois State University (ISU)

Patrick D. O'Rourke

North Dakota State University (NDSU)

William C. Nelson

BUDGET

ORGANIZATION AND ADDRESS Department of Park, Recreation and Tourism Resources Michigan State University 131 Natural Resources Building, East Lansing, MI 48824-1222			USDA AWARD NO. Year 1: Sub-Objectives 1-3&6		
			Duration Proposed Months: <u>12</u>	Duration Awarded Months: _____	
PRINCIPAL INVESTIGATOR(S)/PROJECT DIRECTOR(S) Edward M. Mahoney and Ronald E. Kinnunen					
A. Salaries and Wages			CSREES FUNDED WORK MONTHS		
1. No. of Senior Personnel			Calendar	Academic	Summer
a. ___ (Co)-PI(s)/PD(s)					
b. ___ Senior Associates					
2. No. of Other Personnel (Non-Faculty)					
a. ___ Research Associates-Postdoctorates					
b. ___ Other Professional					
c. <u>1</u> Graduate Students					\$5,000
d. ___ Prebaccalaureate Students					
e. ___ Secretarial-Clerical					
f. ___ Technical, Shop and Other					
Total Salaries and Wages →					\$5,000
B. Fringe Benefits (If charged as Direct Costs)					
C. Total Salaries, Wages, and Fringe Benefits (A plus B) →					\$5,000
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)					
E. Materials and Supplies					
F. Travel					\$1,000
1. Domestic (Including Canada)					
2. Foreign (List destination and amount for each trip.)					
G. Publication Costs/Page Charges					
H. Computer (ADPE) Costs					
I. All Other Direct Costs (Attach supporting data. List items and dollar amounts. Details of Subcontracts, including work statements and budget, should be explained in full in proposal.) Telephone (\$400), Fax (\$50), Postage (\$100), Photocopying (\$400)					\$950
J. Total Direct Costs (C through I) →					\$6,950
K. Indirect Costs If Applicable (Specify rate(s) and base(s) for on/off campus activity. Where both are involved, identify itemized costs in on/off campus bases.)					
L. Total Direct and Indirect Costs (J plus K) →					\$6,950
M. Other →					
N. Total Amount of This Request →					\$6,950
O. Cost Sharing (If Required Provide Details)			\$23,500		

NOTE: Signatures required only for Revised Budget

This is Revision No. →

NAME AND TITLE (Type or print)	SIGNATURE	DATE
Principal Investigator/Project Director		
Authorized Organizational Representative		

BUDGET

ORGANIZATION AND ADDRESS Department of Park, Recreation and Tourism Resources Michigan State University 131 Natural Resources Building, East Lansing, MI 48824-1222			USDA AWARD NO. Year 2: Sub-Objectives 1-3&6		
			Duration Proposed Months: <u>12</u>	Duration Awarded Months: _____	
PRINCIPAL INVESTIGATOR(S)/PROJECT DIRECTOR(S) Edward M. Mahoney and Ronald E. Kinnunen					
A. Salaries and Wages			CSREES FUNDED WORK MONTHS		
1. No. of Senior Personnel			Calendar	Academic	Summer
a. ___ (Co)-PI(s)/PD(s)					
b. ___ Senior Associates					
2. No. of Other Personnel (Non-Faculty)					
a. ___ Research Associates-Postdoctorates					
b. ___ Other Professional					
c. <u>1</u> Graduate Students					\$5,000
d. ___ Prebaccalaureate Students					
e. ___ Secretarial-Clerical					
f. ___ Technical, Shop and Other					
Total Salaries and Wages →					\$5,000
B. Fringe Benefits (If charged as Direct Costs)					
C. Total Salaries, Wages, and Fringe Benefits (A plus B) →					\$5,000
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)					
E. Materials and Supplies					
F. Travel					\$3,000
1. Domestic (Including Canada)					
2. Foreign (List destination and amount for each trip.)					
G. Publication Costs/Page Charges					
H. Computer (ADPE) Costs					
I. All Other Direct Costs (Attach supporting data. List items and dollar amounts. Details of Subcontracts, including work statements and budget, should be explained in full in proposal.) Telephone (\$475), Fax (\$58), Postage (\$150), Photocopying (\$475), Facility rental (\$2,000)					\$3,158
J. Total Direct Costs (C through I) →					\$11,158
K. Indirect Costs If Applicable (Specify rate(s) and base(s) for on/off campus activity. Where both are involved, identify itemized costs in on/off campus bases.)					
L. Total Direct and Indirect Costs (J plus K) →					\$11,158
M. Other →					
N. Total Amount of This Request →					\$11,158
O. Cost Sharing (If Required Provide Details)			\$24,000		

NOTE: Signatures required only for Revised Budget This is Revision No. →

NAME AND TITLE (Type or print)	SIGNATURE	DATE
Principal Investigator/Project Director		
Authorized Organizational Representative		

BUDGET EXPLANATION FOR MICHIGAN STATE UNIVERSITY

(Mahoney and Kinnunen)

Sub-Objectives 1, 2, 3, and 6

- A. **Salaries and Wages.** A quarter-time graduate student will be required.
- F. **Travel.** Year 1: \$1,000 for transportation, lodging, and meal expenses for the two PIs to travel to attend three aquaculture association, retailer, wholesaler, institutional buyer, and/or restaurant buyer meetings to conduct interviews (\$166.67/person per meeting), destinations to be determined. Year 2: \$3,000 for transportation, lodging, and meal expenses for the two PIs to conduct three focal group/taste testing meetings (\$500/person per meeting), destinations to be determined.
- I. **All Other Direct Costs.** Year 1: telephone (\$400), fax (\$50), postage (\$100), and photocopying (\$400). Year 2: telephone (\$475), fax (\$58), postage (\$150), photocopying (\$475), and facility rental for focal group/taste testing meetings (3 meetings at \$666.67 = \$2,000).

BUDGET

ORGANIZATION AND ADDRESS Department of Agriculture Illinois State University Campus Box 5020, Normal, IL 61790-5020			USDA AWARD NO. Year 1: Sub-Objectives 1&3-6				
			Duration Proposed Months: <u>12</u>	Duration Awarded Months: _____		FUNDS REQUESTED by PROPOSER	
PRINCIPAL INVESTIGATOR(S)/PROJECT DIRECTOR(S) Patrick D. O'Rourke							
A. Salaries and Wages			CSREES FUNDED WORK MONTHS				
1. No. of Senior Personnel			Calendar	Academic	Summer	\$7,125	\$
a. <u>1</u> (Co)-PI(s)/PD(s)				1.125			
b. ___ Senior Associates							
2. No. of Other Personnel (Non-Faculty)							
a. ___ Research Associates-Postdoctorates							
b. ___ Other Professional							
c. <u>1</u> Graduate Students						\$3,150	
d. ___ Prebaccalaureate Students							
e. ___ Secretarial-Clerical							
f. ___ Technical, Shop and Other							
Total Salaries and Wages →						\$10,275	
B. Fringe Benefits (If charged as Direct Costs)						\$1,639	
C. Total Salaries, Wages, and Fringe Benefits (A plus B) →						\$11,914	
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)							
E. Materials and Supplies						\$750	
F. Travel						\$1,200	
1. Domestic (Including Canada)							
2. Foreign (List destination and amount for each trip.)							
G. Publication Costs/Page Charges							
H. Computer (ADPE) Costs							
I. All Other Direct Costs (Attach supporting data. List items and dollar amounts. Details of Subcontracts, including work statements and budget, should be explained in full in proposal.) Telephone (\$100), Postage (\$350), Photocopying (\$50), Printing (\$250)						\$750	
J. Total Direct Costs (C through I) →						\$14,614	
K. Indirect Costs If Applicable (Specify rate(s) and base(s) for on/off campus activity. Where both are involved, identify itemized costs in on/off campus bases.)							
L. Total Direct and Indirect Costs (J plus K) →						\$14,614	
M. Other →							
N. Total Amount of This Request →						\$14,614	\$
O. Cost Sharing (If Required Provide Details)		\$13,500					

NOTE: Signatures required only for Revised Budget This is Revision No. →

NAME AND TITLE (Type or print)	SIGNATURE	DATE
Principal Investigator/Project Director		
Authorized Organizational Representative		

BUDGET EXPLANATION FOR ILLINOIS STATE UNIVERSITY

(O'Rourke)

Sub-Objectives 1, 3, 4, 5, and 6

A. Salaries and Wages. The PI is a Professor on an annual 9-month appointment to teach courses and conduct research. The 1.125-month faculty salary indicated in the budget is necessary to cover a portion of the PI's commitment to the project. A portion of a graduate student's time will be needed to assist the PI in conducting ISU's portion of the project.

In order to implement the proposed activities it is necessary for ISU to receive their entire share of the project funds in Year 1 but both the PI and graduate student will be actively involved in Year 2, but at no cost to the project.

B. Fringe Benefits. The ISU fringe benefit rate is 23% of faculty salaries.

E. Materials and Supplies. General office supplies such as paper, pens, notebooks, toner, and computer diskettes (\$750).

F. Travel. \$1,200 for transportation, lodging, and meal expenses for the PI and graduate student to attend four 1-day meetings with aquaculture producers, university professionals, and others in the fish processing and marketing industry for consultation and data collection (\$150/person per meeting), destinations to be determined.

I. All Other Direct Costs. Telephone (\$100), postage (\$350), photocopying (\$50), and printing (\$250).

BUDGET

ORGANIZATION AND ADDRESS Quentin Burdick Center for Cooperatives North Dakota State University Morrill 301, Fargo, ND 58102			USDA AWARD NO. Year 1: Sub-Objectives 1&3-6			
			Duration Proposed Months: <u>12</u>	Duration Awarded Months: _____		FUNDS REQUESTED by PROPOSER
PRINCIPAL INVESTIGATOR(S)/PROJECT DIRECTOR(S) William C. Nelson						
A. Salaries and Wages			CSREES FUNDED WORK MONTHS			
1. No. of Senior Personnel			Calendar	Academic	Summer	\$
a. ___ (Co)-PI(s)/PD(s)						
b. <u>1</u> Senior Associates			0.5			\$1,500
2. No. of Other Personnel (Non-Faculty)						
a. <u>1</u> Research Associates-Postdoctorates			1.0			\$2,160
b. ___ Other Professional						
c. ___ Graduate Students						
d. ___ Prebaccalaureate Students						
e. ___ Secretarial-Clerical						
f. ___ Technical, Shop and Other						
Total Salaries and Wages →						\$3,660
B. Fringe Benefits (If charged as Direct Costs)						\$1,098
C. Total Salaries, Wages, and Fringe Benefits (A plus B) →						\$4,758
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)						
E. Materials and Supplies						\$1,250
F. Travel						
1. Domestic (Including Canada)						
2. Foreign (List destination and amount for each trip.)						
G. Publication Costs/Page Charges						
H. Computer (ADPE) Costs						
I. All Other Direct Costs (Attach supporting data. List items and dollar amounts. Details of Subcontracts, including work statements and budget, should be explained in full in proposal.) Printing (\$250)						\$250
J. Total Direct Costs (C through I) →						\$6,258
K. Indirect Costs If Applicable (Specify rate(s) and base(s) for on/off campus activity. Where both are involved, identify itemized costs in on/off campus bases.)						
L. Total Direct and Indirect Costs (J plus K) →						\$6,258
M. Other →						
N. Total Amount of This Request →						\$6,258
O. Cost Sharing (If Required Provide Details)			\$6,777			

NOTE: Signatures required only for Revised Budget This is Revision No. →

NAME AND TITLE (Type or print)	SIGNATURE	DATE
Principal Investigator/Project Director		
Authorized Organizational Representative		

BUDGET

ORGANIZATION AND ADDRESS Quentin Burdick Center for Cooperatives North Dakota State University Morrill 301, Fargo, ND 58102			USDA AWARD NO. Year 2: Sub-Objectives 1&3-6		
			Duration Proposed Months: _____ FUNDS REQUESTED by PROPOSER	Duration Awarded Months: _____ FUNDS APPROVED BY CSREES (If Different)	
PRINCIPAL INVESTIGATOR(S)/PROJECT DIRECTOR(S) William C. Nelson					
A. Salaries and Wages 1. No. of Senior Personnel	CSREES FUNDED WORK MONTHS				\$
	Calendar	Academic	Summer		
a. ___ (Co)-PI(s)/PD(s)					
b. <u>2</u> Senior Associates	1.0			\$2,860	
2. No. of Other Personnel (Non-Faculty)					
a. <u>1</u> Research Associates-Postdoctorates	1.0			\$2,160	
b. ___ Other Professional					
c. ___ Graduate Students					
d. ___ Prebaccalaureate Students					
e. ___ Secretarial-Clerical					
f. ___ Technical, Shop and Other					
Total Salaries and Wages →				\$5,020	
B. Fringe Benefits (If charged as Direct Costs)				\$1,500	
C. Total Salaries, Wages, and Fringe Benefits (A plus B) →				\$6,520	
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)					
E. Materials and Supplies				\$500	
F. Travel				\$1,500	
1. Domestic (Including Canada)					
2. Foreign (List destination and amount for each trip.)					
G. Publication Costs/Page Charges					
H. Computer (ADPE) Costs					
I. All Other Direct Costs (Attach supporting data. List items and dollar amounts. Details of Subcontracts, including work statements and budget, should be explained in full in proposal.) Printing (\$500)				\$500	
J. Total Direct Costs (C through I) →				\$9,020	
K. Indirect Costs If Applicable (Specify rate(s) and base(s) for on/off campus activity. Where both are involved, identify itemized costs in on/off campus bases.)					
L. Total Direct and Indirect Costs (J plus K) →				\$9,020	
M. Other →					
N. Total Amount of This Request →				\$9,020	\$
O. Cost Sharing (If Required Provide Details)		\$7,910			

NOTE: Signatures required only for Revised Budget

This is Revision No. →

NAME AND TITLE (Type or print)	SIGNATURE	DATE
Principal Investigator/Project Director		
Authorized Organizational Representative		

BUDGET EXPLANATION FOR NORTH DAKOTA STATE UNIVERSITY

(Nelson)

Sub-Objectives 1, 3, 4, 5, and 6

- A. Salaries and Wages.** Year 1: 0.5 month of a Senior Associate and 1.0 month of a Research Associate will be required to accomplish the proposed activities. Year 2: 0.5 months of two Senior Associates and 1.0 month of a Research Associate will be required.
- B. Fringe Benefits.** NDSU fringe benefit rate is 30%.
- E. Materials and Supplies.** Year 1: purchase of walleye, sunfish, and comparable fish samples (\$1,000) and supplies for sensory testing, such as paper plates, oven bags, cooking oils, etc. (\$250). Year 2: purchase of walleye, sunfish, and comparable fish samples (\$400) and supplies for sensory testing, such as paper plates, oven bags, cooking oils, etc. (\$100).
- F. Travel.** Year 2: \$325 for van rental for six people to travel from NDSU's campus in Fargo, North Dakota to Minneapolis, Minnesota (total round trip distance is 722 miles at \$0.45/mile) to spend three days conducting consumer surveys in the Twin Cities region (lodging and meals for six people for three days @ \$65.28/person = \$1,175).
- I. All Other Direct Costs:** Year 1: printing costs for questionnaires (\$250). Year 2: printing costs for questionnaires (\$500).

BUDGET SUMMARY FOR EACH PARTICIPATING INSTITUTION

Year 1

	MSU	ISU	NDSU	TOTALS
Salaries and Wages	\$5,000	\$10,275	\$3,660	\$18,935
Fringe Benefits	\$0	\$1,639	\$1,098	\$2,737
Total Salaries, Wages, and Fringe Benefits	\$5,000	\$11,914	\$4,758	\$21,672
Nonexpendable Equipment	\$0	\$0	\$0	\$0
Materials and Supplies	\$0	\$750	\$1,250	\$2,000
Travel	\$1,000	\$1,200	\$0	\$2,200
All Other Direct Costs	\$950	\$750	\$250	\$1,950
TOTAL PROJECT COSTS	\$6,950	\$14,614	\$6,258	\$27,822

Year 2

	MSU	ISU	NDSU	TOTALS
Salaries and Wages	\$5,000	\$0	\$5,020	\$10,020
Fringe Benefits	\$0	\$0	\$1,500	\$1,500
Total Salaries, Wages, and Fringe Benefits	\$5,000	\$0	\$6,520	\$11,520
Nonexpendable Equipment	\$0	\$0	\$0	\$0
Materials and Supplies	\$0	\$0	\$500	\$500
Travel	\$3,000	\$0	\$1,500	\$4,500
All Other Direct Costs	\$3,158	\$0	\$500	\$3,658
TOTAL PROJECT COSTS	\$11,158	\$0	\$9,020	\$20,178

RESOURCE COMMITMENT FROM INSTITUTIONS¹

Institution	Year 1	Year 2
Michigan State University		
Salaries and Benefits: SY @ 0.10 FTE	\$10,500	\$10,800
Salaries and Benefits: SY @ 0.20 FTE	\$13,000	\$13,200
Total	\$23,500	\$24,000
Illinois State University		
Salaries and Benefits: SY @ 0.05 FTE	\$4,200	\$4,300
Equipment and Waiver of Overhead	\$5,000	\$0
Total	\$9,200	\$4,300
North Dakota State University		
Salaries and Benefits SY 0.0833 FTE	\$4,212	\$4,212
Wavier of Overhead (41%)	\$2,565	\$3,698
Total	\$6,777	\$7,910
Total per Year	\$53,777	\$55,910
GRAND TOTAL	\$109,687	

¹Because cost sharing is not a legal requirement universities are not required to provide or maintain documentation of such a commitment.

SCHEDULE FOR COMPLETION OF SUB-OBJECTIVES

The length of the project will be 24 months from initiation to finish but may need to be expanded to 30 months. The sequence of activities is as follows:

<i>Month</i>	1	3	6	9	12	15	18	24	
Historical and Current Market Analysis	-----								
Technical Analysis of Fillet Attributes			-----						
Consumer Analysis									
Sensory Tests					-----				
Surveys						-----			
Wholesaler- Buyer Analysis									
Interviews and Phone Survey		-----							
Focus Groups and Sensory Tests						-----			
Assessment of Aquaculture Businesses									
Interviews and Phone Survey		-----							
Focus Groups and Sensory Tests						-----			
Estimates of Potential "Supply" and "Demand" and Technical Assistance Follow-up							-----		

LIST OF PRINCIPAL INVESTIGATORS

Ronald E. Kinnunen, Michigan State University

Edward M. Mahoney, Michigan State University

William C. Nelson, North Dakota State University

Patrick D. O'Rourke, Illinois State University

VITA

Ronald E. Kinnunen
Michigan State University - Upper Peninsula
702 Chippewa Square
Marquette, MI 49855-4811

Phone: (906) 228-4830
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EDUCATION

B.S. Michigan State University, 1976
M.S. Michigan State University, 1979
Ph.D. Michigan Technological University, 1997

POSITIONS

Michigan Sea Grant Extension Agent (1981-present), Upper Peninsula, Michigan State University
Acting Alger County Extension Director (1988-1989), Michigan State University Cooperative Extension Service
Fisheries Pathologist (1981), Rangen Research Laboratory, Hagerman, Idaho
Fisheries Biologist (1979-1980), U.S. Fish and Wildlife Service, Leetown, West Virginia

SCIENTIFIC and PROFESSIONAL ORGANIZATIONS

American Fisheries Society, Fish Health Section
Michigan Association of Extension Agents
National Association of Extension Agents
Sea Grant Advisory Service Association

SELECTED PUBLICATIONS

- Kinnunen, R.E. 1996. Walleye fingerling culture in undrainable ponds. Pages 135-145 *in* R.C. Summerfelt, editor. Walleye culture manual. NCRAC Culture Series #101, NCRAC Publications Office, Iowa State University, Ames.
- Kinnunen, R.E., and J.D. Schwartz. 1994. A comparison of the Escanaba 1988 and 1992 transient boater marketing and economics surveys. Michigan Sea Grant College Program (MICHU-SG-94-205).
- Kinnunen, R.E., and J.D. Schwartz. 1994. Upper Peninsula of Michigan Lake Superior 1992 transient boater marketing and economics survey. Michigan Sea Grant College Program (MICHU-SG-94-204).
- Burton, T.M., M.J. O'Malley, and R.E. Kinnunen, 1992. Shakey Lakes association strives for solution to aquatic weed problem. Michigan Riparian, November 1992:7-9 and 22.
- Kinnunen, R.E. 1992. North Central Region 1990 salmonid egg and fingerling purchases, production, and sales. NCRAC Technical Bulletin Series #103. North Central Regional Aquaculture Center Publications Office, Iowa State University, Ames.
- Kinnunen, R.E., and E.M. Mahoney. 1989. 1987 Upper Michigan charter fishing study. Michigan Sea Grant Extension Program (MICHU-SG-89-501).
- Kinnunen, R., J. Lempke, and T. Sundstrom. 1987. Behavior patterns of divers visiting the Alger Underwater Preserve. Michigan Sea Grant Extension Program (MICHU-SG-87-505).

VITA

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East Lansing, MI 48824-1222

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Fax: (517) 432-3597
E-mail: mahoneye@pilot.msu.edu

EDUCATION

B.S. University of Connecticut, 1973
M.S. Michigan State University, 1975
Ph.D. Michigan State University, 1979

POSITIONS

Associate Professor and Extension Specialist (1983-present), Department of Park and Recreation Resources, Michigan State University
Assistant Professor (1978-1982), Department of Landscape Architecture and Regional Planning, University of Massachusetts
Research Associate (1973-1978), Michigan State University
State Park Manager (1972-1973), Connecticut Department of Environmental Protection

SELECTED PUBLICATIONS

- Mahoney, E.M., L. Martin, and M.Y. Kim. 1999. A marketing assessment of the Detroit Boat Show. Report to Michigan Boating Industries Association. Michigan State University, East Lansing.
- Mahoney, E.M. 1998. Recreational boating marketing recommendations. Report to the Sea Grant MarinaNet Project. Michigan State University, East Lansing.
- Mahoney, E.M., L. Martin, and M.Y. Kim. 1998. Michigan marina pricing study. Report to the Michigan Waterways Commission. Michigan State University, East Lansing.
- Mahoney, E.M., and J. Fridgen. 1997. A marketing oriented approach to coastal development. *In Proceedings of the Taiwan Coastal Tourism Development Conference, Taipei, Taiwan.*
- Mahoney, E.M., M. Malarney, and D. Stynes. 1997. Environmental impact assessment of the proposed Thunder Bay Marine Sanctuary. Michigan State University, East Lansing.
- Mahoney, E.M., M. Malarney, and D. Stynes. 1996. Utilizing economic impact and market assessment to compare alternative marine sanctuary development scenarios. *In Proceedings of the 1996 Coastal Society Annual Conference, Seattle, Washington.*
- Mahoney, E.M., and P. Forsberg. 1995. An assessment of the technical and marketing feasibility of producing lake herring products. Report to the Keweenaw Bay Native Community. Michigan State University, East Lansing.
- Spotts, D.M., and E.M. Mahoney. 1989. An analysis of the summer travel market in Michigan's central Upper Peninsula. Michigan State University Agricultural Experiment Station Research Report #494, East Lansing.
- Mahoney, E.M., I.K. Oh, and S.J. Ou. 1989. A study of the National Campers and Hikers Association's 1988 Michigan Campvention. Michigan Travel, Tourism and Recreation Resources Center, Michigan State University, East Lansing.

VITA

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EDUCATION

B.S. North Dakota State University, 1965
M.S. University of Arizona, 1966
Ph.D. Ohio State University, 1971

POSITIONS

Professor (1981-present), Associate Professor (1976-1981), Assistant Professor (1971-1976), Agricultural Economics, North Dakota State University
Director, Institute of Natural Resources and Economic Development (1995-1998)
Director (1992-1992), International Research and Development, North Dakota State University
Provost (1991-1994), Tri-College University
Assistant Director for International Agriculture (1986-1992), North Dakota State University

SCIENTIFIC and PROFESSIONAL ORGANIZATIONS

American Tilapia Association
Association of International Agriculture
World Aquaculture Society

SELECTED PUBLICATIONS

- Saxowsky, D., and W.C. Nelson. 1998. Feasibility of large scale backgrounding feedlot. Department of Agricultural Economics, North Dakota State University, Fargo.
- Coyle, K., and W.C. Nelson. 1998. Tourism potential in North Dakota with emphasis in Southwest North Dakota. Department of Agricultural Economics, North Dakota State University, Fargo.
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EDUCATION

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POSITIONS

Professor (1995-present), Associate Professor (1987-95), and Assistant Professor (1983-1987), Department of Agriculture, Illinois State University
Assistant Professor (1979-1983), Department of Agricultural Economics, Purdue University

SCIENTIFIC and PROFESSIONAL ORGANIZATIONS

American Agricultural Economics Association
International Agribusiness Management Association
Southern Agricultural Economics Association

SELECTED PUBLICATIONS

- Tudor, K.W., P.D. O'Rourke, and J.A. Wood. 1997. Self-perceived business management training needs at Illinois fertilizer and chemical dealerships. *Journal of Natural Resources and Life Sciences Education* 26(2):165-169.
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APPENDIX A

We would like to ask you some questions about farm-raised walleye. Circle the number that best describes how you feel about farm-raised walleye.

1. I feel that farm-raised walleye is

bad	1	2	3	4	5	6	7	good
harmful	1	2	3	4	5	6	7	beneficial
foolish	1	2	3	4	5	6	7	wise
negative	1	2	3	4	5	6	7	positive
unhealthy	1	2	3	4	5	6	7	healthy

2. Farm-raised walleye is not at all relevant to me

	1	2	3	4	5	6	7	very relevant
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3. If you needed to purchase fish, how likely are you to purchase farm-raised walleye?

very unlikely	1	2	3	4	5	6	7	very likely
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4. (a) What do you think the suggested retail price of 1 lb of farm-raised walleye is? _____
 (b) Is this price?

lower than most fish	1	2	3	4	5	6	7	higher than most fish
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Next, we would like to ask you some questions about wild harvested walleye. Circle the number that best describes how you feel about wild harvested walleye.

5. I feel that wild harvested walleye is

bad	1	2	3	4	5	6	7	good
harmful	1	2	3	4	5	6	7	beneficial
foolish	1	2	3	4	5	6	7	wise
negative	1	2	3	4	5	6	7	positive
unhealthy	1	2	3	4	5	6	7	healthy

6. Wild harvested walleye is not at all relevant to me

	1	2	3	4	5	6	7	very relevant to me
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7. If you needed to purchase fish, how likely are you to purchase wild harvested walleye?

very unlikely	1	2	3	4	5	6	7	very likely
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8. (a) What do you think the suggested retail price of 1 lb. of wild harvested walleye is? _____
 (b) Is this price?

lower than most fish	1	2	3	4	5	6	7	higher than most fish
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APPENDIX B

We would like you to write down all of the thoughts you recall going through your mind when you tasted the farm-raised fish. These can be things that you liked or disliked about the product or the taste-test. (Do not take more than two minutes to do this; do not be concerned about spelling, punctuation, or grammar.)

Now, we would like you to write down all of the thoughts you recall going through your mind when you tasted the wild harvested fish. These can be things that you liked or disliked about the fish or the taste-test. (Do not take more than two minutes to do this; do not be concerned about spelling, punctuation, or grammar.)

We are asking the following questions so we can combine your responses with others participating in the study. Remember all the information will be kept confidential, so please answer all questions.

What year in school are you?

_____ Freshman _____ Sophomore _____ Junior _____ Senior _____ Graduate

What is your major? _____

What is your gender? _____ Female _____ Male

Please give us your age: _____

APPENDIX C

For each of the statements below, please indicate whether or not the statement is characteristic of you.

	Not at all like me				Very much like me
I prefer complex to simple problems.	1	2	3	4	5
I like to have the responsibility of handling a situation that requires a lot of thinking.	1	2	3	4	5
Thinking is not my idea of fun.	1	2	3	4	5
I would rather do something that requires little thought rather than something that is sure to challenge my thinking abilities.	1	2	3	4	5
I try to anticipate and avoid situations where there is a likely chance I will have to think in depth about something.	1	2	3	4	5
I find satisfaction in deliberating hard for long hours.	1	2	3	4	5
I only think as hard as I have to.	1	2	3	4	5
I prefer to think about small daily projects to long terms one.	1	2	3	4	5
I like tasks that require little thought once I have learned them.	1	2	3	4	5
The idea of relying on thought to make my way to the top appeals to me.	1	2	3	4	5
I really enjoy a task that involves coming up with new solutions to problems.	1	2	3	4	5
Learning new ways to think doesn't excite me very much.	1	2	3	4	5
I prefer my life to be filled with puzzles that I must solve.	1	2	3	4	5
The notion of thinking abstractly is appealing to me.	1	2	3	4	5
I would prefer a task that is intellectual, difficult and important to one that is somewhat important but does not require much thought.	1	2	3	4	5
I feel relief rather than satisfaction after completing a task that required a lot of mental effort.	1	2	3	4	5
It's enough for me that something gets the job done; I don't care how or why it works.	1	2	3	4	5
I usually end up deliberating about issues even when they do not affect me personally.	1	2	3	4	5