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Identifying Economic and Marketing Needs in U.S. Aquaculture: Insights from Survey of Sea Grant Programs and Aquaculture Hubs

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Introduction

The U.S. aquaculture industry faces significant economic and marketing challenges that hinder its growth, despite its tremendous diversity and potential. To address these challenges, a multi-institutional project was initiated through a partnership with Virginia Tech and a diverse group of economists and Extension specialists. This collaborative effort seeks to strengthen connections among researchers, Extension professionals, and industry stakeholders to enhance the economic viability and market competitiveness of U.S. aquaculture. This project aims to create a robust foundation for sustainable industry development by cultivating new partnerships and expanding the aquaculture economics network.

Central to this project is a comprehensive assessment of economics and marketing needs of Sea Grant programs and "Aquaculture Hubs" across the United States and its territories, including Puerto Rico, Hawai'i, and Guam. This assessment was conducted through a web-based survey, gathering insights from specialists, agents, and key industry stakeholders. The survey targets specific needs for tools, analyses, and training in areas such as business planning, risk management, and strategic planning. By identifying these needs, the project aims to tailor resources that directly support aquaculture businesses in navigating financial and market challenges.

The findings from this survey are expected to guide the development of targeted resources, workshops, and training programs that will empower aquaculture producers and Extension professionals. This study not only addresses immediate needs but also lays the groundwork for long-term collaboration through the creation of an Aquaculture Economics and Marketing Information portal. Engaging diverse regions and stakeholders ensures that the outcomes of this project will promote resilience, innovation, and sustainability in U.S. aquaculture.

Methods

The data for this study were collected through an online survey administered through QuestionPro®. During the development of the survey instrument, members of the project's industry advisory board and Extension & economics Advisory Board were consulted to assist with pre-testing the instrument. This was done to ensure clarity and relevancy of questions asked, as well as efficiency in completion.

Questions included in the survey were designed to capture detailed economic and marketing challenges related to topics such as feasibility and business planning, profitability analysis, and marketing strategies, along with assessing the urgency of

development of specific tools or training needed to address the challenges. The survey was launched on February 9th, 2025, and closed on May 9, 2025. Survey responses were exported from QuestionPro® for further analysis using Microsoft Excel. Project participants refrained from taking part in the survey to avoid potential biases.

Results

Characterizations of Respondents

The survey yielded 52 recorded responses. Of those responses, 41 were 100% complete, while 11 were partially complete.

The majority of respondents (68%) indicated they were Sea Grant Extension Specialists (Figure 1). This was followed by 13% who were Land Grant Extension Specialists, 6% who were Aquaculture Producers, and 3% who were Industry Association Officers. Analysis determined that 16% of respondents had more than one of the professional roles mentioned.

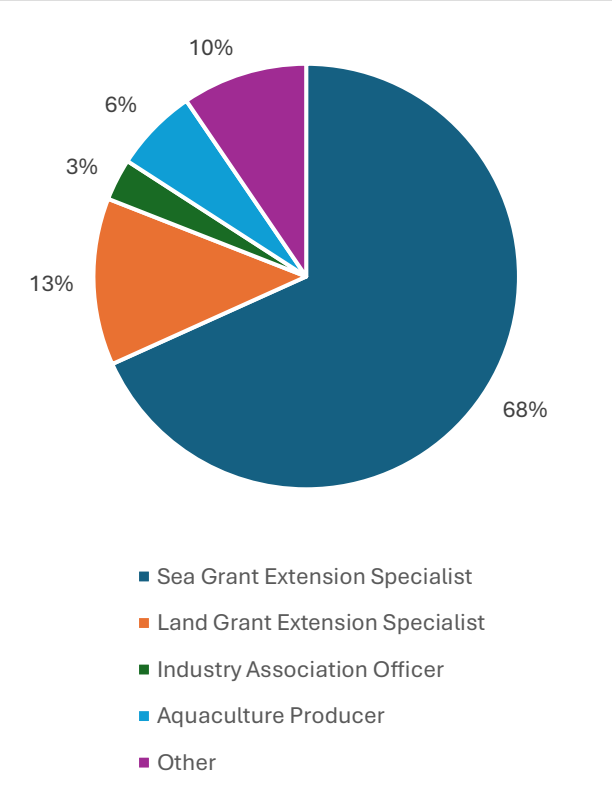

Figure 1. Professional roles of survey respondents.

Sixty-two percent of respondents claimed to actively participate in projects and/or programs with one or more specific Sea Grant Program(s) or Hub(s). All 15 Sea Grant Programs or Hubs were represented by survey respondents (Table 1). Additionally, six distinct U.S. regions, comprising 27 states or U.S. territories, were represented by survey respondents (Table 2).

Table 1. Sea Grant Programs and Hubs with which survey respondents actively participate.

Sea Grant Program or Hub	%
Great Lakes Aquaculture Collaborative	20%
Seaweed Hub	17%
Aquaculture Economics and Markets Collaborative	15%
Southern New England Shellfish Aquaculture Hub	8%
Hawai'i-Pacific Aquaculture Consortium	7%
Indigenous Aquaculture Collaborative	7%
West Coast Aquaculture Collaborative	7%
Maine Aquaculture Hub	5%
StriperHub	5%
Other[a]	9%

[a]Other includes: Southeast Aquaculture Communications Collaborative, Atlantic and Gulf Shellfish Seed Biosecurity Collaborative, East Coast Hard Clam Selective Breeding Collaborative, Recirculation Aquaculture Salmon Network, and the program titled "Understanding community perceptions of aquaculture in the West Coast/Alaska/Pacific region to advance aquaculture literacy through targeted outreach tools."

Table 2. U.S. regions within which survey respondents were are located.

State/Territory	%
Northeast[a]	25%
Gulf Coast[b]	19%
Mid-Atlantic[c]	13%
Southeast[d]	12%
Midwest[e]	12%
West Coast & Pacific Northwest[f]	12%
Pacific Islands & Territories[g]	8%

[a]Includes Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, and New York.
[b]Includes Alabama, Mississippi, Louisiana, and Texas.
[c]Includes Delaware, Maryland, and Virginia.
[d]Includes South Carolina, Georgia, and Florida.
[e]Includes Ohio, Indiana, Michigan, Wisconsin, and Minnesota.
[f]Includes Washington, California, and Alaska.
[g]Includes Hawai'i, Guam, and American Samoa.

Key Challenge Areas

Table 3 lists and defines the economic and/or marketing challenge areas presented in the survey instrument. These challenge areas were selected to encompass a broad range of economic and marketing concerns relevant to aquaculture stakeholders. Definitions were included to ensure consistency in interpretation and to minimize misclassification of challenges by respondents.

Table 3. Definitions of economic and/or marketing challenge areas presented in the survey instrument.

Economic and/or Marketing Challenge Area	Definition
Feasibility & Business Planning	Assessing business viability through structured planning, business plans, investment strategies, and networking to improve outcomes.
Risk Management	Identifying, analyzing, and mitigating risks, including financial, production, marketing, and regulatory, while preparing contingency and disaster recovery plans.
Profitability Analysis & Financial Management	Optimizing financial performance through cost-benefit analysis, budget management, profit and loss statements, and guidance on capital investments.
Marketing Strategies	Developing effective branding, promotional, and digital marketing strategies, conducting market research, and identifying target markets to reach buyers.
Regulatory Compliance	Understanding and adhering to regulations with tools for managing deadlines, preparing documentation, and staying updated on regulatory changes.
Industry Benchmarking & Performance Metrics	Using performance metrics and industry benchmarks to measure and improve business performance through data collection and analysis.

Marketing Strategies

Sixty-seven percent of respondents indicated they were aware of economics and/or marketing challenges related to "Marketing Strategies" (Figure 2). When asked to briefly explain, respondents emphasized that many producers lack formal marketing knowledge and training, often equating to a lack of training in the development of effective sales and marketing strategies. Additionally, respondents suggested that time, technical skills, and labor limitations prevent farmers, especially small or new ones, from effectively engaging in marketing

activities. Technical skills highlighted include website creation and social media engagement. Furthermore, survey respondents mentioned several challenges regarding market access and development, such as reaching new markets, dealing with market saturation, and stagnant prices.

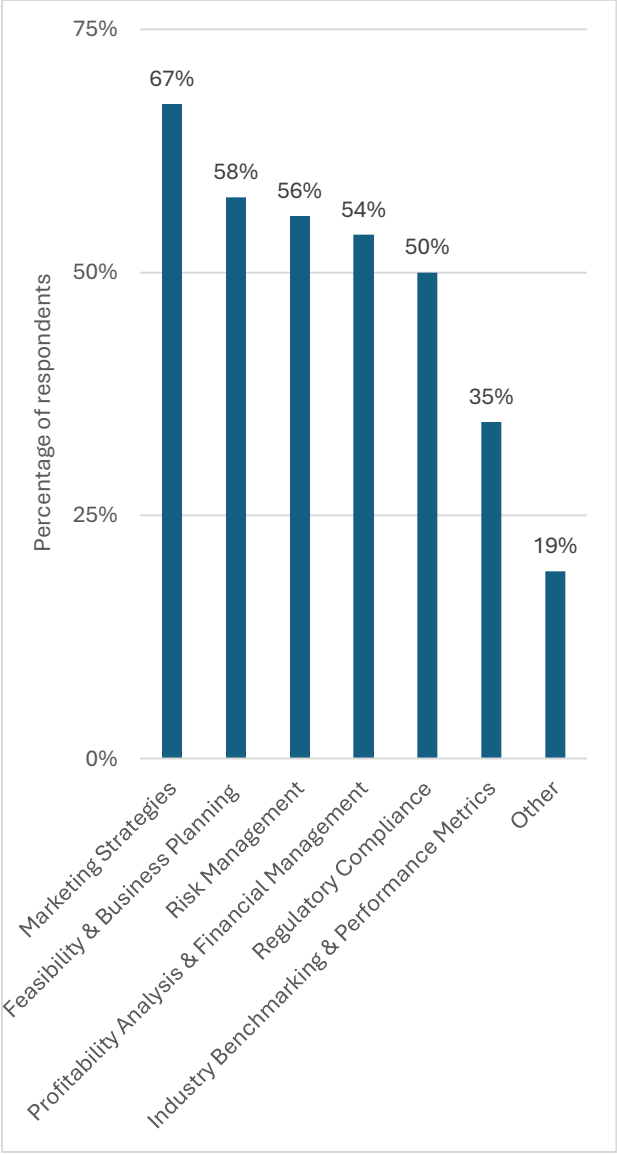

Figure 2. Economics and marketing challenge areas identified by survey respondents.

Respondents who were aware of challenges related to "Marketing Strategies" were asked to indicate how urgent it is to address these challenges (Table 4). Fifty Percent suggested these challenges were of "Moderate urgency", and 25% suggested these challenges were of "High urgency."

Table 4. Perceived urgency of challenge(s) related to "Marketing Strategies", according to survey respondents.

Challenge Area	Marketing Strategies
Low urgency	7%
Moderate urgency	50%
High urgency	25%
Immediate action needed	18%

Survey respondents were asked to identify potential outputs or opportunities to help address challenges related to "Marketing Strategies" (Table 5). Sixty-nine percent of respondents indicated that "Support with conducting market assessments and identifying target markets" would be of assistance to U.S. aquaculture producers. This was followed by 66% choosing "Networking with potential buyers or distributors", 60% selecting "Marketing workshops or training programs", 57% choosing " Assistance with branding and promotional strategies", 51% selecting "Digital marketing tools and resources", 51% choosing "Case studies of successful marketing strategies", and 49% indicating that "Assistance with market research reports or consumer trends" may help U.S. aquaculture producers address challenges related to "Marketing Strategies."

Table 5. Potential outputs or opportunities to help address challenges related to *"Marketing Strategies",* according to survey respondents.

Potential Output or Opportunities	%
Support with conducting market assessments and identifying target markets	69%
Networking with potential buyers or distributors	66%
Marketing workshops or training programs	60%
Assistance with branding and promotional strategies	57%
Digital marketing tools and resources	51%
Case studies of successful marketing strategies	51%
Assistance with market research reports or consumer trends	49%

Feasibility & Business Planning

Fifty-eight percent of respondents indicated they were aware of economics and/or marketing challenges related to "Feasibility & Business Planning" (Figure 2). When asked to briefly explain, several respondents emphasized that new and prospective aquaculture producers often lacked formal training in business planning, leading to ad hoc planning, missed cost projections, and challenges with long-term sustainability. Respondents also noted challenges with startup and scalability, such as estimating initial investments in gear and infrastructure, timing capital purchases, accessing financing, and understanding profitability timelines – how long it takes before the business begins generating enough revenue to cover its costs and become financially self-sustaining – during early stages of their businesses. Additionally, survey respondents noted that, while business planning tools exist, they vary in complexity and relevance, and prospective farmers with little or no background in aquaculture or business may struggle to interpret or use these tools effectively.

Respondents who were aware of challenges related to "Feasibility & Business Planning" were asked to indicate how urgent it is to address these challenges (Table 6). Forty-three percent suggested these challenges were of "Moderate urgency", and 39% suggested these challenges were of "High urgency."

Table 6. Perceived urgency of challenge(s) related to "Feasibility & Business Planning", according to survey respondents.

Challenge Area	Feasibility & Business Planning
Low urgency	9%
Moderate urgency	43%
High urgency	39%
Immediate action needed	9%

Survey respondents were asked to identify potential outputs or opportunities to help address challenges related to "Feasibility & Business Planning" (Table 7). Sixty-three percent of respondents indicated that "One-on-one consulting with business experts" would be of assistance to U.S. aquaculture producers. This was followed by 57% choosing "Access to business plan templates and tools", 57% selecting "Networking opportunities with other aquaculture businesses", 53% choosing "Guidance on investment strategies and securing funding opportunities", 50% selecting "Workshops or webinars on business feasibility studies", and 47% indicating that "Case Studies of successful aquaculture businesses" may help U.S. aquaculture producers address challenges related to "Feasibility & Business Planning."

Table 7. Potential outputs or opportunities to help address challenges related to "Feasibility & Business Planning", according to survey respondents.

Potential Output or Opportunities	%
One-on-one consulting with business experts	63%
Access to business plan templates and tools	57%
Networking opportunities with other aquaculture businesses	57%
Guidance on investment strategies and securing funding opportunities	53%
Workshops or webinars on business feasibility studies	50%
Case studies of successful aquaculture businesses	47%

Risk Management

Fifty-six percent of respondents indicated they were aware of economics and/or marketing challenges related to "Risk Management" (Figure 2). When asked to briefly explain, respondents highlighted the challenges posed by environmental changes, extreme weather events, and market saturation, which can lead to significant production, marketing, and financial risks for aquaculture producers. Several respondents conveyed that there is a general lack of awareness and understanding of these risks, and that there is a need for broader education, as well as contingency planning and support in the aquaculture industry. Additionally, many respondents indicated there is a significant shortage of accessible resources for risk management and risk recovery, such as crop insurance or disaster aid support, at the federal and state levels.

Respondents who were aware of challenges related to "Risk Management" were asked to indicate how urgent it is to address these challenges (Table 8). Fifty percent suggested these challenges were of "Moderate urgency", and 36% suggested these challenges were of "High urgency."

Table 8. Perceived urgency of challenge(s) related to "Risk Management", according to survey respondents.

Challenge Area	Risk Management
Low urgency	9%
Moderate urgency	50%
High urgency	36%
Immediate action needed	5%

Survey respondents were asked to identify potential outputs or opportunities to help address challenges related to "Risk Management" (Table 9). Sixty-two percent of respondents indicated that "Risk assessment tools and resources" would be of assistance to U.S. aquaculture producers. Identical proportions of respondents (62% each) also indicated that "Training on risk mitigation strategies", "Education or training for insurance programs or options", and "Workshops or webinars on industry-specific risks (i.e. production, marketing, financial institution risks)" would be useful to aquaculture producers. Fifty-five percent of respondents also indicated that "Guidance on developing contingency and disaster recovery plans" may help U.S. aquaculture producers address challenges related to "Risk Management."

Table 9. Potential outputs or opportunities to help address challenges related to "Risk Management", according to survey respondents.

Potential Output or Opportunities	%
Risk assessment tools and resources	62%
Training on risk mitigation strategies	62%
Education or training for insurance programs or options	62%
Workshops or webinars on industry-specific risks (i.e. production, marketing, financial institution risks)	62%
Guidance on developing contingency and disaster recovery plans	55%

Profitability Analysis & Financial Management

Fifty-four percent of respondents indicated they were aware of economics and/or marketing challenges related to "Profitability Analysis & Financial Management" (Figure 2). When asked to briefly explain, respondents suggested that aquaculture producers struggle to accurately track production costs due to the complexity of accounting for both direct inputs like labor and seed or juveniles, as well as indirect or less visible expenses such as permitting fees, equipment maintenance, and time spent on regulatory compliance. Additionally, difficulties in forecasting profitability due to variable and sometimes unpredictable long-term challenges, such as environmental changes and regulatory and permitting delays or costs were mentioned by survey respondents. Furthermore, several respondents indicated that many small operations lack the time or capacity to engage in financial planning, even though it is considered essential for business sustainability and growth.

Respondents who were aware of challenges related to "Profitability Analysis & Financial Management" were asked to indicate how urgent it is to address these challenges (Table 10). Forty-seven percent suggested these challenges were of "High urgency", and 32% suggested these challenges were of "Moderate urgency."

Table 10. Perceived urgency of challenge(s) related to "Profitability Analysis & Financial Management", according to survey respondents.

Challenge Area	Profitability Analysis & Financial Management
Low urgency	11%
Moderate urgency	32%
High urgency	47%
Immediate action needed	11%

Survey respondents were asked to identify potential outputs or opportunities to help address challenges related to "Profitability Analysis & Financial Management" (Table 11). Sixty-one percent of respondents indicated that "Training on cost-benefit analysis and budget management" would be of assistance to U.S. aquaculture producers. Identical proportions of respondents (57% each) also indicated that "Assistance with developing profit and loss statements", "Benchmarking data for aquaculture operations", and "Access to financial advisors or consultants" would be useful to aquaculture producers. This was followed by 50% selecting "Financial management software or tools", and 39% indicating "Guidance on capital investment and cost optimization" may help U.S. aquaculture producers address challenges related to "Profitability Analysis & Financial Management."

Table 11. Potential outputs or opportunities to help address challenges related to "Profitability Analysis & Financial Management", according to survey respondents.

Potential Output or Opportunities	%
Training on cost-benefit analysis and budget management	61%
Assistance with developing profit and loss statements	57%
Benchmarking data for aquaculture operations	57%
Access to financial advisors or consultants	57%
Financial management software or tools	50%
Guidance on capital investment and cost optimization	39%

Regulatory Compliance

Fifty percent of respondents indicated they were aware of economics and/or marketing challenges related to "Regulatory Compliance" (Figure 2). When asked to briefly explain, respondents emphasized that aquaculture regulations are often overly complex, redundant, and inconsistent across states and agencies, making it difficult for producers to understand and comply. Additionally, respondents suggested that the time-consuming and costly nature of permitting and compliance limits innovation and operational flexibility within the U.S. aquaculture industry.

Respondents who were aware of challenges related to "Regulatory Compliance" were asked to indicate how urgent it is to address these challenges (Table 12). Sixty percent suggested these challenges were of "High urgency", and 20% suggested these challenges were of "Moderate urgency."

Table 12. Perceived urgency of challenge(s) related to “Regulatory Compliance”, according to survey respondents.

Challenge Area	Regulatory Compliance
Low urgency	5%
Moderate urgency	20%
High urgency	60%
Immediate action needed	15%

Survey respondents were asked to identify potential outputs or opportunities to help address challenges related to “Regulatory Compliance” (Table 13). Sixty-five percent of respondents indicated that “Templates for documentation required by regulatory bodies” would be of assistance to U.S. aquaculture producers. This was followed by 62% choosing “Guidance on navigating local, state, and federal regulations”, 50% selecting “Tools for tracking and managing regulatory deadlines”, 46% choosing “Case studies for aquaculture businesses that achieved compliance”, and 38% indicating that “Webinars or workshops on regulatory compliance” may help U.S. aquaculture producers address challenges related to “Regulatory Compliance.”

Table 13. Potential outputs or opportunities to help address challenges related to “Regulatory Compliance”, according to survey respondents.

Potential Output or Opportunities	%
Templates for documentation required by regulatory bodies	65%
Guidance on navigating local, state, and federal regulations	62%
Tools for tracking and managing regulatory deadlines	50%
Case studies for aquaculture businesses that achieved compliance	46%
Webinars or workshops on regulatory compliance	38%

Industry Benchmarking & Performance Metrics

Thirty-five percent of respondents indicated they were aware of economics and/or marketing challenges related to “Industry Benchmarking & Performance Metrics” (Figure 2). When asked to briefly explain, respondents noted that access to consistent, standardized benchmarking data, especially at the local and regional levels, is limited, making comparisons across operations difficult or unreliable. Also, several respondents emphasized that the industry is still developing, with diverse market demands and insufficient baseline data to guide economic decisions or performance assessments. This was found to be especially true in emerging regions such as Alaska. Additionally, respondents also highlighted that farmers often lack the time, tools, or knowledge to effectively track performance metrics, which can limit the practical use of existing benchmarks.

Respondents who were aware of challenges related to “Industry Benchmarking & Performance Metrics” were asked to indicate how urgent it is to address these challenges (Table 14). Thirty-eight percent suggested these challenges were of “High urgency”, and an additional 38% suggested these challenges were of “Moderate urgency.”

Table 14. Perceived urgency of challenge(s) related to “Industry Benchmarking & Performance Metrics”, according to survey respondents.

Challenge Area	Industry Benchmarking & Performance Metrics
Low urgency	15%
Moderate urgency	38%
High urgency	38%
Immediate action needed	8%

Survey respondents were asked to identify potential outputs or opportunities to help address challenges related to “Industry Benchmarking & Performance Metrics” (Table 15). Fifty-six percent of respondents indicated that “Development of performance metrics and key performance indicators (KPIs)” would be of assistance to U.S. aquaculture producers. Similarly,

56% of respondents also suggested that "Training on data collection and analysis" would be useful. This was followed by 50% selecting "Access to industry benchmarks for comparison", 50% choosing "Case studies of businesses that improved performance", 44% selecting "Software for tracking business performance", and 44% indicating "Assistance with performance improvement plans" may help U.S. aquaculture producers address challenges related to "Industry Benchmarking & Performance Metrics."

Table 15. Potential outputs or opportunities to help address challenges related to "Industry Benchmarking & Performance Metrics", according to survey respondents.

Potential Output or Opportunities	**%**
Development of performance metrics and key performance indicators (KPIs)	56%
Training on data collection and analysis	56%
Access to industry benchmarks for comparison	50%
Case studies of businesses that improved performance	50%
Software for tracking business performance	44%
Assistance with performance improvement plans	44%

Discussion and Conclusion

The survey responses from Extension professionals and stakeholders nationwide call attention to critical economic and marketing challenges confronting the U.S. aquaculture industry. Issues related to marketing strategies and regulatory compliances were deemed highly urgent by respondents, highlighting the pressing need for targeted intervention. According to written responses by participants, there is a strong agreement that economic and profitability data, especially break-even pricing and updated impact assessments, are essential for improving operations, attracting investment, and guiding industry development.

Other challenges related to economics and marketing identified by survey respondents, but in fewer numbers, include challenges with recognition of new or emerging species, workforce development, lack of skilled labor, high employment turnover, and issues with cold-chain logistics and transportation infrastructure.

It is important to note that, while the survey instrument was made available to U.S. aquaculture producers and stakeholders who may have more direct knowledge of the challenges facing the industry, the majority of respondents were Extension specialists who may or may not be aware of the most relevant industry challenges. The overarching goal of this project is to create new partnerships and strengthen relationships between research, Extension, and industry. Therefore, researchers and Extension specialists were the focal audience of this survey, with the hope that participants would be inclined to contact their local producers to ensure their responses represent their local industry, while working toward strengthening those two-way relationships. With that in mind, it is important that challenges reported by fewer respondents are also taken into strong consideration when completing the future objectives of this study.

These findings will directly inform the development of targeted educational and outreach efforts, such as workshops, training programs, and the forthcoming Aquaculture Economics and Marketing Information portal to be hosted on the Virginia Seafood Agricultural Research and Extension website. By aligning these resources with the most pressing industry challenges, this project will help equip the U.S. aquaculture industry with practical tools to improve decision-making, resilience, and economic viability. Furthermore, building a strong foundation for collaboration across regions and disciplines will be vital in ensuring that these efforts remain relevant and impactful over time.

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