

TRIUMPH GULF COAST, INC. PRE-APPLICATION FORM

Triumph Gulf Coast, Inc. (“Triumph Gulf Coast”) has created a pre-application process to provide initial consideration of eligibility for potential ideas of projects or programs that may seek an award of funding. Applicants are required to participate in the pre-application process. Notwithstanding the response from Triumph Gulf Coast on the pre-application form, an Applicant may still elect to submit an Application.

APPLICANT INFORMATION

Name of Individual/Entity/Organization: Florida A&M University

Proposal Title: Economic Development through Artificial Intelligence and Data Science-based Education and Training in Advanced Aquaculture

Amount of Triumph Funds Requested: \$5,900,000

Total Estimated Project Cost: \$12,000,000

Brief Description of Individual/Entity/Organization:

Florida Agricultural and Mechanical University (FAMU) has a long and rich history of educating students at the undergraduate, graduate, doctoral and professional levels and enabling them to have a profound impact on society after graduation. It is the nation's largest comprehensive public land-grant HBCU & research institution with approximately \$50 Million in annual research awards. Further, FAMU offers a wide array of skills and capabilities to assist our clients in meeting their research, technology and workforce needs. Center for Spatial Ecology and Restoration (CSER) @ FAMU leverages AI, machine learning (ML) and deep learning (DL) algorithms in the distributed cloud to develop intelligent, cost-effective decision support systems to aid in natural disaster recovery response, as well as ecosystem restoration and management. FAMU also hosts the Centre for Complex Materials Design for Multidimensional Additive Processing, which promotes additive manufacturing of conventional and novel device structures and bioengineering. In addition to the main Tallahassee campus, FAMU has several satellite campuses across Florida. These include the Crestview Campus of College of Pharmacy and Pharmaceutical Sciences (COPPS) in the Okaloosa, County.

Contact Information

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Names of co-applicants, partners or other entities, organizations that will have a role in the proposed project or program:

Henry Mack, Florida's Chancellor for Career, Technical and Adult Education & Satyanarayan Dev, PhD; Ashvini Chauhan, PhD; Keith Bowers, PhD - FAMU

REQUIRED EXECUTIVE SUMMARY (Please find attached)

In a maximum of two (2) pages, please describe the proposed project or program and anticipated outcomes including (i) the amount of funds being sought from Triumph Gulf Coast; (ii) the amount and identity of other sources of funds for the proposed project or program; (iii) the location of the project or program; (iv) summary description of the proposed program, including how the program will be transformational and promote economic recovery, diversification, and enhancement of the disproportionately affected counties, and (v) a summary timeline for the proposed project or program.

IMPORTANT NOTICE

This pre-application process will **not** result in an award of funding by Triumph Gulf Coast. Rather, this process is designed to facilitate submission of ideas for potential projects or programs before the Applicant expends time and/or resources to complete a full Application. All Applicants for funding are required to complete an Application, which will be reviewed and then considered for award at the discretion of Triumph Gulf Coast Board.

Please Select the Proposal’s Eligibility Category(s)

Pursuant to Section 288.8017, Triumph Gulf Coast, Inc. was created to make awards from available funds to projects or programs that meet the priorities for economic recovery, diversification, and enhancement of the disproportionately affected counties. The disproportionately affected counties are: Bay County, Escambia County, Franklin County, Gulf County, Okaloosa County, Santa Rosa County, Walton County, or Wakulla County. *See*, Section 288.08012.

1. From the choices below, please check the box that describes the purpose of the proposed project or program (check all that apply):

- Ad valorem tax rate reduction within disproportionately affected counties;
- Local match requirements of s. 288.0655 for projects in the disproportionately affected counties;
- Public infrastructure projects for construction, expansion, or maintenance which are shown to enhance economic recovery, diversification, and enhancement of the disproportionately affected counties;
- Grants to local governments in the disproportionately affected counties to establish and maintain equipment and trained personnel for local action plans of response to respond to disasters, such as plans created for the Coastal Impacts Assistance Program;
- Grants to support programs that prepare students for future occupations and careers at K-20 institutions that have campuses in the disproportionately affected counties. Eligible programs include those that increase students’ technology skills and knowledge; encourage industry certifications; provide rigorous, alternative pathways for students to meet high school graduation requirements; strengthen career readiness initiatives; fund high-demand programs of emphasis at the bachelor’s and master’s level designated by the Board of Governors; and, similar to or the same as talent retention programs created by the Chancellor of the State University System and the Commission of Education, encourage students with interest or aptitude for science, technology, engineering, mathematics, and medical disciplines to pursue postsecondary education at a state university or a Florida College System institution within the disproportionately affected counties;
- Grants to support programs that provide participants in the disproportionately affected counties with transferable, sustainable workforce skills that are not confined to a single employer; and
- Grants to the tourism entity created under s. 288.1226 for the purpose of advertising and promoting tourism and Fresh From Florida, and grants to promote workforce and infrastructure, on behalf of all of the disproportionately affected counties.

Please Select the Priorities this Proposal's Outcomes will Achieve

1. Please check the box if the proposed project or program will meet any of the following priorities (check all that apply):

- Generate maximum estimated economic benefits, based on tools and models not generally employed by economic input-output analyses, including cost-benefit, return-on-investment, or dynamic scoring techniques to determine how the long-term economic growth potential of the disproportionately affected counties may be enhanced by the investment.
- Increase household income in the disproportionately affected counties above national average household income.
- Leverage or further enhance key regional assets, including educational institutions, research facilities, and military bases.
- Partner with local governments to provide funds, infrastructure, land, or other assistance for the project.
- Benefit the environment, in addition to the economy.
- Provide outcome measures.
- Partner with K-20 educational institutions or school districts located within the disproportionately affected counties as of January 1, 2017.
- Are recommended by the board of county commissioners of the county in which the project or program will be located.
- Partner with convention and visitor bureaus, tourist development councils, or chambers of commerce located within the disproportionately affected counties.

Economic Development through Artificial Intelligence and Data Science-based Education and Training in Advanced Aquaculture Project Summary

- (i) **Funds being sought from Triumph Gulf Coast:** \$5,900,000
- (ii) **Sources of funds for the proposed project:** This project will leverage multiple federally funded grants at FAMU valued at least \$6,100,000 for the performance period
- (iii) **The location of the project:** The project office will be located at the Crestview Campus in Okaloosa County, but will be executed by partnering with institutions in Franklin and Wakulla counties
- (iv) **Summary description of the proposed program: Transferring Curriculum certificates to Jobs and Workforce Development in Wakulla, Franklin, and Okaloosa counties.**

A) Aquaculture Based-Curriculum development:

Our proposed aquaculture farming is structured to take advantage of the biology and life cycle of a vast array of aquaculture with a focus on fin-fish to improve productivity. A basic understanding of these topics will greatly improve the productivity and marketability of one's product. There are several aspects of aquaculture that must be covered in a quality curriculum to train aquaculture ranchers successfully. The following is a brief note of the various aspects that need to be elucidated to the students.

Florida waters are host to a variety of predators and pests. Many are native to this region and others were inadvertently introduced into the environment. For example, small marine snails have a rasp-like apparatus that drills a hole through several fish species to access the meat. The Japanese drill (*Ceratostoma inornatum*) and the eastern drill (*Urosalpinx cinerea*) are the most common aspects. Once an area is infected with drills, it is almost impossible to get rid of them. Several sea star species are common predators, especially in lower intertidal areas. It can take less than 24 hours for a sea star to devour an adult fish or oyster. In upper intertidal areas, they can be removed from aquaculture beds by hand and taken ashore for disposal. These are situations where our state-of-the-art drone school technology would help in keeping these predators in check.

Florida A&M University proposes that we train hundreds of students especially underrepresented minorities in aquaculture with the proposed curriculum development activities. Curriculum development is a major task and would require significant financial support to develop a quality curriculum. Therefore, the curriculum development process is at its infancy pending financial support. It is proposed that FAMU would develop two curriculum tracks: 1) Certified Aquaculturist and 2) Certified Aquaculture Entrepreneur. The students will also learn the benefits of using cutting edge technology like the microwave annealing of algal microbial mats for tilapia feeding and the use of underwater drone school systems for keeping the predators in check while monitoring water quality.

B) Aerial drone swarm and Underwater drone school operational training certification:

One of the important limiting factors in restoring any ecological system is the agricultural run-off containing pesticides and chemicals that are harmful to many organisms that are sensitive to them. The important step in the development of a new autonomous eco-friendly pest control system is made possible by improvements in artificial intelligence, holding open the possibility that groups of micro-drones (less than 6 inches) could act together under human direction. Such drone swarms would be cheap to produce and able to overwhelm the swarms of pests. The micro-drones have already demonstrated advanced swarm behaviors such as collective decision-making, adaptive formation flying, and self-healing.

These drones are synchronized individuals acting together as a collective organism, sharing one distributed brain for decision-making and adapting to each other like swarms in nature. They communicate and collaborate with every other and the swarm has no leader. Hence, they can gracefully adapt to swarms of pests entering or exiting the team. By integrating a solid-state MASER (Microwave Amplified using Stimulated Emission of Radiation) a device using the stimulated emission of radiation by exciting atoms to amplify or generate coherent monochromatic electromagnetic radiation in the microwave range) and generating short pulses, the pests can be destroyed (or) disabled instantaneously. Laboratory studies have also identified that laser pulses, although not effective to kill all the larger pests like the locust, sterilize the males and the sperm sac of the females resulting in no offspring. Moreover, by integrating night vision into the systems, pests like locusts, which cannot fly at night due to colder temperatures, can be easily targeted and destroyed. This technology can eliminate the use of pesticides in agricultural production, thereby preventing their run-off into the coastal waters and destroying the ecosystem.

In an underwater environment, a solid-state sound amplification by stimulated emission of radiation (SASER) (a device using the stimulated emission of sound waves to amplify or generate coherent sound waves in the ultrahigh-frequency range) device is used. The SASER generates short pulses, any biological entity can be sterilized (made nonreproductive) or destroyed (or) disabled instantaneously by applying SASER pulses in a targeted fashion. Integrating bio-sensors with

SASER would act as a real-time data acquisition, monitoring, and eco-systems control tool. Laboratory studies have also identified that SASER pulses are an effective means of communication as well as a reliable 3D mapping tool. This combined with water quality sensors and LiDAR could make these schools of drones ideal underwater dwellers. Moreover, if equipped with foldable solar panels they can charge themselves and return to work autonomously. The figure below represents a schematic of this technology. The curriculum for training is still under development as research and development are still in progress in these two patent-pending technologies.

C) Electromagnetics assisted Nutritional Enhancement for Algal Silage for Aquaculture and Ecosystem Restoration Applications

Aquaculture is critical to resolving USA’s and world’s food insecurity and projected future food shortages. Food production needs to double by 2050 to feed the projected world population. The world’s oceans represent the greatest potential source of protein by generating 30 x more yield per acre of water versus an acre of land. Aquaculture will be an ever-growing portion of the seafood industry and will enable us to have available, accessible, and affordable seafood while bringing much needed economic development. Attaining self-reliance and self-sufficiency of sea-food also ensures national bio-security by limiting our vulnerabilities to biological attacks. The federal government recognizes the importance of growing the aquaculture industry. The National Oceanic and Atmospheric Administration (NOAA) has stated that marine aquaculture is an important part of its strategy for building economic and environmental resiliency in coastal communities. But decreasing fishmeal supply is a major concern for the future of the aquaculture industry. The use of algal silage as a dietary replacement for fish meal is a solution proposed by many researchers. Preparing algal silage from microalgae has the following advantages. 1) Algal biomass resources are converted into dietary materials for aquaculture. 2) the silage is acidic and therefore will have a long shelf life at room temperature. Therefore, surplus cultured microalgal silage can be preserved and utilized depending on the demand or even distributed to other aquaculture farms. 3) The silage will have several health benefits for the aquacultured organisms and therefore will result in high-quality cultured fish and shellfish including oysters. 4) This microalgal microbial mat will protect and feed the aquatic life.

This invention uses metagenomics techniques, that incorporate the addition of new algae and bacterial prospects to enhance the nutritional value for high yield aquaculture, including oyster production. A newly developed solid-state microwave applicator will be used not only to improve the nutritional composition of the microalgae but also to expedite the annealing process of the microalgae on the silage. New isolates have been screened for their natural abilities to produce added nutritional value comparable, if not higher, relative to industry gold standard strains.

D) Development of Career Themed Courses and Submission Florida Career and Professional Education (CAPE) for certification.

The Florida CAPE certification list needs expansion to include evolving Florida industries/job/job titles. Many of these jobs in the Aquaculture industry need a Standard Occupational Classification (SOC) code. To serve today's evolving Aquaculture workforce needs, industry certifications developed in alignment with the industry needed. . It has been documented that CAPE students who graduate with an industry certification outperform the academy students who graduate without an industry certification, with a higher placement rate in employment or postsecondary education. The curriculum developed in this project will be submitted to the FLDOE for approval and listing on the CAPE list. Moreover, these courses will be offered as Advanced Placement and Dual enrollment courses, thereby encouraging CAPE participants for post-secondary enrollment in universities.

(v) Summary Timeline for the proposed project:

