Application of AI in extensive shrimp farming clusters: A business case for monitoring and management along with the e-traceability system in Bangladesh

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Abstract:

Shrimp is one of the largest agricultural export commodities in Bangladesh. More than 99% of shrimp farmers in Bangladesh are smallholders, involved with extensive farming practices. The shrimp farmers in the coastal region of Bangladesh face a myriad of problems towards meeting the global market standard in terms of ensuring food safety and traceability. Moreover, the adverse effects of climate change in recent years are equally responsible for the decline of shrimp production over the last 6 years. However, recent concerns about sustainability, food security, climate change, and shrimp health management have paved the way for implementing AI-based and data-driven shrimp farming adaptation for the shrimp farmers in Bangladesh.

In recent years, environmental and weather variables along with the lack of quality inputs (i.e seed, feed, lime, fertilizer, probiotic, etc.) inversely affect the shrimp production both in terms of quality and quantity. As observed, the outbreak of diseases happening more frequently, yet hasn't been monitored or any effective countermeasure been taken. In addition, supply chain actors are facing hurdles to maintain traceability for the individual extensive shrimp farms due to very small individual production volume.

Hence, the project has focused to develop a business case towards standardizing the production systems through application of AI in monitoring and management of extensive shrimp farms. The overall aim of the project is to identify the risk of abrupt weather and environmental events in extensive farming and thereby improve the production practices through machine-learned predictive feedback system. Generally, the system will analyze the patterns of production and inabilities in shrimp farming with a view to mobilizing early warning system for the farming clusters. However, this will work as a standalone solution for the shrimp clusters, ensuring reliable and transparent low-cost traceability system.

With the recent advances in AI, temporal data behavior can be learned using deep learning-based regression models and identify the causality and correlation between input factors and final output in terms of production. Learned models can help guide and select the appropriate feedback support for the farmers to take effective measures following early warnings. This smart system can make sure the farmers take the right measures which as a whole would contribute to the overall growth of shrimp production in Bangladesh.

However, the project presumed that this standalone system will support extensive farmers towards getting 30% production increase at their shrimp farms. Moreover, the farmers will get access to premium market chain by the adoption of AI into farming practices and supply chain. Therefore, production gain and profitability will be capitalized to minimize the application cost towards developing the business case.