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Wrought Wealth from The Waste: Extraction and Characterization of Chitosan Through The Utilization of Discarded Shells of Soft-Shell Mud Crabs in Bangladesh

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Soft-shell crab farming, favoured for its culinary appeal and higher profits, has replaced shrimp farming, producing discarded shells that are valuable raw materials for chitosan and bring more economic value than a low-cost sale of animal feed. This study aimed to investigate the production of chitosan from mud crab (*Scylla olivacea*) shell waste in soft-shell farming, as well as the changes in chitin and chitosan yield percentages for three different size groups: small (S) crab shells (60–80 g), medium (M) crab shells (81–100 g), and large (L) crab shells (101–120 g).

The study also aimed to evaluate the production costs of chitosan. The study employed two different HCl concentrations, 1 M (Treatment A) and 1.5 M (Treatment B), in the demineralization steps of chemical extraction methods. The remaining steps included deproteinization and deacetylation. The 1 M and 1.5 M HCl treatments produced chitin from small, medium, and large crab shells at rates of 6.34%, 6.5%, and 6.92%, as well as 6.08%, 6.64%, and 7.19%. Conjointly, the 1 M and 1.5 M HCl treatments yielded chitosan at 4.07%, 4%, and 4.29%. 4.38%, 4.39%, and 6.32%, respectively. The extracted chitosan was analyzed using FTIR and TGA. The company exports approximately 252 tons of softshell mud to meet the growing demand, generating 1.512 million US dollars annually through the production of 15.12 tons of chitosan from these shells. Establishing a small-scale chitosan industry that utilizes new waste management developments could yield significant profits. The extra income from the sludge of minerals and proteins from demineralization and deproteinization processes would boost profits by 50% above production costs. Recycling shell waste will boost the nonconventional fisheries sector, creating jobs especially for women.

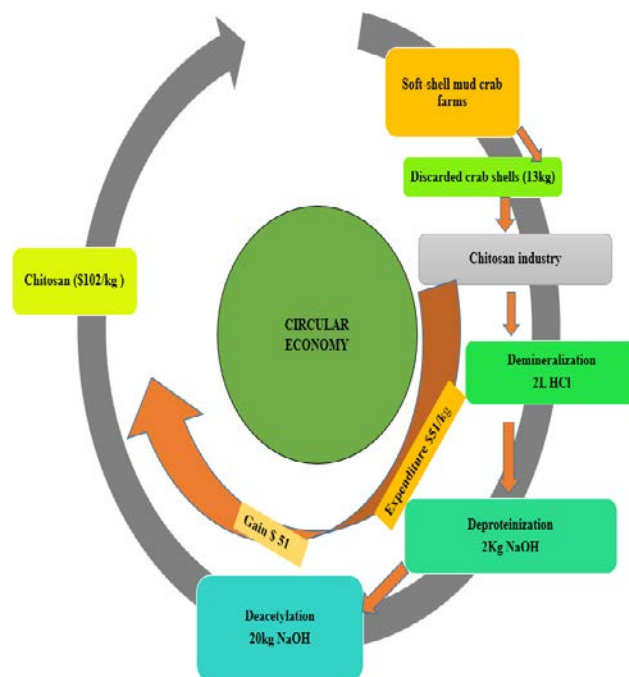


Figure: Protocol of 1kg chitosan production based on circular economy.