Detailed Budget for Chitosan Production & Automated System Development

Total Budget: ₦150,000,000

Item	Qty	Unit Cost (₦)	Total (₦)	Justification
Vibratory feeders	1	2,000,000	2,000,000	Automated feeding of raw shells into system
Belt conveyors	2	1,500,000	3,000,000	Transport of shells between stages
Storage silos (SS/lined)	2	2,000,000	4,000,000	Safe bulk storage of shells & intermediates
Washing tanks + conveyors	2	1,750,000	3,500,000	Cleaning & pre-treatment of shells
Rotary drum dryer	1	6,000,000	6,000,000	Drying shells before crushing
Industrial crusher	1	3,500,000	3,500,000	Pulverization of shells
Acid reaction tanks w/ agitators	2	1,250,000	2,500,000	Demineralization step (HCl)
Dosing pumps (acid/water)	2	750,000	1,500,000	Controlled reagent addition
pH control & auto dosing system	1	2,500,000	2,500,000	Automation of reaction control
Steam-heated reactor	1	5,000,000	5,000,000	Deacetylation stage
Alkali reactors (x2)	2	4,000,000	8,000,000	Deproteinization & deacetylation
Corrosion-resistant recirculation pumps	2	1,000,000	2,000,000	Safe handling of corrosive solutions
Temperature controllers	2	500,000	1,000,000	Maintain optimal reaction temperatures
Large-scale decanter centrifuge	1	3,500,000	3,500,000	Solid-liquid separation

Rotary vacuum belt filter	1	4,000,000	4,000,000	Filtration of chitosan slurry
Counter-current washing tanks + decanting	2	1,250,000	2,500,000	Efficient washing after reaction
Neutralization tanks + dosing system	2	1,000,000	2,000,000	Final pH adjustment
Automatic/semi-auto bagging machine	1	3,500,000	3,500,000	Packaging of finished product
Waste treatment plant	1	3,000,000	3,000,000	Compliance with safety/environmental standards
Corrosion-resistant pumps & pipes	Lot	1,500,000	1,500,000	Chemical-safe fluid transfer
Acid storage tank	1	1,500,000	1,500,000	Bulk safe HCl storage
Alkali storage tank	1	1,500,000	1,500,000	Bulk safe NaOH storage
Electrical distribution & fuses	Lot	2,000,000	2,000,000	Power supply reliability
Fire detection & suppression system	Lot	2,000,000	2,000,000	Safety compliance
PPE, showers, eyewash stations	Lot	1,500,000	1,500,000	Worker safety
Analytical balance & scales	2	750,000	1,500,000	Precision weighing
pH & conductivity meters	2	500,000	1,000,000	Process monitoring
FTIR spectrometer	1	5,000,000	5,000,000	Degree of deacetylation
Viscometer	1	2,000,000	2,000,000	Molecular weight estimates
Muffle furnace	1	2,000,000	2,000,000	Ash content analysis
Moisture analyzer / Karl Fischer	1	2,500,000	2,500,000	Precise moisture analysis
CHN elemental analyzer	1	2,500,000	2,500,000	Nitrogen content analysis

Titration setup	Lot	1,000,000	1,000,000	Degree of deacetylation
HPLC	1	21,000,000	21,000,000	Purity, molecular characterization
UV-Vis spectrophotometer	1	3,000,000	3,000,000	Absorbance studies
Lab glassware, fume hood	Lot	10,000,000	10,000,000	General lab work
Cockroach farming facility	Lot	2,000,000	2,000,000	Raw material supply
Prawn farming tanks/ponds	Lot	2,500,000	2,500,000	Consistent prawn shells
Feed & starter stock	Lot	500,000	500,000	Initial inputs
Solvents, acids, reagents	Lot	3,000,000	3,000,000	Production inputs
Personnel cost	-	-	10,000,000	working capital and operations
Miscellaneous and Contingencies (5%)	-	-	7,500,000	Coverage for regulatory approvals, certifications, market development and partnerships, installation, training, and
GRAND TOTAL	-	-	**150,000,000**	

Budget Narrative

1. **Industrial Processing Equipment (₦55m);** Core production units for raw material handling, crushing, chemical treatment, drying, and separation. Includes feeders, conveyors, rotary dryers, reactors, dosing pumps, centrifuge, and temperature/pH controllers.

2. **Filtration, Neutralization & Packaging (₦15.5m**); Rotary vacuum filters, washing systems, neutralization tanks, bagging machines, and a waste treatment plant to ensure efficient separation, product purity, and environmental compliance.

3. **Storage, Utilities & Safety (₦11.5m**); Chemical storage tanks, corrosion-resistant pumps and pipelines, fire safety systems, PPE, showers, eyewash stations, and electrical distribution to safeguard personnel and equipment.

4. **Laboratory Analytical Equipment (₦42m**); Quality control and R&D tools including FTIR, HPLC, CHN analyzer, viscometer, spectrophotometer, moisture and ash analyzers, balances, titration setups, and laboratory glassware with fume hoods for product validation and research support.

5. **Farming & Raw Material Setup (₦5m)**; Cockroach farming facility and prawn farming ponds to ensure consistent supply of chitin-rich raw materials for extraction.

Note: The edible portion of prawns will be sold locally to support food security.

6. **Consumables & Operations (₦13.5m)**; Reagents, acids, solvents, and caustics for production and testing, as well as ₦10m personnel and operations cost for skilled staffing, maintenance, and routine activities.

7. **Miscellaneous/Contingency (₦7.5m);** Allowance for fluctuations, regulatory approvals, installation, training, certification, and other unforeseen expenses.

Conclusion:
Each cost category is critical to scaling production, ensuring quality, and aligning with NASENI's mandate to promote innovation-driven industrialization.