

NRCGP 2025- Production of D-Limonene from Nigerian Citrus Waste: The Nigerian Limonene Waste to Wealth Initiative (NL2WI)

3.0 ESTIMATED BUDGET

3.1 Cost of training, sensitization and establishment of citrus peel processing hubs; toward citrus value chain development and socioeconomic empowerments for project sustainability and job creation (Creation of citrus peel collection hubs and training of selected collectors on GMP in citrus peel collection, sorting, drying and, packaging).

S/No	Description of item	Quantity	Unit Cost	Amount (N)
1	Rent of collection hub across the Nation (35 hubs)	N300,000 per year	35	10,500,000
2	Sensitization/awareness creation/training Creation of citrus peel collection hubs and training of selected collectors on GMP in citrus peel collection, sorting, drying and, packaging.	a. Honorarium for 5 participants from 7 priority states b. Honorarium for Facilitators	N50,000/day for 3 days =N150,000/ person for 5 persons from 7 state = (150,000 x5 x7) =N5,250,000 N 120,000/day for 3 day = N360,000 for three person = N1,080,000 for seven state = 7,560,000	12,810,000
3	Fabrication of GMP compliant drying trays for all collection hubs (Electric/gas oven)- Temp; 40 ⁰ c to 100 ⁰ C, 340x280x235 cm (lxwxh) dimension	35	900,000	31,500,000
Subtotal				54,810,000

3.2 Cost of repair and maintenance of the existing 500-liter capacity steam distillation equipment and other apparatus.

S/No	Item Description	Quantity	Unit cost (N)	Amount (N)
1a.	30 KVA power diesel generator	1 complete set	18,000,000	18,000,000
1b.	12 mm electric cable	30 meters	255,000.00	255,000
1c.	Change over switch Installation/logistics	1	160,000.00	160,000
1d.		1	585,000.00	585,000
2a.	Procurement of Cooling tower fan motor (2 KW).	1 set	400,000.00	400,000
2b.	Starter switch contactor for Fan electric motor	3	50,000.00	150,000
2c.	Three Phase electrical imprevener	3	25,000.00	75,000
3a.	Steam boiler: Burner contactor (100A)	2	80,000.00	160,000
3b.	2.5 mm electric cable	30 m	3,000.00	90,000
4a.	Stainless steel steam pipes – (16 lengths of 2")	16 lengths of 2" diameter	295,000.00 / length	4,720,000
4b.	Stainless steel water pipes – (8 lengths of 1 3/4")	8 lengths of 1 3/4"	275,000 / length	2,220,000
			245,000 / length	

4c.	Stainless steel water pipes – (5 lengths of 1 1/2")	5 lengths of 1 1/2"		1,225,000
			295,000 / length	
4d.	Stainless steel water pipes - 11 lengths of 2"	11 lengths of 2"		3,245,000
4e.	Glass wool fiber for lagging of Steam line	16 lengths of 2" diameter	115,000/length	1,840,000
4f.	Pipe fittings/accessories		1,350,000.00	1,350,000
	Glass wool fiber blanket For Extractor/Reboiler		1,000,000.00	1,000,000
	Workmanship for welders And procurement of Argon gas		2,700,000.00	2,700,000
	Logistics for Technicians and Pipes/fittings/accessories		850,000.00	850,000
5.	Automatic Polarimeter for Optical Rotation. Model – Veidt INESA WXG-4	1 unit	800,000.00	800,000
6.	Digital Viscometer (10 - 100,000 mPa's)			
	Specification - <i>Digital lab rotation viscosity meter ± 3% accuracy fluidity meter tester with 4 rotors and temperature probe (110-240v) NDJ-5S</i>	1 unit	1,200,000.00	1,200,000
	<i>Features; Compact design, variable spindle/rotor speed, Data storage, Versatility, Accuracy and repeatability,</i>			

<i>Digital display, Temperature measurement, Integrated time, Spindle set.</i>			
7.	Tabletop digital refractometer (BRIX ABBE)		
	Model name/number; BNWYA-2S/3S 0-100%		
	Features.	1 unit	1,700,000.00
	1. Sapphire prism, temperature control, 8-inch color touch screen.		1,700,000
	2. Brix: 0-100%, high resolution: Brix: 0.01%		
Estimated freight charges, insurance, tax on items to be imported:			950,000
Subtotal			43,675,000

3.3 List of materials needed for the project

S/No	Description of item	Quantity	Unit Cost (N)	Amount (N)
1	Collection of Citrus peel from collection hubs	100 tonnes	N200 / kg of 100 tonnes =(200 x 100,000)	20,000,000

2	Packaging, Labeling and Cartons (30 ml essential oil bottles, and other storage vessels)	10,000 units	1,500	15,000,000
3	Transport of feed stock from the various collection hub to extraction site (NIPRD Abuja)	100 trips (1tonnes/ trip)	120,000	12,000,000
4	Labour for Ad-Hoc staff for the proposed 12 weeks duration (Exaction and purification of Limonene from Citrus peel essential oil)	900 hrs.,	8334.00/hr	7,500,600
	Purchase of a 200L standalone pilot scale essential oil extraction machine to complement NIPRD facility as a back-up.	200L capacity extraction stainless steel vessel, Operating temp -5oc to 100 °c, With vacuum pump, 35m2 condenser, circulating pump	1 unit	35,956,700
Subtotal -				90,457,300

3.4 List of daily running costs for production during the proposed 12 weeks duration

S/No	Description of item	Quantity	Unit Cost	Amount (N)
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1	Diesel fuel for running generator (14.62L/hr)	10526 liters	1368/hr	14,400,115
2	Diesel fuel for running the steam generator boiler (12.5L/hr)	9000 liters	1368/hr	12,312,000
3	Charges for the use of water supplied	750 hrs.	4000/hr	3,000,000
Subtotal				29,712,000

3.5 List and cost of glassware needed for the project

S/N	Item description	Quantity	Unit Price (Naira)	Amount (Naira)
1.	TLC glass plates GF 254 (5cm x 10cm) / plate, 40 plates/pack. (Qingdao HaiYang Chemical Company, China)	10 cartons	7000 /pack 70,000 / carton	700,000.00
2.	TLC glass tanks – (10 x 20 cm) / set	4 sets	30,145.00	120,580.00
3.	Glass rod 8 x 500mm	10 sets	180.50	1,805.00
4.	Forceps – 30cm, 20cm long	15 pcs	210.00	3,150.00
5.	Glass pipettes – 15cm long	500 pcs	90.50	45,250.00
	30cm long	500 pcs	120.00	60,000.00
6.	Glass pipettes rubber fillers (2ml)	20 pcs	90.00	1,800.00
7.	Glass Separating funnel	250 ml (5pcs)	2,500.00	12,500.00
		500 ml (5pcs)	5,200.00	26,000.00
		1 liter (10pcs)	7,000.00	70,000.00

		3 liters (2 pcs)	10,000.00	20,000.00
		5 liters (2 pcs)	15,000.00	30000.00
8.	Glass pycnometer	50ml (5pcs)	8000.00	40,000.00
		25ml (5pcs)	5000.00	25,000.00
		10ml (5pcs)	3000.00	15,000.00
9.	Glass round bottom flasks (various sizes)	10ml (50pcs),	950.50	47,525.00
		25ml (20pcs),	1000.00	20,000.00
		50ml (20pcs),	1500.00	30,000.00
		250ml (20pcs),	2500.00	2,500.00
		500ml (10pcs),	4000.00	80,000.00
		1L (10pcs),	6000.00	6,000.00
		2L (10pcs)	8000.00	80,000.00
10.	Glass round bottom flasks connector mouth	29/24 (3 sets)	5,000.00	15,000.00
		29/19 (3 sets)	5,000.00	15,000.00
11.	Glass measuring cylinders	5ml (30pcs)	1,011.00	30,330.00
		10ml (20pcs)	1,013.00	20,260.00
		250ml (20pcs),	1197.00	23,940.00
		500ml (10pcs),	33,277.00	332,770.00
		1L (10pcs),	21,408.00	214,080.00
		2L (10pcs)	71,677.00	716,770.00
12.	Glass beakers	5ml (30pcs)	6,062.00	181,860.00
		10ml (20pcs)	6,029.00	120,580.00
		250ml (20pcs),	11,759.00	235,180.00
		500ml (10pcs),	14,518.00	145,180.00
		1L (10pcs),	29,996.00	299,960.00
		3L (10 pcs)	35,000.00	350,000.00
		5L (10pcs)	40,000.00	400,000.00
13.	Melting point Capillary tubes	40 pks	5,000.00	20,000.00

14.	Glass desiccator (30cm diameter) with desiccant	1 set	40,000.00	40,000.00
15.	Densitometer for volatile oil	1 set	35,800.00	35,800.00
	Estimated freight charges, insurance, tax for items to be imported:			950,000.00
Subtotal -				₦6,426,550.00

3.6 Cost of Quality Control / Lab Test of products

16.	TLC/ GCMS analysis	100 batches	30,000	3,000,000
Subtotal -				3,000,000

3.7 List and cost of solvents, chemicals and reagents needed for the project

19.	Sodium hypochlorite (99% Sigma- Aldrich or BDC)	20 x 500g	30,000	600,000
20.	D limonene (99% Reference standard) CAS number - 470-82-6	2 x 100 mg	400,000	800,000
21.	Hydrochloric acid (analar)	2.5L x 20	40,000	800,000
22.	Hexane (Analar grade 99%) Sigma- Aldrich	2.5L x 12	40,000	480,000
23.	Standard distilled water (Sigma)	2.5L x 12L	30,000	360,000.00
24.	Silica Gel			
	60-80 micron	10 cartons	45,000/carton	450,000.00
	100-200 micron	10 cartons	45,000/carton	450,000.00
	300-400 micron	10 cartons		

			55,000/carton	550,000.00
25.	Sephadex LH-20			
	a. 100g (China)	2 pack x 100g	200,000.00	400,000.00
	b. 500g (China)	3 pack x 500g	900,000.00	2,700,000.00
26.	5ml syringe	10 boxes	10,000.00	100,000.00
27.	Parafilm roll – (10cm x 38 cm roll)	2 sets	32,900.00	65,800.00
	Estimated freight charges, insurance, tax for items to be imported:			350,000.00
			Sub-total:	N7,305,800.00

3.8 Literature, documentation, information

S/N	Item description	Quantity	Unit Cost (N)	Amount (N)
1.	NAFDAC documentation and product listing			1,200,000
2.	Stationeries for results, reports and filing (3 cartons of A-4 paper)	3 ctns	10,000	30,000
3.	3-in-1 Hp Lazer-jet black & white Printer (A4 paper size)	1 unit	800,000	800,000
4	Marketing & Distribution			1,500,000
			Sub-total:	3,530,000
			Grand Total:	238,916,650.00

Grand Total = Two hundred and thirty-eight million, Nine hundred and sixteen thousand, six hundred and fifty naira only (N238,916,650.00)