

The Third Annual Bontho Oyster Festival (Sierra Leone) Promotes Value-Added Smoked Mangrove Oyster Products with Support of the Whitstable Oyster Company

Francis Murray¹, Jason Hoepfl¹, Dimtar Taskov¹, James Green², Salieu Sankoh³, Richard Wadsworth⁴
¹ University of Stirling, ² Whitstable Oyster Company, ³ University of Freetown, ⁴ Njala University

Since 2014 the 'Darwin Sherbro Oyster Project', funded through the UK Darwin Initiative, has worked with remote communities in the Sherbro River Estuary, Sierra Leone to offer more sustainable livelihoods for women based on the culture, processing and marketing of native mangrove oysters (*Crassostrea tulipa*). Sierra Leone is one of the poorest countries in the world. Finding effective solutions has required close partnership between locals, scientists from Freetown and Njala Universities in Sierra Leone and the UK's University of Stirling and the Whitstable Oyster Company (WOC). On the 22nd of June team members hosted the third annual 'Bontho Oyster Festival' (**Plate 1**). Following the successful format of previous years, events which attracted over 100 entrants included oyster smoking and recipe contests (**Plate 2 & Plate 3**), a speed-shucking competition as well as music. Winners of improved oyster steaming-troughs and cash prizes included previous year's victors Ms Seinya Sie of Gbongboma village (smoked oysters) and Mammie Kode of York Island (speed-shucking). TV and radio coverage was provided by BBC South East and local community station 'Imperri Radio'. Vitally, the Whitstable Oyster Company has committed to funding implementation of the project for a further five years. Primary focus will be on quality assurance measures for value-added marketing and promotion of the 'Sherbro Oyster' brand through local radio and further annual festivals.



Plate 1. The 3rd Annual Bontho Oyster Festival



Plate 2. Judging the smoked oyster contest (L-R Mr Zebedee and Seinya Bakarr of WA BICC, James Green of WOC)



Plate 3. Judging the oyster recipe contest (L-R Josephus Mamie Deputy Director of fisheries and his wife, Mohamed Jalloh DoF, Chris Hewlett WOC)

Early in the project, researchers concluded that market incentives could be one of the most effective ways to support more sustainable management of oyster and mangrove resources in what is an extremely challenging regulatory environment. However, remoteness and the micro-dispersed nature of the gathering population amongst the mangroves creates extreme logistical and quality assurance challenges. This results in value-chains that are short and lacking in specialisation. Most producers, predominantly women must harvest, process and stockpile sacks of smoked oysters (**Plate 6**) for wholesale at the nearest mainland weekly market (*‘lumi’*) for modest gain. Mobility restrictions imposed by dependence on dug-out canoes and lack of motorised transport (**Plate 4**) mean that gathering (**Plate 5**) is highly localised and primary processing (steaming; **Plate 7** and **Plate 8**) and secondary processing (hot-smoking; **Plate 9**) are necessarily household-based with very limited scope for more scaled-up centralised collective production activity.



Plate 4. Full-time gatherer Kadie Karimu and her husband paddling to the oyster grounds near Bonthe Town



Plate 5. Scraping razor-sharp oysters from overhanging mangrove roots



Plate 6. Bagged smoked oyster production by a family of 8, full-time processing for 6 weeks.



Plate 7. Different types of steaming troughs; back & left zinc-coated roofing sheeting, right 4mm steel



Plate 8. Loading the steaming trough



Plate 9. Smoking steamed oysters for stockpiling prior to wholesale

It was in this context that researchers chose to support cooperative marketing efforts to realise a shift from the current extractive and production-focused status of mangroves oysters as a low-value commodity to a more niche 'low-volume, high-value' differentiated product. To this end, Bonthe Town primary teachers and 'petty-traders', Matilda Hai and Aminata Foday (**Plate 10 and Plate 11**) have taken the lead in establishing a fledgling 'Sherbro women's oyster marketing association' (SWOMA), empowerment of which is key to the project's longer term success. The research team is supporting group members to develop and evaluate demand for a range of value-added oyster products in strategic mainland retail market segments. In the rest of this article we summarise outcomes of a marketing trial staged concurrently with the 2019 festival. The trial was designed to assess how different combinations of product attributes could be used to maximise profitability contingent on the mix of margins and demand levels in target market segments.



Plate 10. Aminata Foday and Matilda Hai (centre L&R) SWOMA executives organising group members

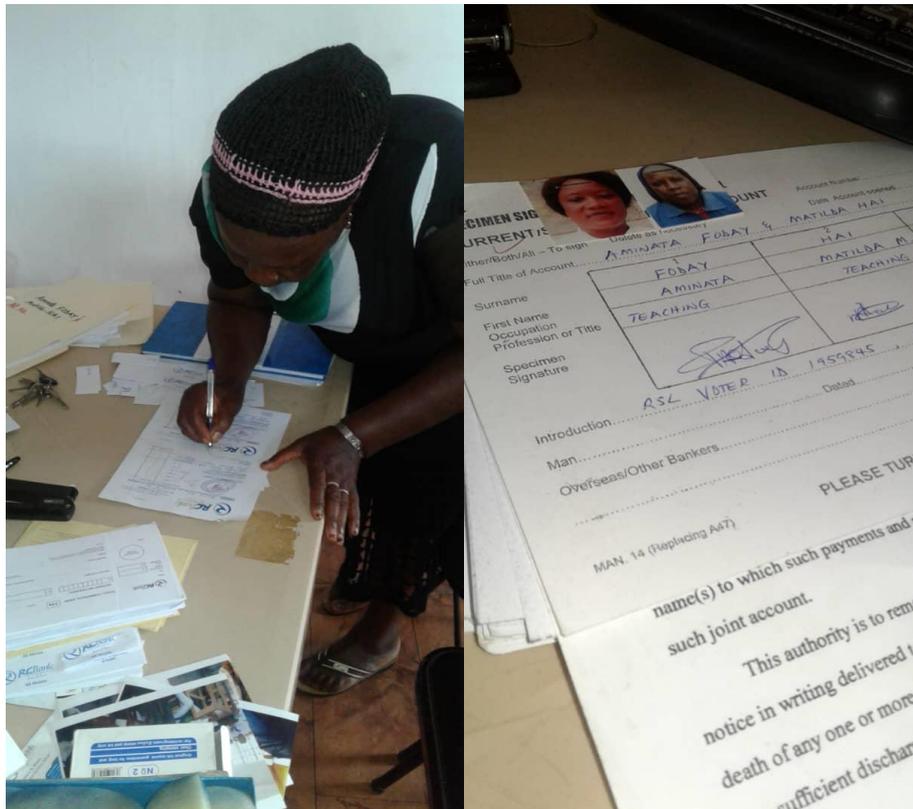


Plate 11. Aminata Foday and Matilda Hai opening a SWOMA group bank account at the Rokel Commercial Bank (established in 2019 the first commercial bank branch in Bonthe Town).

Cooperative smoked-oyster marketing trials: Prior to the festival, Matilda and Aminata organised gatherers from 3 mangrove communities to produce and test retail demand for a range of value-added products at a strategic location near Moriba Town (**Plate 12**). Moriba Town is located 30km inland of Yagoi, a small road-head town hosting the weekly *lumi* where the group would normally make a 2-3 hour journey by motorised launch to make bulk sales of their produce at wholesale prices. Moriba Town is the base of the Sierra Rutile (titanium) Mining Company and a relatively affluent service centre. To attract customers and help establish their brand, the SWOMA team donned distinctive blue and white uniforms bearing the ‘Bonthe Oyster’ logo developed by the project to market oysters at a road junction adjacent to the company’s Mogbewa processing plant. As the leader of the marketing effort, Matilda’s marketing experience and fluency in Creole, the *lingua franca* of this remote and tribally diverse area, was also vital to the marketing effort (Sierra Leone has 16 ethnic groups, each with their own language).



Plate 12. Matilde Hai (L) leading smoked oyster product placement testing in Moriba Town - with Yema and Fatti, oyster gatherers from Gbongboma and Nyandahun villages Bonthe Island.

Trial products included smoked oysters on skewers (25g, **Plate 13**), in bread rolls (42g, **Plate 14**) or in transparent (biodegradable) covered pots containing 52g of steamed or 42g of smoked oysters (**Plate 15 & Plate 16**). Each option was offered with a choice of tomato, onion and chili cold sauces, lime and palm oil garnishes. Smoked oyster pots with chilli-tomato sauce and sliced-onion were runaway winners with the predominantly male customer-base of salaried Rutile shift workers at the chosen location. In just two hours around lunch hour, the selling team of 3 ladies sold 159 items, including 111 pots of smoked oysters at Le 3,000 per pot (roughly £0.30). Averaged over all sales units, the team more than doubled (215%) the prevailing maximum retail price of smoked oysters sold loose ‘by the cup’. Sold at weekly *lumis*, loose cups of smoked oysters retail for up to Le 5,000 (roughly £0.45) and hold on average 152g of oysters, equivalent to 6.1 skewers or 3.6 pots sold by the marketing group. Based on the combination of unit sales shown in **Table 1**, the SWOMA team averaged a 30% additional net-profit per unit weight of smoked oysters sold after deduction of the additional expenses incurred

for retail marketing (i.e. sauce/ garnish ingredients, packaging and inland travel from Yagoi to Moriba Town).



Plate 13. Smoked oyster skewer and marketing materials



Plate 14. Smoked oyster sandwich with onions, chili-tomato sauce and palm oil



Plate 15. Some of the products evaluated in the placement testing at Moriba Town



Plate 16. Garnishing the smoked oyster pots

Table 1. Simple cost-benefit analysis for retail of value-added oyster products by SWOMA, Moriba Town Sierra Leone.

1. Input costs	Unit Weight (g)	No's	Unit Cost/ Price (Le)	Total Cost/ Price (Le)	Gross/ Net Profit Margins ¹	Notes
Smoked oysters (cups)	152	67	5,000	335,000		Gross 10.2kg of which 5.2kg (34 cups=111 pots) sold
Steamed oysters(cups)	187	10	4,000	40,000		No sales achieved
Sauces & garnishes						Must be consumed on day of preparation
Onions (large)		5	4,000	20,000		
Fresh chilies (cup)		2	2,500	5,000		
Dried chilies (cup)		1	3,000	3,000		
Peanut oil (pint)		1	4,000	4,000		
Tinned puree	60	2	2,000	4,000		
Maggi cubes	10	9	333	3,000		
Fresh limes		30	50	1,500		
Sub-total				40,500		
Bread rolls		8	1,000	40,000		Sold at cost
Packaging & skewers						
Biodegradable pots		111	676	75,084		(4oz pots) £29.41 per 300
Cocktail sticks (case)				500		
Yagoi to Rutile Travel				40,000		Motorbike taxi, Le 20,000 per journey
2. Retail revenue						
Skewer oysters	25	40	2,000	80,000	243	Equivalent to 6.1 skewers per cup
Pot smoked full	60	3	4,000	12,000	203	
Pot smoked 3/4 full	42.5	108	3,000	324,000	215	Equivalent to 3.6 pots per cup (price inc. sauce)
Pot steamed full	52	0	3,000	0	270	
Bread rolls		8	1,000	40,000		Sold at cost (exc. full cup oysters & relish)
Sub-total		159		456,000		Total sales of all units
3. Margin/ unit sale						
Retail price/ pot of smoked oysters		3.6	1,398			No pots/ cup & price per 42g loose oysters (Le)

Cost of sauce & garnish per unit sale (Le)	255	(8.5) ²	
Cost per biodegradable cup (Le)	676	(22.5) ²	
Inland travel cost per unit sale (Le)	252	(8.4) ²	
Gross profit margin/ unit sale%	1,602	215	Before deduction of additional retail costs
Net profit margin/ unit sale (Le)	1,817	130	Value added after deduction of retail costs

Notes:

¹ Gross & net margins calculated as a ratio (%) of the prevailing (upper) retail price available at Yagoi market for a 152g cup of smoked oysters, per unit weight

² Ratio (%) of specified input cost to mean unit retail price of value-added products at Moriba Junction.

Prevailing Leone exchange rates: £1: Le 11,500, \$1: Le 8,800

Strategic marketing options: Findings from this and earlier marketing trials are being used to help SWOMA increase profitability through (i) identification of strategic high-profit-potential market segments (ii) development of product attributes meeting the wants of those segments (iii) cost-benefit/ sensitivity analysis to target cost-reductions and (iv) promotional activities to reinforce latent demand for these attributes. For example, further sales might have been generated through division of labour targeting the Rutile operation’s early morning and afternoon shift hand-over periods, salary payment dates, and different informal marketing points (near company canteens and accommodation centres, banking facilities serving salaried individuals etc.).

Attempts to sell at a fixed daily market in Moriba later in the day (**Plate 17**) confirmed earlier findings that high entry barriers (e.g. additional licence fees, unionisation, space restrictions, greater consumer price-sensitivity and competition with other convenience-food substitutes) made such segments a poor value-addition proposition. Attempts to overcome such barriers also created temptation by some members to switch back to a normative and less profitable ‘by the cup’ bulk-sales strategy. Conversely, the sales to salaried workers at Mogbewa junction were indicative of much lower demand elasticity around the selected price point of Le 3,000 for oyster pots, suggesting they could have been sold for Le 3,500 to 4,000 without significant depreciation in demand. Possibly also contingent on the type of garnish offered e.g. with or without onions (see below).



Plate 17. Trying to ‘hawk’ oysters at a fixed daily market in Moriba Town

Value-added attributes: When asked about reasons for their purchasing decisions, many customers cited attributes of quality assurance and convenience associated with the rigid, resealable packaging pots. ‘The lid keeps out dust and flies, a real problem here and the transparent container lets me see that the product is clean’ said one Rutile employee. Others valued the fact that the snack-sized pots facilitated storage for subsequent consumption by themselves, colleagues or family. This proved a critical attribute, allowing the team to cater to much higher demand levels than the more traditional convenience ready-to-eat skewer and sandwich offerings, already periodically ‘hawked’ by local

female vendors. Knowledge of these existing offers also helped determine initial price-points for this exercise. Although the gross profit margin for the smaller skewer units (243%) was significantly higher than the smoked oyster pots (215%), most of the net-profit generated came from the much greater demand for pots. Nevertheless the trial demonstrated that optimum results were achievable from combined sales of both products in this market segment. Only limited sales of skewers were made in the more price-sensitive fixed market.

Maintenance of the aligned 'quality' and 'freshness' attributes are certain to be key to longer term sustainability of any successful value-added model and associated brand. All smoked oysters sold by the team were harvested and processed over just 3-4 days prior to the trial. Notably, this also included product from the team that subsequently won the festival smoked-oyster contest (**Plate 18**)! In the longer term, this brand attribute would differentiate the team's offer from the much more erratic quality of 'wholesale' smoked oysters periodically reaching Moriba Town and other inland locations. Wholesale production of smoked oysters typically involves concentrated effort and stock-piling of bulk quantities over 2-3 weeks prior to sale, with potential for further insanitary storage along the value-chain for up to 1-2 months prior to retail. Such product is also more likely to be 'over' smoked and periodically re-dried to reduce moisture content and associated bacterial/ fungal spoilage risk (**Plate 19**). As well as reducing the sale price, this also results in lower yield from moisture loss and poorly appreciated food safety risks such as increased build-up of carcinogenic polycyclic aromatic hydrocarbons from over-smoking and fungal mycotoxin contamination.

At the level of smoking applied in this trial any surplus 'freshly-smoked' SWOMA product should retain its quality for several successive days of premium retail-marketing'. Beyond this point, surpluses could still enter the prevailing lower-value retail or wholesale value-chain segments. By contrast, under ambient conditions the sauce and garnish accompaniments must be consumed on their day of production, necessitating a more 'just-on time' batch-processing strategy.



Plate 18. Freshly smoked winning oysters (Gbongboma village)



Plate 19. Mould blooms on smoked oysters after 6 weeks of storage resulting in downgrading & lowering of the wholesale price

These observations point to further differentiation opportunities as well as collective quality assurance challenges for the SWOMA membership and their brand! To this end pots were stickered with a Sherbro Oyster logo incorporating an earliest harvest-date stamp (**Plate 15**) (processing always follows on the same or next day after harvesting). Earlier work also identified such labelling as an entry level requirement for formal retail outlets including supermarkets in larger inland towns.

Other differentiation attributes also merit further investigation. For example, locally produced food commodities are universally sold by count or volume (plastic cups or tins in the case of oysters). This not only complicates accurate profit and loss accounting but lends itself to poorly transparent or even fraudulent trading practice. In earlier market studies, for example, we observed a tendency for smaller unit volumes to be offered in retail markets further up the value chain without corresponding changes in retail price. Capitalisation of more accurate weight-based sales as a brand attribute would require significant further promotional awareness raising. Community radio stations located in Bonthe Town (Radio Bontico) and Moriba Town (Radio Imperri), already involved in promotion and reporting of the Bonthe festival will also provide an effective means of disseminating these product differentiation messages.

The trials also highlighted less promising demand attributes for this market segment. Prior research revealed that the maximum price-premium available for smoked oysters does not fully compensate additional processing costs and moisture loss incurred during smoking of steamed oysters i.e. effectively making steamed oysters sold by the cup more profitable. Furthermore, the marketing of steamed oysters precludes the significant mangrove fuel wood requirement for secondary smoking. However, the opportunity to market steamed oysters is severely limited by their highly perishable nature in the absence of any refrigeration capacity. Thus, steamed oysters must be consumed within

just 12hrs of processing; one 'cup' (approx. 190g) typically providing for an evening family meal. For the purpose of this trial a small quantity of steamed oyster were prepared the evening before the trial to sell in the pots, however no units were sold in this more convenience oriented market-segment. Customers eschewed steamed oysters as a snack option, describing them as 'having no flavour, even with a little garnish'. Instead they were preferred a home-meal ingredient cooked as a stew. Earlier efforts to produce lightly hot-smoked oysters (for 15-20 rather than 30-40 minutes) for sale in Moriba Town had also proved prone to spoilage loss. Finally in this trial, the successful combination of freshly smoked oysters and spicy/ flavoursome garnish combinations in pots, appeared to preclude any need to provide consumers with stove-warmed sauces, though potential for cooked ready meals incorporating steamed oysters merits further investigation.

Increasing profitability: Simple cost-benefit analysis (**Table 1**) highlighted cost reduction areas that could significantly increase profitability. The biodegradable packaging pots (imported from the UK) alone accounted for 23% of the achieved retail price, whilst sauces and inland travel each accounted for just over 8%. Procurement of lower-cost local eco-friendly packing is therefore a key first step. Similarly just one ingredient, fresh onions, accounted for nearly 50% of the sauce/ garnish costs. This type of analysis is also key to helping drive behaviour change and path dependency around the normative wholesale and/or bulk retail smoked-oyster marketing models. For example, wholesale vendors will invariably rapidly sell all their stockpiled production over a relatively small number of transactions. For one team member the prospect of returning with almost 50% of the combined smoked oyster stock of 67 cups/ 10.2kg) unsold was of concern until the profit margin on the retailed stock was elaborated. Similarly, subsistence-orientated producers often find it difficult to discount the value of their time and effort invested in production and marketing in their more intuitive benefit estimation approaches. Sierra Leone has one of the lowest literacy rates in Africa.

The next day, team members went on to sell the stock-balance, by the pot for further profit at the Bonthe Festival. After remunerating those involved in gathering and processing of the trial oysters at the prevailing retail price per-cup, net profits were shared equally amongst the four ladies undertaking the marketing effort (**Plate 20**). The individual total of Le 54,125 or \$6.15 effectively generated from a single lunch-time shift, is equivalent to 1/10th of the statutory national minimum monthly wage of Le 500,000. However, in a rentier state overly reliant on mineral extraction, some 2/3 of the population are directly involved in subsistence agriculture and even this option is highly limited for those based in the mangrove areas. More substantial profits could be generated through extended marketing e.g. across multiple Rutile shifts involving over-night stays by specialised team members, a practice already followed some female vendors in Yagoi. Potential also exists to enter the high-value supermarket segment in inland urban areas e.g. Bo, Kenema with highly limited access to seafood. However this goal would be contingent on the ability of the group to manage and maintain consistently high quality standards and supply targets.

Food Security: Clearly encouraging a shift toward a more value-added 'cash-crop' marketing strategy, brings with it potential food security and other livelihood risks and trade-offs. Oysters are most abundant over 3-4 months of the dry season (Mar-July; when estuarine salinity is highest), also the 'hungry-months' when subsistence agriculture yields are at annual lows. However, the primary protein staple for populations in the mangrove areas is fresh fish (as with oysters, surpluses are smoked for wholesale in the same mainland value-chains). Furthermore fish and oyster production, processing and marketing are highly gendered; males responsible for fish and females for oysters. Female control of the oyster channels ensures their ability to independently manage income for essential household reproductive-tasks e.g. clothing, health schooling costs. This is particularly critical given a relatively high prevalence of polygamous relations where individual wives and their children effectively represent fundamental household units. The relatively low yield of fresh oyster meat relative to harvest weight (<14%) and high production effort also lend themselves to this value-added strategy.

Populations within the mangrove areas mainly consume fresh-steamed oysters that currently secure a higher margin than smoked oysters. However, a real risk is that a significant reduction in price differentials could encourage a shift from locally-consumed steamed to 'export-orientated' smoked oyster production, further intensifying mangrove-wood extraction for smoking. Earlier projects efforts to introduce solar cold chain technology and fuel-efficient smoking technology faced major implementation challenges in this development context. In the near-term, severely limited communications are likely to limit extraction pressure from a local population growing at a rate of around 2.1% per year.



Plate 20. Splitting the profits under the watchful eye of James Green (WOC)!

Market incentives and environmental stewardship: In the absence of any formal or informal regulation, oyster harvesting effort is ultimately limited by use of simple hand-gathering methods from un-motorised dugout canoes. More time devoted to the kind of value-added marketing described above can both reduce spoilage and harvesting effort, helping offset pressure from the growing number of dependents on the resource i.e. with more time and effort spent on marketing a low-volume, high value product and less time spent on harvesting and processing.

Quality assurance challenges associated with the prevailing production-orientated model, were amply demonstrated during a visit to a family group that had temporarily encamped in an area reported to be rich in oysters to focus on intensive smoked oyster production over the two peak months (May-June) of the oyster season (**Plate 21 to Plate 25 & Plate 6**). Having optimised their production efficiency through gendered labour division; males gathering and females processing, we arrived to witness a wholesale buyer (a food store owner from Moriba Town) down-grading the price of the family's oysters stockpiled over the previous 6 weeks, from Le 4,000 to Le 3,000 per cup due to quality issues (**Plate 24, Plate 19, Plate 6**).



Plate 21. Female family members shucking the steamed oysters



Plate 22. Shucking a steamed oyster



Plate 23. Flies attracted to shucked steamed oysters in open pot



Plate 24. Shop owner from Moriba purchasing a 6 week stockpile of oysters measured 'by the cup' at the processing site

As well as training members on sanitary production methods, we are supporting SWOMA to promote more prudent harvesting as a further attribute of the Sherbro brand. For example by avoiding cutting of mangrove roots (**Plate 25**) and more fuel-efficient processing. Realistically this poses a very challenging attribute to incentivise in such a price-sensitive market. However, we hope to help the group use such stewardship attributes to leverage further conservation-orientated external grant-funding. The group will also share their growing marketing experience and take a progressively more central role in organisation, implementation and capitalisation of the oyster festival with a view to placing it on a sustainable economic footing after the next 5 years of WoC support.



Plate 25. Mangrove roots are routinely cut to harvest mature oysters!

WOC owner and festival sponsor James Green added ‘just as in Whitstable, oysters are an intrinsic part of the local economy, and working with local partners and co-ordinators such as Matilda and Aminata have taught us many lessons that we will bring back to Whitstable’.

Festival guest competition judges were: Mr. Josephus Mamie (Deputy Director of fisheries) and Mr. Mohamed Jalloh (Deputy permanent Secretary), Ms Seinya Bakarr & Mr Zebedee (West Africa Biodiversity and Climate Change Program; WA BiCC), Mr Chris Hewlett (WOC), Dr Francis Murray (UoS). Festival coordinators and promoters included: Dr Salieu Sankoh (Freetown University), Dr Richard Wadsworth (Njala University), Mr Jason Hoepfl (University of Stirling), Mayor Sandi Joe Leymin and Mr Sylvester Dangoma (Bonthe Municipal Council), Mr Amara Kalone (Bonthe). Media coverage was provided by Mr Peter Sao Gboya (Imperri Radio), Tim Everest and Lucy Vladev (BBC SE). Coverage featured on BBC World’s ‘Focus on Africa’. Further project details are available at <https://www.stir.ac.uk/darwinoysterproject> & <http://whitstableoystercompany.com/>.



Plate 26. Entrants gathering for the recipe competitions in Bonthe Municipal Council Hall