CAUSES OF HIGHCOST OF PROJECTS IN NIGERIA

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News Frontiers in Cooking Technology

Local Content: Good for Economy

NEW FRONTIER IN COOKING TECHNOLOGY – 'COOKING GREEN'

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ABSTRACT

An insulating carbon neutrality bag has been designed, tested and commissioned for green cooking. This has provided an eco - solution that has reduced the amount of energy needed for cooking, save money, reduce emission rate, create employment for the youths/ women and allows for waste to wealth conversion. The Okada Wonder Bag (OWB) was designed, fabricated, and the performance of the bag was critically evaluated using different food stuffs (Beans, Rice, Yam, plantain, Maize, beef, goat meat and Skin/beef ('special kpomo' from the head of a cow) to ascertain the reliability of the bag. Results obtained show a high degree of reliability/correlation as the bag displayed maximum performance in terms of heat conservation and cooking efficiency. Performance characteristics also reveal that the bag with expanded polystyrene insulation was better than that with wood shavings as insulating material. Also, an attempt was made using cooking gas as a case in point to show how much gas/money can be saved and emission reduction by the application of the insulation cooking technique and the results were encouraging.

KEYWORD: Insulation, Carbon Neutrality, Wealth creation, Energy needs, Environment, Waste and Cooking time, Emission, Money.

1.0: INTRODUCTION

Various ways exist for conventional cooking using firewood, sawdust, kerosene (paraffin oil), gas, hot plate, microwave, solar etc as heat sources for cooking. In all these methods, except for solar cookers there is a reasonable level of direct or indirect combustion which releases carbon emission into the atmosphere. Also, in this period of global economic melt down and severe energy crisis, innovative insulating technology(cooking green) for cooking will be of benefit to both developed and developing countries as an energy saving , environmental protection/conservation, alternative funding, job creation, poverty alleviation and women/youth empowerment technique. The okada wonder bag fashioned after the South African Wonder bag is a green technology and eco – solution that also seeks to promote the recycling of 'waste(polystyrene used for packaging, wood shavings, wood offcuts, saw dust, used paper, paper mill wastes, agro vegetable wastes etc.. Such 'waste' materials can serve as insulating material to build a bag that possesses the ability to conserve the heat energy introduced into a system by conventional means until the purpose for which it was introduced (cooking/warming) is achieved. Various researchers the world over have diverse experience on insulation cooking technology. The underlying principle is heat retention by insulation.

3. STATEMENT OF THE PROBLEM

Globally the world is challenged with the following issues: financial meltdown, energy shortage, poverty, unemployment, youth/women (gender), environmental (waste management, global warming, GHG), funding, desertification/deforestation etc. The most critical challenge is how to develop capacity and source funding to deal with these issues for national growth and development. The Okada wonderbag is an innovative technique that can proffer possible positive solutions to these issues in other to chart a way forward. The researchers therefore would attempt to

publicize the world of opportunities enveloped in the simplicity of this bag.

4.0: MATERIALS AND METHODS

4.1 THE OKADA WONDER BAG

The wonderbag is an insulated container consisting of two cotten layers filled with insulating materials, a 2-3m rope, a portable double layered cover. The composite bag provides an approximately 10 litres cooking chamber. It can hold a pre – heated cooking vessel safely for several hours while cooking its contents through heat retention. The masses of the polysterene, wood shaving Okada and the South African ploysterene wonder bags were 0.9, 0.9 and 0.8kg respectively. For easy adjustment or total replacement of the insulating material (polysterene or wood shaving), each bag was made of two layers of cotton cloth sewn together with five compartments each with a zipper. Each bag has a cover made by sewing two sheets cotton cloth together with a ziper through which the insulating material can be introduced or removed as need be. Each wonder bag can hold a 10 litres pot.

The beauty of the Okada Wonder Bag (OWB) is characterized by the following: Meeting our energy needs, an innovative technology, creation of wealth from waste, youth and women empowerment, entrepreneurship and skill development, climatic suitability, carbon neutrality and a reforestation tool.

4.2 CHEMICAL BALANCE/MEASURING CUPS.

A top loading Camry scale balance was used to measure the masses of the samples that were used for the cooking experiments. The scaled measuring cups(plastic make) were used for the measurement of water used during the cooking process.

4.3 GAS COOKER

An IGNIS domestic gas cooker with two gas burners and two electric hot plates was the sole cooking medium, although only the the gas burners were made use of.

4.4 POTS

Stainless steel pots of volume of 1.6ml and 2.0ml, with tight fitting covers having vents (breathers) were used.

4.5 METHODS

The following procedure was adopted:

i. For each food type, three samples of approximately the same mass obtained by weighing with a chemical balance were gotten.

ii. The first sample was cooked to completion on gas noting the amount of water added, time to boil and finally the time to get completely cooked.

iii. The same quantity of water was added to the second and third samples and both were placed on gas at the same time. The time it took each sample to boil was noted. As soon as the second sample started boiling it was transferred to the Wood Shaving Okada Wonder Bag **(WSOWB)**, while the third sample was transferred to the Polystyrene Okada Wonder Bag **(POWB).**

iv. The cooking time on gas was used as a guide to determine at what time to open the Okada Wonder Bag **(OWB)** quickly to remove a sample and do a check to determine how far the cooking had been accomplished. The result would also influence when to do a second and final check to on the level of cooking achieved.

5.0: ADVANTAGES OF COOKING GREEN

With the wonder bag, a lot of energy is saved in that the food does not need to spend exactly the same time it spent on the conventional cooking device. The food spends about 30 – 40 percent of the actual cooking time on the conventional source before being transferred to the wonder bag. By so doing, a lot of energy is saved, money is saved and emission is reduced since emission concentration and amount of energy used are directly proportional.

6. PERFORMANCE EVALUATION/TEST AND RESULTS

The performance of the wonder bag was evaluated to determine the reliability of the bag in terms of

- Energy Saved
- Money Saved
- Emission Reduction

The evaluation was done by considering an average family in a typical Nigerian situation comprising a family size of six members (father, mother and four children). A comparative analysis was done between the wonder bag and a conventional cooking method using a gas burner.

Table 1: MAIZE

Samples	Weight of Food Stuff (g)	Volume of Water (Liters)	Time to Reach Boiling Point (min)	Time to Cook (min)	Amount of Gas Used (kg)	Amount of Gas Saved (kg)	Emission Released (kg)	Amount of Money Spent (N)
Sample 1 (Normal Gas)	400	1.2	9.5	40	0.0119	0	0.0074 (0.74%)	2.48 ($0.016)
Sample 2 (Saw Dust Bag)	400	1.2	9.5	80% cooked at 47	0.002827	0.009073	0.0018 (0.18%)	0.59 ($0.004)
Sample 3 (Polystyrene Bag)	400	1.2	9.5	180	0.002827	0.009073	0.0018 (0.18%)	0.59 ($0.004)

Remark: | Though the same amount of gas was saved with the bag, sample 3 (polystyrene bag) is a faster cooker than sample 2 (saw dust bag).

Table 2: MEAT MIXED WITH SKIN (SPECIAL KPOMO'

Samples	Weight of Food Stuff (g)	Volume of Water (Liters)	Time to Reach Boiling Point (min)	Time to Cook (min)	Amount of Gas Used (kg)	Amount of Gas Saved (kg)	Emission Released (kg)	Amount of money spent (N)
Sample 1 (Normal Gas)	200	1.5	9.5	73	0.02173	0	0.0136 (1.36%)	4.52 ($0.030)
Sample 2 (Saw Dust Bag)	200	1.5	9.5	160	0.00283	0.0189	0.0018 (0.18%)	0.59 ($0.004)
Sample 3 (Polystyrene Bag)	200	1.5	9.5	140	0.00283	0.0189	0.0018 (0.18%)	0.59 ($0.004)

Remark: Though the same amount of gas was saved with the bag, sample 3 (polystyrene bag) was a faster cooker the sample 2 (saw dust bag).

Table 3: YAM

Samples	Weight of Food Stuff (g)	Volume of Water (Liters)	Time to Reach Boiling Point (min)	Time to Cook (min)	Amount of Gas Used (kg)	Amount of Gas Saved (kg)	Emission Released (kg)	Amount of Money Spent (N)
Sample 1 **(Normal Gas)**	200	0.3	4	21	0.00625	0	0.0039 (0.39%)	1.30 ($0.009)
Sample 2 **(Saw Dust Bag)**	200	0.3	4	45	0.00119	0.00506	0.0007 (0.07%)	0.25 ($0.002)
Sample 3 **(SA Bag)**	200	0.3	4	44	0.00119	0.00506	0.0007 (0.07%)	0.25 ($0.002)

Remark: Though the same amount of gas was saved with the bag, sample 3 (SA Bag) was a faster cooker the sample 2 (saw dust bag).

Table 4: RICE

Samples	Weight of Food Stuff (g)	Volume of Water (Liters)	Time to Reach Boiling Point (min)	Time to Cook (min)	Amount of Gas Used (kg)	Amount of Gas Saved (kg)	Emission Released (kg)	Amount of Money Spent (N)
Sample 1 **(Normal Gas)**	136	0.3	8	28	0.00833	0	0.0052 (0.52%)	1.74 ($0.012)
Sample 2 **(Saw Dust Bag)**	136	0.3	8	40	0.00238	0.00595	0.0015 (0.15%)	0.50 ($0.003)
Sample 3 **(Polystyrene Bag)**	136	0.3	8	33	0.00238	0.00595	0.0015 0.15%)	0.50 ($0.003)

Remark: Though the same amount of gas was saved with the bag, sample 3 (polystyrene bag) was a faster cooker the sample 2 (saw dust bag).

Table 5: WHITE COLOUR COWPEA

Samples	Weight of Food Stuff (g)	Volume of Water (Liters)	Time to Reach Boiling Point (min)	Time to Cook (min)	Amount of Gas Used (kg)	Amount of Gas Saved (kg)	Emission Released (kg)	Amount of Money Spent (N)
Sample 1 **(Normal Gas)**	128.11	0.6	8	26	0.00774	0	0.0048 (0.48%)	1.61 ($0.011)
Sample 2 **(Polystyrene Bag)**	128.11	0.6	8	45	0.00238	0.00536	0.0015 (0.15%)	0.50 ($0.003)

Table 6: BROWN COLOUR COWPEA

Samples	Weight of Food Stuff (g)	Volume of Water (Liters)	Time to Reach Boiling Point (min)	Time to Cook (min)	Amount of Gas Used (kg)	Amount of Gas Saved (kg)	Emission Released (kg)	Amount of Money Spent (N)
Sample 1 **(Normal Gas)**	144.06	0.6	5	33	0.00982	0	0.0061 (0.61%)	2.05 ($0.014)
Sample 2 **(Polystyrene Bag)**	144.06	0.6	5	56	0.00149	0.00833	0.0009 (0.09%)	0.31 ($0.002)

Table 7: GOAT MEAT

Samples	Weight of Food Stuff (g)	Volume of Water (Liters)	Time to Reach Boiling Point (min)	Time to Cook (min)	Amount of Gas Used (kg)	Amount of Gas Saved (kg)	Emission Released (kg)	Amount of Money Spent (N)
Sample 1 **(Normal Gas)**	124.9	0.2	2	22	0.00655	0	0.0041 (0.41%)	1.36 (0.009)
Sample 2 **(Polystyrene Bag)**	124.9	0.2	2	44	0.00060	0.00595	0.0004 (0.04%)	0.12 ($0.001)

Table 8: BEEF (COW MEAT)

Samples	Weight of Food Stuff (g)	Volume of Water (Liters)	Time to Reach Boiling Point (min)	Time to Cook (min)	Amount of Gas Used (kg)	Amount of Gas Saved (kg)	Emission Released (kg)	Amount of Money Spent (N)

Table 9: FROZEN CHICKEN

Samples	Weight of Food Stuff (g)	Volume of Water (Liters)	Time to Reach Boiling Point (min)	Time to Cook (min)	Amount of Gas Used (kg)	Amount of Gas Saved (kg)	Emission Released (kg)	Amount of Money Spent (N)
Sample 1 **(Normal Gas)**	250	0.1	3	20	0.00595	0	0.0037 (0.37%)	1.24 ($0.008)
Sample 2 **(Polystyrene Bag)**	250	0.1	3	35	0.00089	0.00506	0.0006 (0.06%)	0.19 ($0.001)

Table 10: PLANTAIN

Samples	Weight of Food Stuff (g)	Volume of Water (Liters)	Time to Reach Boiling Point (min)	Time to Cook (min)	Amount of Gas Used (kg)	Amount of Gas Saved (kg)	Emission Released (kg)	Amount of Money Spent (N))
Sample 1 **(Normal Gas)**	284.87	0.1	4	22	0.00655	0	0.0041 (0.41%)	1.36 ($0.009)
Sample 2 **(Saw Dust Bag)**	284.87	0.1	4	30	0.00119	0.00536	0.0007 (0.07%)	0.25 ($0.002)

6.1. FUEL (GAS) SAVING CALCULATION

A family of six members was considered, and the following assumptions were made

1. That they depend solely on gas for all their cooking
2. That they consume 12kg of gas within 28 days.

Therefore:

Rate of gas consumption = quantity consumed / time
= 12/28 = 0.42857kg/day
= 0.017857kg/hour
= 0.0002976kg/min
= 0.00000496kg/s

Amount of gas consumed (kg) = Rate of consumption (kg/min) * Time (min)

6.2. EMISSION REDUCTION CALCULATION

For the emission reduction calculation, one basic assumption was made. The assumption is that for every 1kg of gas burnt, 0.625kg of emission is released. (**Reference: Inventory results**

(including environmental impact categories CML 2001) per life generation source, EU25 and EU15 mixes, as produced by the Eco-design Toolbox)

6.3. AMOUNT OF MONEY SAVED:

Current market price as at 28th July, 2009 reveals that 12 kg gas is sold at N2500 ($16.55) at an exchange rate of $1 to N151. Therefore, 1kg gas equivalent to N208.33.

7.0: OBSERVATIONS/CONCLUSIONS

7.1 OBSERVATIONS

The OKWB compared favourably with the SAWB.

The OKWB with polystyrene insulator was much better in cooking than the OKWB with wood shavings as the insulating material except for the preparation of rice.

In all cases there was reasonable savings in amount of gas used as well as the amount of emissions with respect to the assumed/inferred or referred conditions.

The savings in terms of money amounted to $1.38 per kg of gas save and $0.625 per kg of gas with respect to emission.

In most cases, the cooking times with the bags were at least twice the absolute cooking time on a gas burner.

7.2 CONCLUSIONS

The wonder bag designed and fabricated in Okada, fashioned after the South African wonder bag (SAWB) has been tested and results shown in tables, graphs and sample calculations show reasonably that the bag technology can serve as a medium do deal with the global melt down, alternative financing, poverty alleviation, youth and women empowerment, job creation, energy conservation, effective utilization and management. Also, the emission reduction will evidently reduce global warming and protect the environment. The recycling of waste will reduce the menace of solid waste disposal and its nuisance factor in our environment. The technology will promote environmental friendliness, funds accumulation, emission reduction and waste to wealth generation.

8.0: RECOMMENDATIONS

- Trial runs should continue in order to create a comprehensive cooking guide to various foods/meals
- Other insulating materials: shredded paper, sawdust, maize waste, dried leaves/grasses, wood offcuts/other agric wastes (rice husk) etc should be used as insulating materials in other bags and a comparative studies be carried out to determine their cooking efficiency, emission reduction and money saved
- The technology should be introduced to women groups especially in rural areas but also for the working class in urban areas as well as food and nutrition labs in various schools through workshops, seminars and conferences.
- Other variants of insulation cooking technology can be tried by creating insulation boxes for specific cooking vessels.

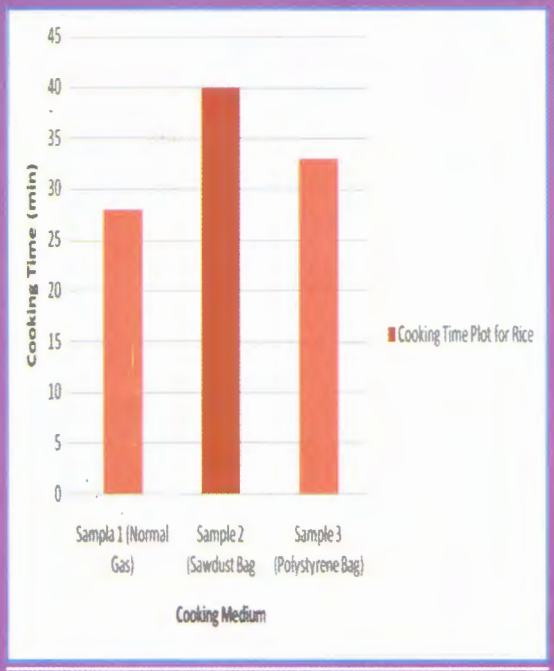

Fig 1: Graph of Cooking Bag versus Time (min) for Rice

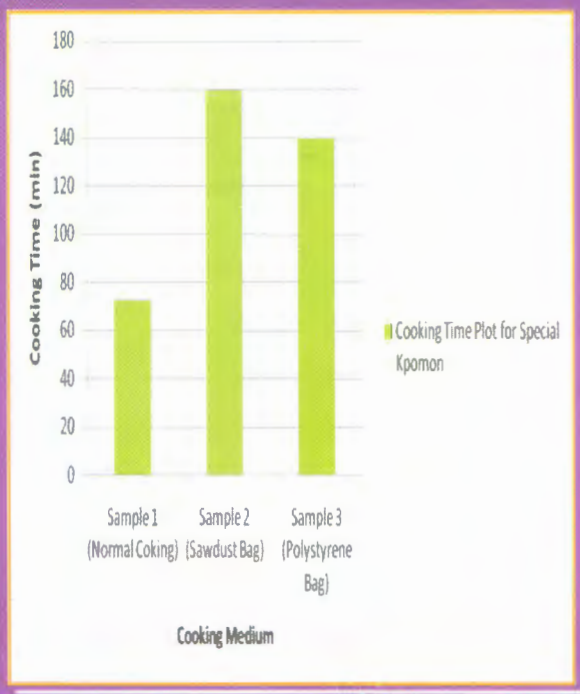

Fig 2: Graph of Cooking Bag versus Time (min) for Special Kpomo'

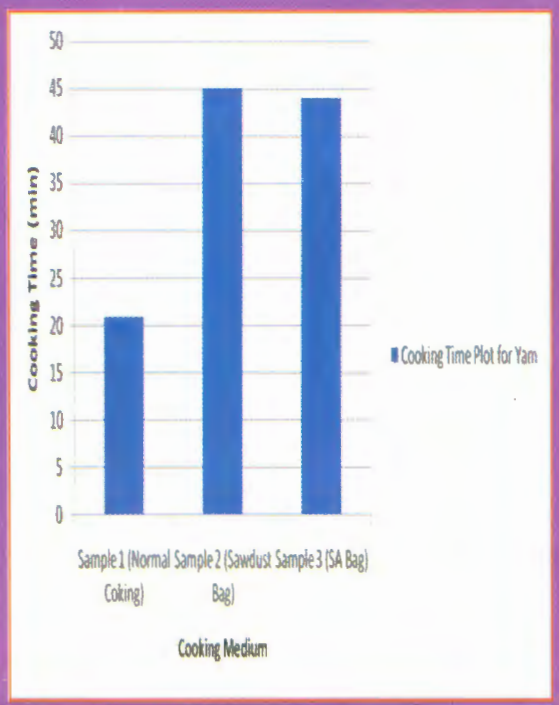

Fig 3: Graph of Cooking Bag versus Time (min) for Yam

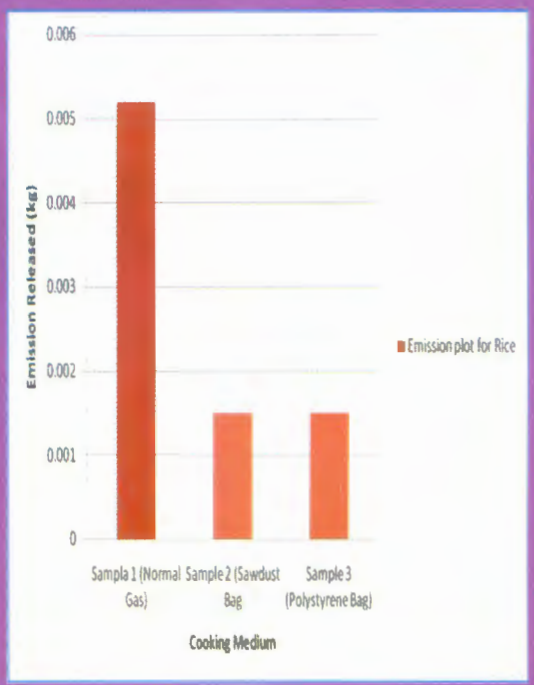

Fig 6: Graph of Cooking Bag versus Emission Released for Rice.

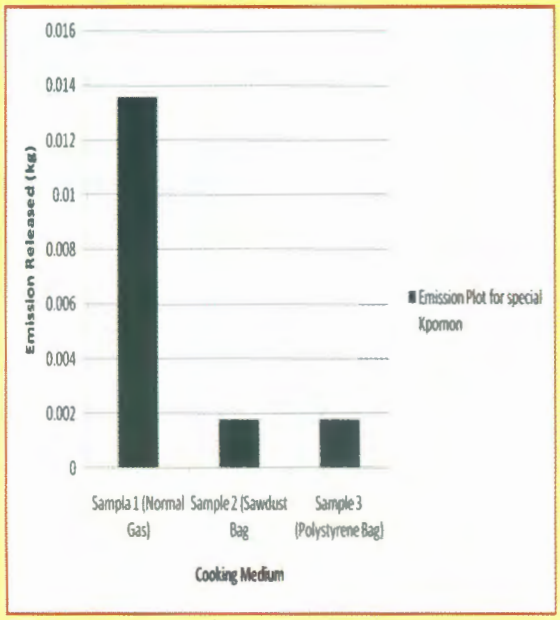

Fig 4: Graph of Cooking Bag versus Emission Released for Special kpomo'

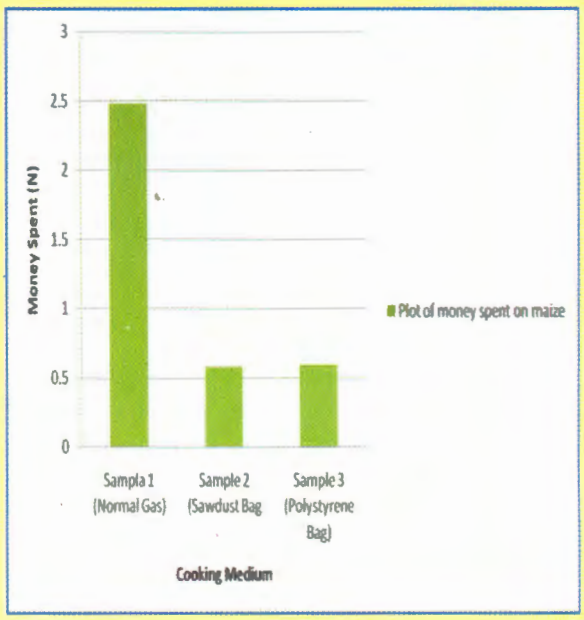

Fig 7: Graph of cooking Bag versus Amount of Money Spent on Cooking Maize