

IRON CONTENT IN FORTIFIED RICE SOLD IN THE NATIONAL CAPITAL DISTRICT PAPUA NEW GUINEA

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BACKGROUND

- Anaemia is one of the major global public health problems in resource limited countries like PNG,
- It has major negative impact on human health and on social and economic development [UNICEF/WHO 2012]
- Anaemia is the world's 2nd leading cause of disability among young children, non-pregnant and pregnant women [WHO/UNICEF/UNU 2001, WHO/WFP/UNICEF 2006];
- **According to WHO estimates, about 50% of all cases of anaemia are due to Iron deficiency** [WHO/UNICEF/UNU 2001, WHO/WFP/UNICEF 2006];

Background cont...

- Iron fortification of staple foods is one of the recommended long-term cost-effective strategy for control and prevention of Iron deficiency among at-risk groups [Steiger et al 2014, FFI 2014];
- **2005 PNG National Nutrition Survey indicated anaemia prevalence of 40.0%** [PNG NNS 2005];
- **Legislation for mandatory fortification of white rice was introduced in PNG in 2007;**
 - “100g of Rice must contain at least 0.5mg of Vit B1, 6.0mg of Vit B3 and **3.0mg of Iron** [PNG NDOH 2007];

Background cont...

- No data is available to indicate systematic monitoring of Iron content in White Rice;
- Justification for this study was based on apparent lack of verifiable data on the extent of compliance with national fortification standards for rice;
- This study assesses the presence of Iron in brands of white rice sold in the National Capital District.

METHODOLOGY & RESULTS

- Brands of **white rice** sold in NCD were purchased from various outlets, in Sept & Nov 2015 and in August 2016, and used in the present study;
- Reagents were prepared according to Standard Operating Procedures (SOPs) of Food Fortification Initiative (FFI) [FFI 2015];
- SOPs were used for **qualitative assay** of rice fortified by both **KERNELS** and **DUSTING**;
 - In rice containing Ferric Pyrophosphate, Ferric Orthophosphate or other Iron fortificants;

Methodology & Results cont...

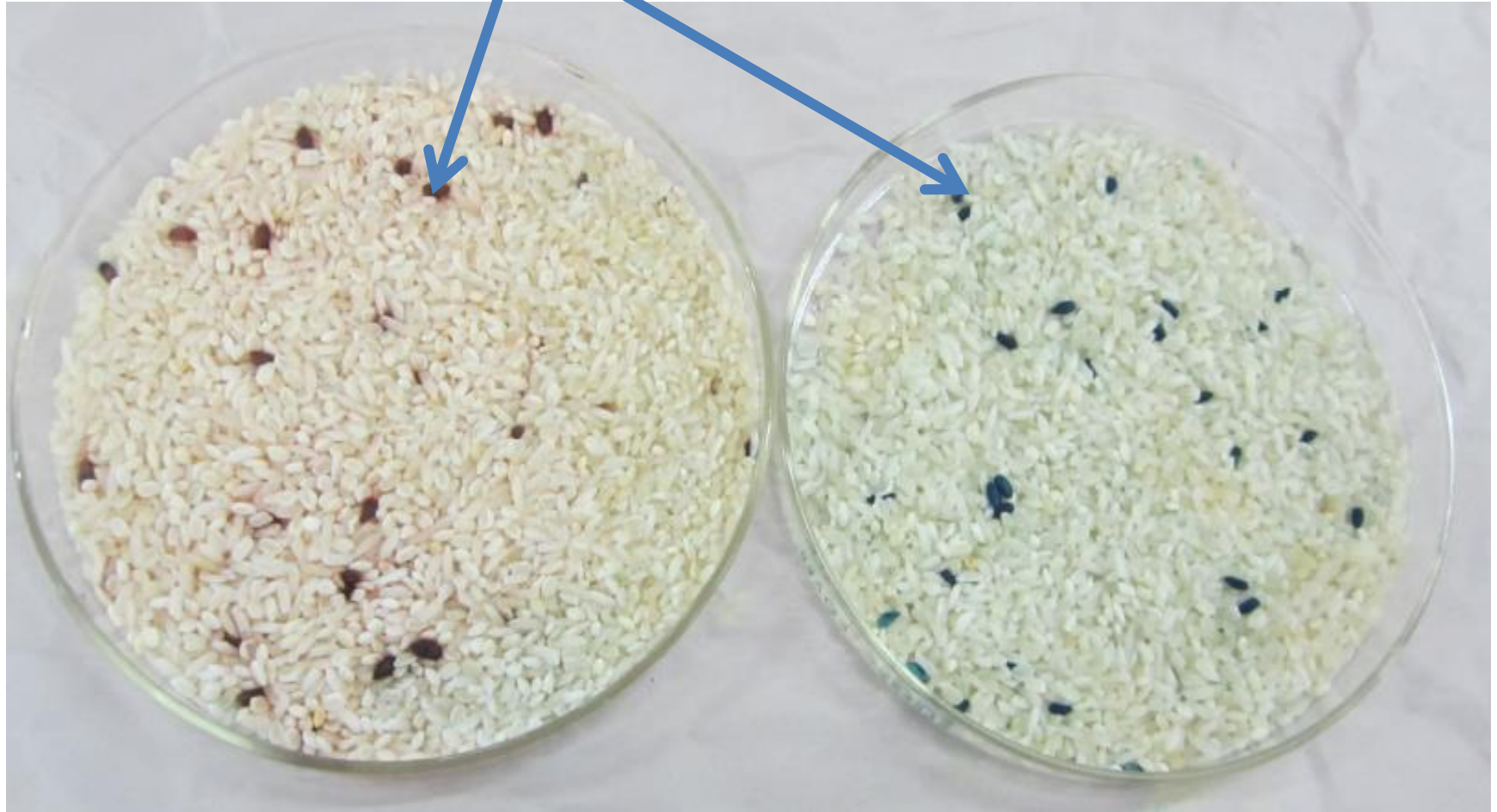
- SOP reagents used in the present study were modified in our lab:
 - **Reagent 1:** Hydrochloric Acid-Potassium Thiocyanate
 - **Reagent 2:** Hydrochloric Acid-Potassium Ferrocyanide
- About 2 x 50g rice were spread in 2 plastic plates
- Reagent 1 was sprayed onto rice in plate 1;
- Appearance of dark red kernels or dust in the rice indicates presence of Iron (See Figures)
- Reagent 2 was sprayed onto rice in plate 2
- Appearance of dark blue kernels or dust in the rice indicates the presence of Iron;

Fortified rice before spraying with Reagent 1 or 2



Results of qualitative testing of rice for presence of Iron

Coloured Kernels in rice after spraying indicates presence of Iron



Sprayed with Reagent 1

Sprayed with Reagent 2

Results of qualitative testing of rice for presence of Iron

Diffuse blue and red coloring indicates dusting technology



Sprayed with Reagent 2

Sprayed with Reagent 1

Methodology & Results Cont....

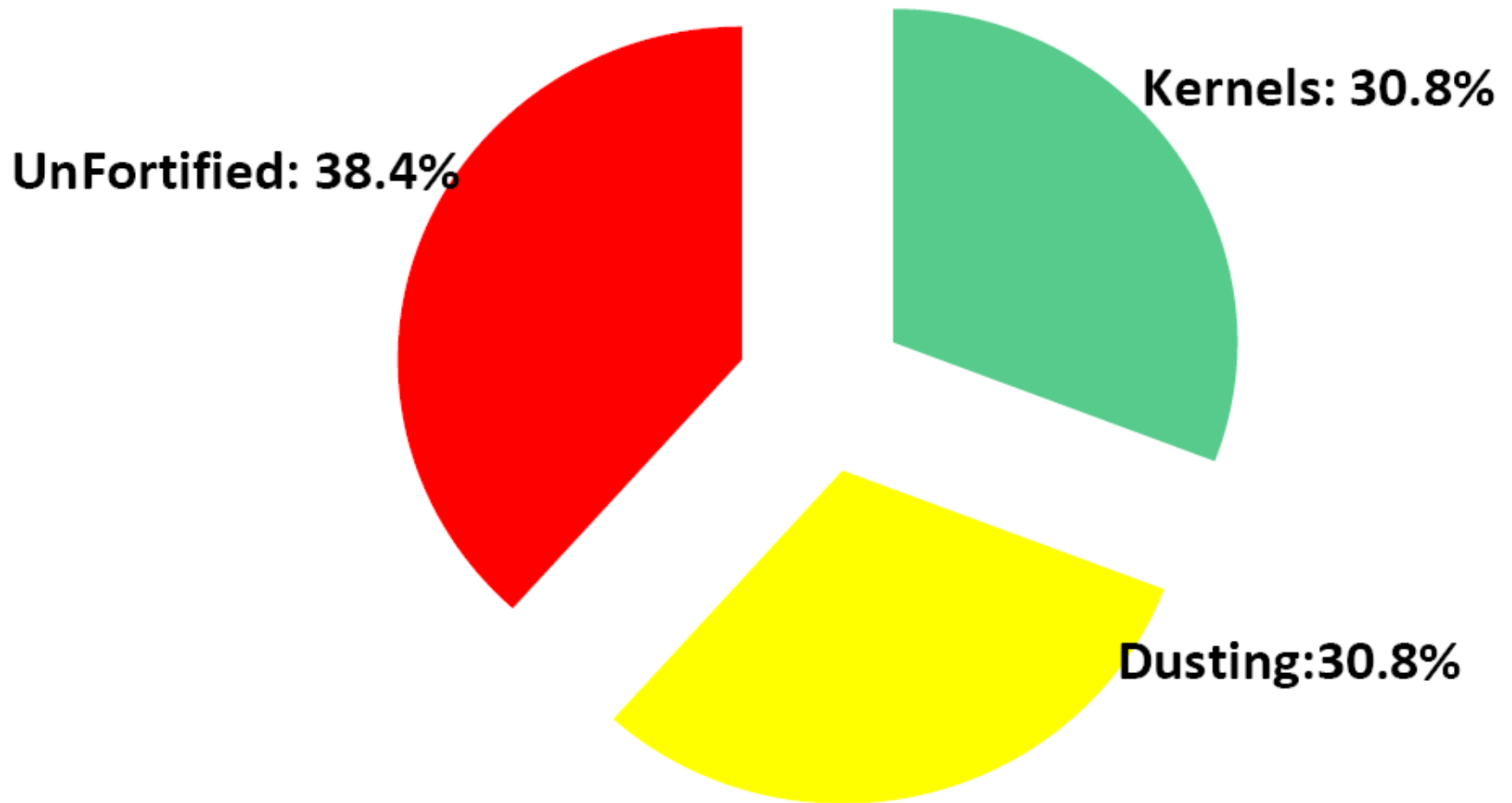
- Table 1, Figs A & B show Results obtained in 2015 and 2016;
- **In order to avoid any legal complications the names of rice brands are not used in our presentation;**
- **ID codes unrelated to the names of the rice brands are used to indicate the brands,**

	2015	2015	2015	2016	2016	2016
	BRAND ID #	Iron detected	Fortification method	BRAND ID #	Iron detected	Fortification method
1	A	Yes	Kernels	A	Yes	Kernels
2	B	Yes	Kernels	B	Yes	Kernels
3	C	Yes	Kernels	C	Yes	Kernels
4	N	Yes	Kernels	N	Yes	Kernels
5				M	Yes	Kernels
6	E	Yes	Dusting	E	Yes	Dusting
7	F	Yes	Dusting	F	Yes	Dusting
8	G	Yes	Dusting	G	Yes	Dusting
9	H	Yes	Dusting	H	Yes	Dusting
10	I	No		I	No	
11	J	No		J	No	
12	K	No		K	No	
13	L	No		L	No	
14	D	No		D	No	
15				O	No	
16				P	No	
17				Q	No	
18				R	No	

Brands of rice in NCD in 2015: Total = 13 different brands:

Unfortified brands = 5 (38.4%)

Fortified brands: Kernels = 4 (30.8%) & Dusting = 4 (30.8%)



Brands of rice in NCD in 2016: Total = 18 different brands:

Unfortified brands = 9 (50.0%)

Fortified brands: Kernels = 5 (27.8%) & Dusting = 4 (22.2%)



Methodology & Results cont....

- Rice brands fortified by Kernels & brands fortified by dusting were used for more detailed study;
- **In PNG, rice is usually washed before cooking;**
 - A major reason is to remove dust and to ensure that the rice is clean;
- Volume of water used in washing varies among the communities;
- In our study a 1:2 ratio of rice to water was used;
- Both wet rice and water decanted were tested for the presence of Iron; (See Figures below)

Effect of washing rice fortified with Iron by kernels



Water from unfortified rice washed once; water was sprayed with Reagent 1



Water from rice fortified with kernels washed once; water was sprayed with Reagent 1



Water from rice fortified with kernels washed twice; water of 2nd wash was sprayed with Reagent 1



Water from rice fortified with kernels washed three time; water from 3rd wash was sprayed with Reagent 1

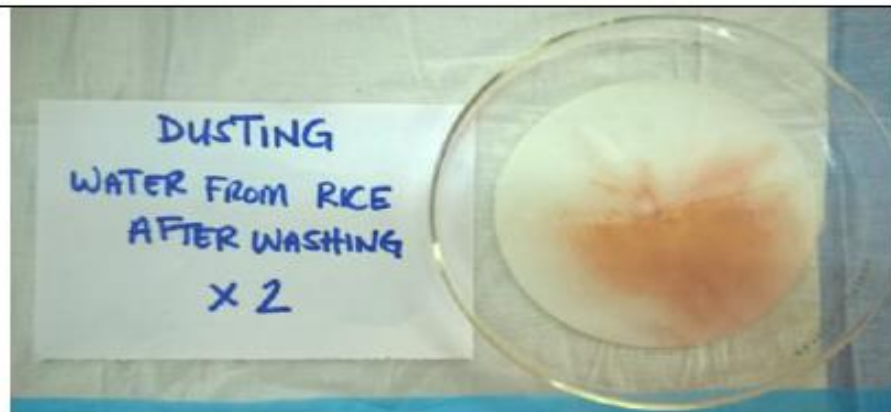
Effect of washing rice fortified with Iron by dusting technology



Water from unfortified rice washed once



Water from rice fortified by dusting washed once; water was sprayed with Reagent 1



Water from rice fortified by dusting washed twice; water of 2nd wash was sprayed with Reagent 1

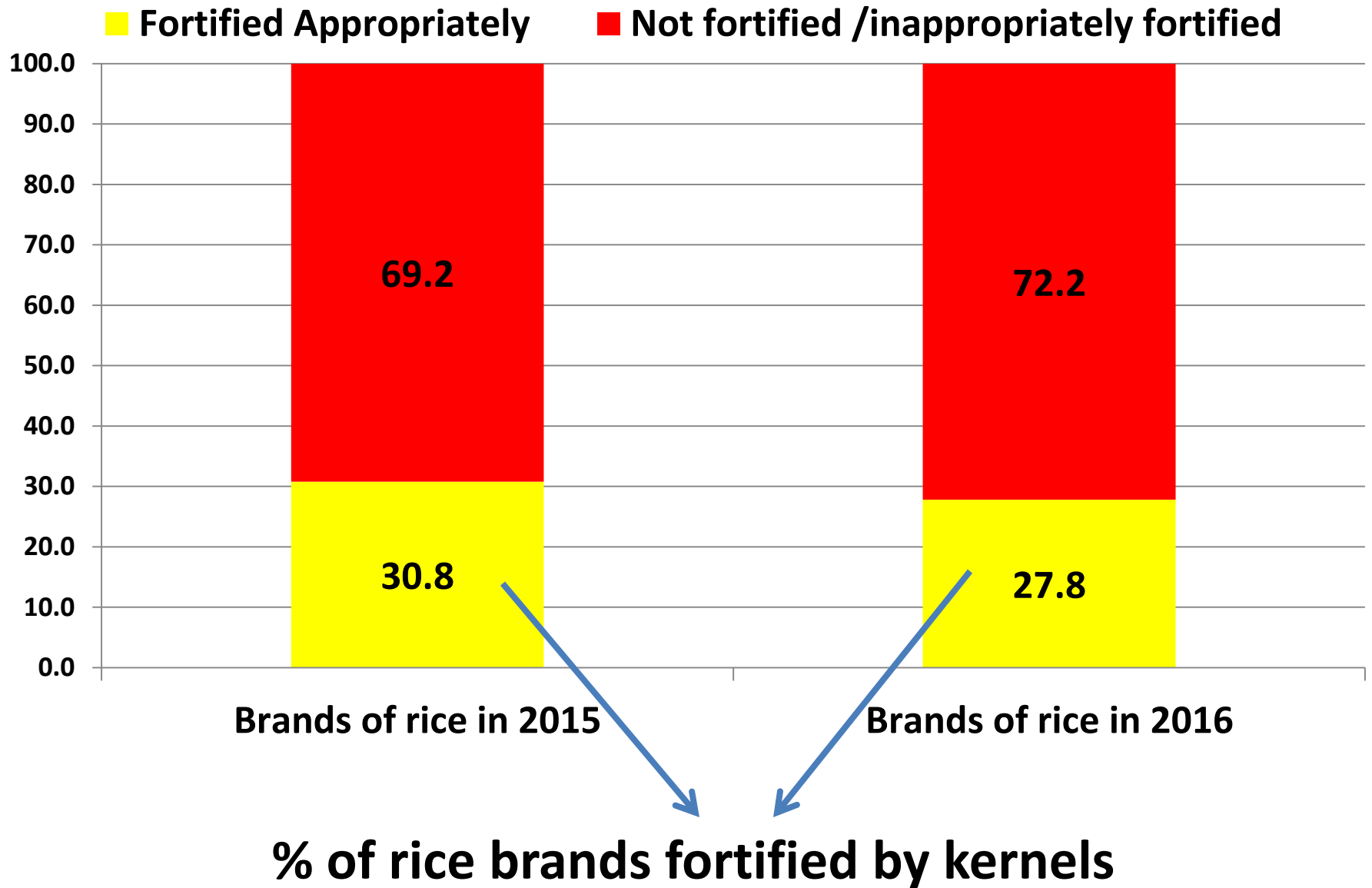


Water from rice fortified by dusting washed three time; water from 3rd wash was sprayed with Reagent 1

Methodology & Results cont....

- Results indicate that fortification of rice by **dusting** is not appropriate for use in PNG, if the objective is to improve the Iron status of the vulnerable groups in the population;
- In 2015, of the 13 brands of rice, only 4 (30.8%) were appropriately (Kernels) fortified;
- In 2016, of the 18 brands of rice, only 5 (27.8%) were appropriately (Kernels) fortified;

Results Cont.....



CONCLUSIONS

- Despite existing legislation, significant numbers of rice brands in NCD are not appropriately fortified with Iron;
- Rice fortification legislation in PNG could be improved by specifying suitable fortification methodology;
- Effective and sustainable Iron fortification monitoring program should be put in place to ensure that only appropriately Iron fortified rice is sold in NCD;
- Iron levels in PNG rice standards could also be increased for greater health impact;

Conclusions cont....

- **Our findings further underscore the urgent need to advocate for inclusion of Iron fortification of wheat flour in the PNG Food Fortification policy;**
- In PNG, the use of wheat flour in food preparation does not include washing flour before cooking; Iron fortification of flour has a greater potential in improving the Iron status of the population, than that of rice (which is commonly washed before cooking).

ACKNOWLEDGEMENTS

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THANK YOU

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