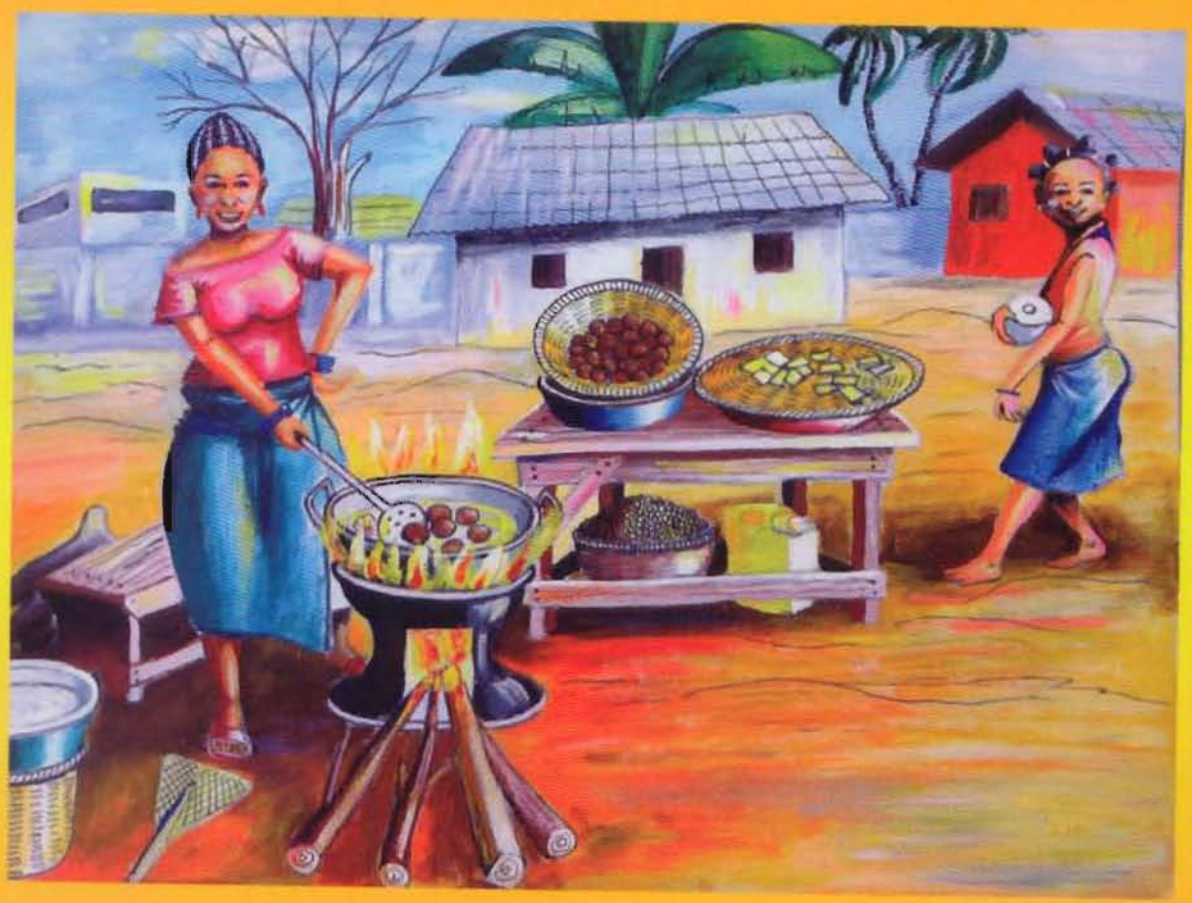
Keeping local foods on the menu

A study on the small-scale processing of cowpea



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ABSTRACT

Agriculture plays a significant role in the economy of most African countries. Yet malnutrition and micronutrient deficiencies occur regularly. Concomitantly, many carbohydrate rich staple foods and meat products are dumped on the African market and compet strongly with local products. The present thesis studied the potential of indigenous resources and locally developed practices to supply culturally acceptable and nutritious foods to African resource-poor people, using cowpea as model crop. This research is implemented using an interdisciplinary approach, which comprised plant breeding, food science and technology, human nutrition and social sciences. This thesis reports the findings of the research on food science and technology.

This study aimed to (i) characterise cowpea landraces in use in Benin with regard to nutritional, anti-nutritional and functional properties; (ii) determine present cowpea processing methods and eating habits with special reference to the content of cowpea dishes in available iron, zinc and calcium; (iii) assess the effect of the use of alkaline cooking aids on amino acids of cooked cowpea, and (iv) assess the impact of processing techniques on the flatulence generated by the intake of cowpea foods.

The genetic, nutritional and technological characterisation of cowpea landraces in use in Benin showed that a high level of similarity among unpigmented landraces as opposed to pigmented landraces. The cluster of unpigmented landraces significantely differed from the pigmented landraces for their fibre (24 vs. 56 g/kg, d.w.) and phenolics (3 vs. 8 g/kg, d.w.) contents as well as their seed size (200 vs. 139 g/1000 seeds, d.w.) and water absorption capacity (1049 vs. 1184 g/kg, d.w.).

An inventory of 18 cowpea dishes was obtained, which are produced by the combination of the following main unit operations: cooking, dehulling, deep-fat frying, steaming, roasting and soaking. Fermentation and germination are unusual technological practices in West-Africa. Consumers mainly consume *Ata*, *Atassi* and *Abobo*. These dishes contain little available iron because their [phytate] : [iron] molar ratio is above the required thresholds for a good iron uptake by the human body. The incorporation of cowpea leaves in certain dishes resulted in appropriate available iron and calcium potentials.

The constraints to cowpea processing were identified as: their long cooking time, the tediousness of the dehulling process and the perishability of beans and dishes. The local answer to the long cooking time is the use of alkaline cooking aids. These alkaline salts and

the applied cooking conditions did not induce any significant change in the amino acid composition of pigmented landraces. Moreover, the toxicity potentially associated with this practice was not confirmed as no lysinoalanine could be quantified while using up to 0.5 % (w/v) of alkaline cooking aids.

Flatulence was indicated as the main constraint to cowpea consumption. Cowpea hulls are usually pointed as the main responsible for flatulence. In this research, galactose-oligosaccharides that are indigestible for humans and cause flatulence formation were not found in cowpea hulls. Fermentation wih *Rhizopus* or *Bacillus* bacteria reduced significantly the fermentability of cowpea *in vitro* and *in vivo* as compared with traditional processes.

The present study demonstrates the opportunities to improve the quality of cowpea dishes by the incorporation of the leaves and the possibilities to sustain the consumption of cowpea by focusing on soaking and/or fermentation processes.

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