Peanut by-product as an energy source for improving peanut productivity

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Introduction

- Peanut is a versatile and globally used cash crop with a unique flavour (Lorenzo et al., 2018). It is a cash and oil crop that contributes to the economy of many countries in Asia and Africa, with an annual global production of 34 million metric tonnes on 24.39 million hectares of land (Maiti & Ebeling, 2002).
- The kernel can be consumed directly, processed into different edible forms (Nareen & Abdulla, 2013), or used as raw material in feed (Korley et al., 2021; Nareen & Abdulla, 2013), and cosmetic industries (Nareen & Abdulla, 2013).
- Peanut shells (Figure 1) is the by-product that remains after removing the kernel, amounting to 20 – 30% by weight of the peanut (Deeba, Pruthi, & Negi, 2017; Ge et al., 2020), which is often discarded or burnt in the field thereby polluting the environment (Deeba et al., 2017) and wasting feedstock for biofuel production.
- In rural areas where peanut is highly cultivated, fuelwood is used as the energy source for boiling, cooking, roasting and frying it, as well as processing into different dishes and snacks.

Methodology

- Moisture content of peanut shells was determined according to EN ISO 18134–3:2015, using Gallenkamp UF30 hot air laboratory oven.
- LECO AC 600 Calorimeter was used in measuring calorific value of shells, according to ISO 1928:2009.
- Ash content was determined using LECO TGA701 following ISO 18122:2015.
- Elemental analysis of peanut shells was carried out using LECO CHN628/628 S, in accordance with BS EN ISO16948:2015.
- The results obtained were compared with what was reported in similar studies and the provision of the International Standard Organization (ISO) for non-woody solid biomass.
- Literature sources were used to review various dishes and snacks produced from peanuts, their process of production in rural areas and the energy sources used for the production.

Figure 1. Peanut shells

Highlights

- Peanut shells is the main by-product of peanut processing.
- The shells can serve as a promising feedstock for densified biofuel production (in the form of pellets or briquettes).
- The solid biofuel produced can be used for boiling, roasting, cooking, or frying peanuts.
- Using biofuel for processing peanuts will reduce deforestation, manage waste by-products and generate more income for the farmers, which can improve productivity.

Results

- The net calorific value of peanut shells as received was 17.48 MJ.kg^{-1} with moisture and ash contents of 7.92% and 3.19%, respectively.
- Fuelwood was discovered to be the major source of energy used for peanut processing in rural areas (Figure 2), which is associated with deforestation.

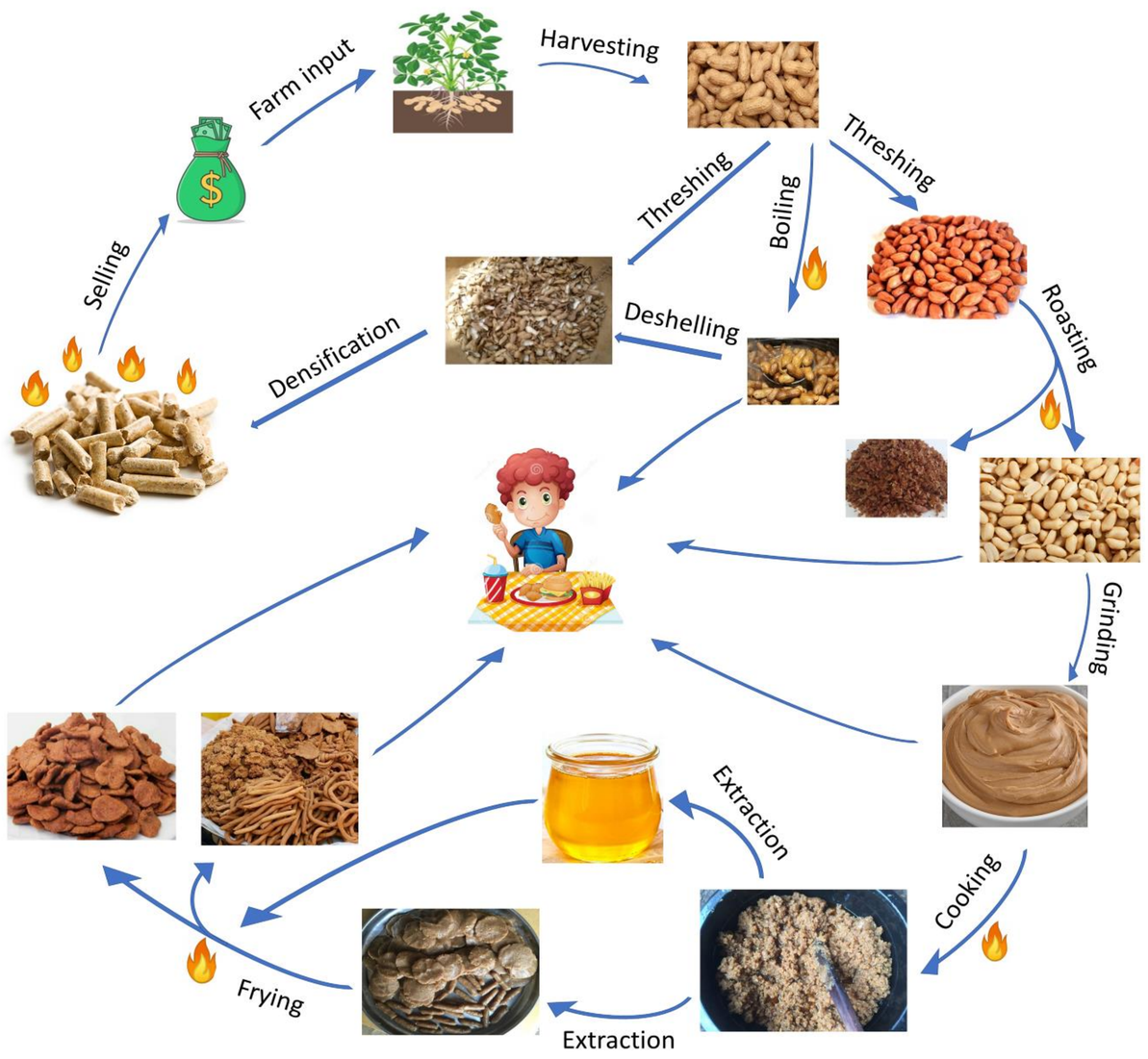

Figure 2. Peanut snacks processing cycle

Conclusions

- Peanut shells have attractive fuel-energy properties, e.g., high energy value and low ash content.
- Low nitrogen content of the peanut shells represents a low risk of emitting associated nitrogen oxides during combustion.
- Fuelwood is commonly used in rural areas to process peanuts into snacks and meals.
- Pellets production using the shells is a sustainable, suitable way of managing waste, reducing deforestation, producing renewable energy and providing income to local farmers.
- Income obtained from selling pellets can help farmers improve farm input, thereby increasing peanut productivity.

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