Proposal for NASENI Research & Commercialization Program

Project Title: Design and Development of Soya Bean De-husking/Separation Machine

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Introduction

Soya bean (Glycerin maxl) is a leguminous plant that is most frequently grown in the world and it is an important source of protein and fat in food and animal feed industries (SHARMA et al 2014). Soya bean seeds contain from 38 to 42% of protein, from 19 to 22% of fat in dry matter (Bellaloui, Gillen 2010). Soya bean also contain many other compounds, including minerals which are beneficial for health and reduce the risk of many diseases (Kumar et al 2014). Humans require at least 22 minerals element for their well-being (Welch, Graham 2002; White, Broadley 2005; Graham et al 2007). Food and water are primarily a source of minerals for humans and animals, and content of essential elements in both soil and plant. The level of minerals in plants raw materials is dependent on environmental and varietal factors, but it is also possible to influence mineral content through agronomic practices (Wang et al 2008; Devi et al 2013). Soya bean is also widely cultivated in Nigeria for food, oil and feed purposes. It is grown due to its inherent ability to improve soil fertility thereby boosting crop production. Soya bean is a cheap source of protein eaten to alleviate nutritional problem in Nigeria (Idrisa et al, 2010).Nigerians feed more on starchy staples with resultant malnutrition and high incidence of chronic illness such as diabetes, hence a need to ameliorate the trend with incorporation of soya bean in our meals (Akah et al, 2021).

Nigerians suffer from health issues such as heart problem due to consumption of vegetable oils high in omega -6- fat (Falada et al 2017). However, soya bean oil is known to lower chances of heart problems because it reduces cholesterol level in the digestive system through the reduction of cholesterol absorption (Messina et al 2021).

The great potential of the Malayan variety which showed a promising yield potential led to its mass multiplication and supply to farmers in 1946. A total 9tons of soya bean were initially exported from Nigeria in 1947 from cultivation in Benue, Zaria and Kastina (Shurtleff and Ayogi, 2021). The Tiv division of Benue province was the main production area with about 10.5 tons and 700tons of soya in 1946 and 1948respectively. Subsequently, Nigerians soya bean

exportation rose from 9 tons in 1947 to 15,86o tons in 1963 (Shurtleff and Ayogi, 2021). To date, Benue province remains the most important location of soya bean production in Nigeria. The expansion of soya bean production in other states were accredited to its nutritional composition and economic importance (Nater et al, 2021). Nigeria is currently the second largest African producer of soya bean after south-Africa (Khojey et al, 2018).

To minimize post harvest losses, processing and preservation became very necessary this give rise to 'Design and fabrication of soya bean de-husking/separation machine' the machine is aimed at instant de-coating of soya bean prior to milling into flour.

Aim: The aim of the project is to design, fabrication, test-run and optimize soya bean de-coating and separation machine.

Objectives:

1 Performance of extensive literature review

2 Development of conceptual engineering drawings

3 Design calculation

4 Simulation of the completed design drawing

5 Costing of the machine

6 Fabrication of the machine

7 Test-run and Optimization of process parameters

8 Patent of the project

9 Commercialization of the machine

Significance of the Project

To minimize post harvest losses, improve soya bean processing and preservation; enhance development of indigenous technology and domestication of the technology, and to enhance the development of small scale industry for full processing of soya bean flour.

Methodology

De-husking/Separation Machine:

De-husking/de-coating is the removal of the hard-shell cover of the soya bean seed in order to free the inside white seed. Soya bean can be de-husked orde-coated wet or dry. Wet de-coating requires soaking in water for a very long time, usually a whole day before attrition is applied for the removal of the coats. Large quantity if water is required for washing and for the separation of the coast from the inners seed. After washing the soya-bean is dried again before processing continues. This method of de-husking is very expensive, time consuming and highly labour intensive. This method of de-husking is not adopted for this plant design.

Dry de-husking which is cheaper, faster, with increased productivity and de-husking separation is adopted for the design of this plant. One of the essences of toasting is to increase the temperature of the soya bean coating, thereby making it to be very fragile which is suitable for light impact operation. The toasted soya beans are given a radial force at high angular velocity and restricted to heat an anvil, thereby causing the breakage of the coatings and isolating

the inner seeds from broken coatings. The volumetric air generated by the arrangements of fan blades inside the system separate the light broken coatings from the inner seeds. Both the broken coatings and the inner seed are collected at different points. The double chamber de-husking and separation machine has a capacity of 0.4tons (400kg) per/hr, the efficiency is quite unbelievable.

The design, fabrication, test-run and optimization have been completed; also the Project has been Patented. The figure below is the Soya bean De-husking and separation machine

Figure 1: Soya bean De-husking / separation machine

Budget

S/no	Name of Machine	Capacity	Material of construction	Quantity	Amount
1	Soya Bean De-husking/Separation machine	400kg/ hour	Stainless steel	1	N17,000.000

Team members:

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Conclusion

The mass production of this product will contribute to the food security of Nigeria and equally generate revenue for the nation through export market. Proposal on the level of production on

this machine can be raised and collaboration be made with local and international fund-raising organizations like bank industry, ministry of agriculture, world food programme (WFP), food and agricultural organization (FAO), the international fund for agricultural development (IFAD) and other organizations towards raising fund for establishment of micro, small and medium scale industries.

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