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DESIGN, FABRICATION AND PERFORMANCE EVALUATION OF A POTATO GRADER FOR VILLAGE-LEVEL OPERATIONS PROTOTYPE I

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ABSTRACT

Marketing of potato harvest especially in the arena of global trade requires quality standard as pre requisite to command a premium. A basic value adding operation to harvested potato tubers is grading them into homogenous cluster with reference to several characteristics, either by size, color, weight or other preferences. Such operation offers increased quality of the harvest and promotes ease of handling, marketing and enable storage. In the potato processing industry, uniformly sized tubers contribute to an improved efficiency of the processing line. Meanwhile, planting efficiency of a potato planter is also associated with the uniformity of size of the planting tubers.

This study deals with the development of a mechanical potato grader suited under village level operations that will provide a cheap and quality approach of grading marketable potato tubers by size. The grader operates on the principle of rotating spiral, grading unit, with increasing gaps starting from the inlet. Tubers with minor diameter smaller than the gaps of the spiral pass through to the collection tray provided under the grading unit. The fabricated potato grader is presented in Figure1.

Machine parameters during the evaluation include speed of the grading unit in RPM, inclination of the grading unit in degrees, and feed rate expressed in kg/min. While the dependent variables, response variables, are the grading system efficiency (GSE), capacity (C), percentage of damage tubers, and power consumption in W-hr. The grader was evaluated on potato tubers taking note the influence of the machine parameters to the performance of the grader. Careful analysis of data show that optimum set-up of the grader is at 15 RPM speed of the grading unit, inclination of 10 degrees and feed rate of 30 kg/min. giving a system efficiency of 94.5%, less damaged tubers of 1.85% and low power consumption of 18.1 W-hr.

The cost of the grader is P37, 000.00 with a break-even quantity of 28 tons of tubers/year. The capacity of the device can be improved by considering a larger dimension of the grading unit.



Figure 1. Fabricated potato grader

