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Approaches to Successful Development of Low-Cost Fruit Juice Extraction Technologies: A Case Study to Improved Rural Livelihood in Malawi

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Abstract

Fruits, in Malawi, are available ranging from mangoes (Kalisere and Boloma), water melon, guava, pineapples, paw paw, oranges, tomatoes, tangerines, baobab fruit and many other indigenous fruits. Production is estimated up to 75,000 metric tons per year. Unfortunately, post harvest losses account for over 60 % due to fruit perishabilty, poor marketing and lack of post harvest processing techniques strategic to product development for adding value. Two simple hand-operated low-cost Horizontal and Vertical Fruit Juice Extractors were developed to increase utilisation and minimise post harvest fruit losses in rural areas of the country. Performance evaluations on both machines were conducted on-station and on-farm in terms of: extraction capacity, efficiency, fruit-seed breakage, power requirement, rest period and economic analysis was also carried out. A split plot design with two treatments replicated three times; machine types- horizontal versus vertical (T1), fruit variety (T2) were used in which 12 kg fruit sample was used in each turn. The data recorded and analysed showed that both machines were able to extract juice from various fruits at zero seed breakage and reasonable capacity, efficiency, power requirement and rest period achieving 11–15 l h^{-1} at 75–80 %, 52–60 W and 240–263 min h^{-1} compared to 15–17 l h^{-1} at 78–84 %, 45–50 W and 300–340 min h^{-1} for peeled Kalisere mango variety and 15–20 l h^{-1} at 80–85 %, 50–55 W and 267–300 min h^{-1} compared to 18–20 l h^{-1} at 83–86 %, 40–45 W and 340–390 min h^{-1} with peeled Boloma mango variety respectively. In case of other fruits, a similar trend was drawn: 5–35 l h^{-1} at 60–80 %, 9–30 W and 570–1900 min h^{-1}compared to 6–60 l h^{-1} at 65–85 %, 7–17 W and 1006–2443 min h^{-1} respectively. As it is naturally difficult to store fresh and ripe fruits under rural conditions for more than 2–3 days, this study showed fruit juice offers increased utilisation and benefits i.e. nutrition, longer shelf life (90 to 120 days), economic returns (IRR of over 60 %) for improved rural livelihood and hence reduced post harvest losses of fruits' varieties. Rural communities in Malawi are so far adopting the technology.

Keywords: Equipment, extraction, fruits, juice, Malawi, packaging, processing

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