Comparative Life Cycle Analysis of Environmental Impact from Micro and Small Scale Cassava Chip Production Using Raw Cassava Roots

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Cassava chips are produced from fresh cassava root and the market for chips has increased over recent years. The aims of the analysis were to assess the environmental impact of cassava chips manufacturing and to identify the hotspots in the life cycle of cassava chips manufacturing. Three separate but interrelated components: inventory analysis, impact assessment and interpretations were performed for the cassava chips life cycle using SimaPro software 8.4.0.0 faculty version. Inventory data were collected through the use of structured questionnaires and personal communication. Data were collected on cassava farming, chips manufacturing, packaging, transportation and waste management. The scenario combining machinery use, LPgas and polythene showed higher environmental impact than the scenario combining no machinery use, LP gas and polythene. Higher contribution was associated with the electricity used in machineries. Cassava cultivation and cassava chips processing stages contributed to a higher impact on the environment and transportation of raw cassava root, raw material and cassava chips contributed to a lesser impact on the environment. The impact categories most affected by cassava cultivation were stratospheric ozone depletion 78.2%, Human non-carcinogenic toxicity 67.1%, land use 68.6% and mineral resource scarcity 76.4%. The impact categories most affected by cassava chips processing were fine particulate matter formation 80.7%, human carcinogenic toxicity 99.5%, terrestrial acidification 78.2%, marine ecotoxicity 75%, freshwater ecotoxicity 83.8%, fossil resource scarcity 84.9% and ozone formation 80%. No machinery use in cassava chips processing stage contributed to lesser environmental impact compared to the machinery use. Transportation of raw cassava root, raw material and cassava chips contributed to lesser impact on the environment. Cassava cultivation and cassava chips processing stages contributed a higher impact on the environment.

Keywords: Cassava chips, Life cycle assessment, Environmental impacts, Micro and small scale production