ASSESSMENT OF AGRICULTURAL PLASTIC MULCH USE AND WASTE FLOWS IN SRI LANKA USING LIFE CYCLE AND MATERIAL FLOW ANALYSIS

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Agricultural plastic mulch is widely used in Sri Lanka because it helps improve crop production, conserve soil moisture, reduce weed growth and support modern farming practices. The increasing use of plastic mulch has also created environmental problems, including plastic waste generation, improper disposal and possible microplastic pollution in agricultural soils. In Sri Lanka, there is limited information regarding the quantities of plastic mulch imported, distributed, used and disposed of, making it difficult to develop proper management systems and policies. Therefore, this study aimed to assess the flow and fate of agricultural plastic mulch in Sri Lanka using Product Life Cycle and Material Flow Analysis approaches. The study used primary and secondary data collected during the period 2022–2025 to estimate the annual use and waste flows of agricultural plastic mulch in Sri Lanka. Material Flow Analysis was conducted using the mass balance principle and STAN2 software to identify how plastic mulch moves from import and distribution to agricultural use and final disposal. The study analyzed procurement methods, mulch types, provincial distribution, annual usage and disposal methods at the national level. The results showed that the annual plastic mulch usage in Sri Lanka was estimated at ~51 tonnes/year over ~296 hectares of cultivated land. The average lifespan of plastic mulch was 1.19 years, indicating rapid conversion into waste. Silver/black mulch was the most commonly used mulch type. About 90% of plastic mulch was supplied through government supported agricultural programs such as the Sri Lanka Good Agricultural Practices Program and modernization projects, while only a small amount was purchased from retail shops. The study also found that open burning was the main disposal method, accounting for more than 80% of total plastic mulch waste, while reuse and recycling practices were very low. The Material flow analysis results showed that the system mainly follows a linear flow pattern where plastic mulch is imported, used and disposed of with very limited recycling or recovery. The MFA indicated an annual inflow of 118.09 ± 9 tonnes/year and an outflow of 58.16 tonnes/year, resulting in a stock accumulation of 59.93 ± 9 tonnes/year within the system. The findings highlight the need for structured collection systems, recycling initiatives, and policy interventions to promote circular management of agricultural plastics in Sri Lanka.

Keywords: material flow analysis, plastic mulch, mulch disposal, mulch procurement

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