Energy use pattern and greenhouse gas emission of winter vegetables: insights from Chotanagpur Plateau region, India

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The study investigated energy use efficiency (EUE) and greenhouse gas (GHG) emissions for winter vegetable production in India's Chotanagpur Plateau region, focusing on garden peas and potatoes. Data from vegetable growers revealed garden peas required 6564.29 MJ/ha, primarily from human energy (25.56%), farmyard manure (21.33%), seed (20.15%) and diesel (12.22%). For potatoes, the energy requirement was 40,282.29 MJ/ha, with fertilizer (42.30%), chemicals (24.43%), and seed (16.98%) major contributors. EUE was 9.80 for garden peas and 1.11 for potatoes. GHG emissions were 718.32 and 369.69 kg CO_2 eq./ha for garden peas and potatoes respectively. Promoting small farm machinery and optimizing resource management could enhance energy efficiency and reduce GHG emissions. Sustainable farming practices are crucial for mitigating energy use and GHG emissions in the region's vegetable production, urging further research for effective strategies.

Keywords: Chotanagpur Plateau, energy pattern, energy use efficiency, GHG emissions, vegetable production.

of 10 hectares and above. The state's geographical area spans 7.9 m ha, of which approximately 4.18 m ha are considered cultivable, with a net sown area of 1.81 m ha (ref. 2). More than 70% of the rural population depends on agriculture and its allied sectors as their primary source of livelihood. Among the various crops cultivated, major vegetable crops include potato, onion, cauliflower, brinjal, cabbage, tomato, garden pea, chillies, okra and leafy vegetables. Vegetable cultivation covers around 0.15 m ha of the state's land. Over the years, the area under vegetable crops has expanded due to their promising economic returns compared to cereals and pulses[2].

Energy plays a critical role in agricultural production, and in Jharkhand, the shift from low-energy input, traditional farming methods to higher-energy input approaches is evident[3]. This transition presents an opportunity for agriculture to become a vital renewable energy source, offering significant economic prospects for farmers. The energy consumption per unit area in agriculture directly depends on various inputs such as fuel, electricity, machinery, seeds, fertilizers and chemicals[4]. Efficient energy usage can increase productivity, bolstering the economy, profitability