Analysis of the Fertilizer Footprint of Principal Crops in China: A Spatial Allocation Perspective

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Utilizing the sophisticated Multi-Regional Input-Output Analysis (MRIO) approach, this investigation meticulously examines the nitrogen (N), phosphorus (P), and potassium (K) fertilizer footprints associated with predominant crops throughout various Chinese provinces. Crucial provinces, namely Heilongjiang, Jiangsu, Shandong, and Henan, manifest a pronounced geographical aggregation in fertilizer footprints. Intriguingly, Heilongjiang, Shandong, and Henan collectively represent 49.2% and 42.7% of the cumulative national footprint.

From a provisioning perspective, the assimilation of N, P, and K fertilizers predominantly gravitates towards Heilongjiang, Shandong, Henan, Jiangsu, and Anhui, cumulatively contributing 32.74%, 35.73%, and 36.48% to the nation's aggregate input. Distinctly, regions such as the Yangtze River Delta, Pearl River Delta, and the Beijing-Tianjin-Hebei conurbation emerge as paramount crop consumption hubs, with aggregate consumptions scaling to 4505.12 Gg, 1741.71 Gg, and 2026.57 Gg, respectively. Notably, the exogenous crop provisions in metropolises like Shanghai and Beijing play a pivotal role in shaping their N, P, and K footprints, quantified at 6.78%, 5.56%, and 5.79%, and 1.26%, 1.37%, and 1.71%, respectively.

Furthermore, three salient regions—the Northeastern Plains, the Huang-Huai-Hai Plains, and the Middle to Lower tracts of the Yangtze River—collectively encompass 57.4%, 66.1%, and 66.2% of the national N, P, and K footprints. Compellingly, the dynamics of crop footprint migration in provinces such as Henan, Heilongjiang, and Shandong appear to be predominantly modulated by wheat and corn.

In summation, this scholarly endeavor elucidates the intricate spatial delineation of the fertilizer footprint, its translocation mechanisms, and its intricate interplay with socio-economic and demographic paradigms, thereby laying a robust theoretical groundwork for augmenting fertilizer efficacy and championing the cause of sustainable agricultural practices.