Crop biomass is a finite resource that serves multiple purposes implying competition between different uses. By valorizing residues a more diverse basket of bio-based products can be produced from available raw material. As flows become less linear, multiple value chains are linked in a network, resulting in intertwined allocation decisions. In sub-Saharan Africa (SSA), farmers often pursue multiple objectives simultaneously, whereas resource availability is often limited; leading to trade-offs and wide variability in management decisions. Decision support tools (DSTs), such as Digital Twins, can improve understanding by simulating intended management strategies and explore related impacts. Nevertheless, digital innovation efforts are strongly focused on developed countries. The main research question of this research is: To what extent can decision support tools contribute to coordination of crop biomass allocation and valorization in SSA? A system approach is adopted to explore economic and environmental consequences of valorization and alternative resource allocation on different scales. The focus in this project is on coffee and banana systems in Uganda, which are analyzed using simulation studies and participatory research. It is then assessed whether DSTs can enhance decision making towards a more sustainable situation for smallholders.