Digital innovation options for sustainable crop-livestock intensification in sub-Sahara Africa (INNOVAFRIKA concept)

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Abstract

Cassava (*Manihot esculenta* Crantz) is an essential food-feed crop in Africa, and contributes greatly to food security and income. D.R. Congo and Ghana are among the top producers in the world, ranked 2nd ($48.77\,\mathrm{Mt\,y^{-1}}$) and 4th ($25.99\,\mathrm{Mt\,y^{-1}}$) respectively. In both countries, cassava is produced largely by smallholder crop-livestock farmers. However, due to poor soil fertility, prolonged dry spells, and high pests and disease incidences the average yield of the crop in both countries of about $8.1\,\mathrm{t\,ha^{-1}}$ is far low relative to the global average of $30\,\mathrm{t\,ha^{-1}}$. The productivity of the livestock sub-system is also low due to high mortality rates, poor feed quality and improper management practices. The INNOVA-FRIKA concept aims at improving cassava-livestock production by using the cassava peels as livestock feed and livestock manure as a fertiliser to increase cassava production in D.R. Congo and Ghana. The cassava-livestock system is conceptualised as a farming system with three sub components, namely cassava production unit, cattle production unit and land-holding. A causal loop diagram and system analysis to is used to qualitatively investigate the potential contributions of each sub component. The effectiveness of emerging digital innovations such as image based plant health monitoring, sensor monitoring of cattle performance and geo-referenced fertiliser application, climate smart manure management and sensor monitoring of greenhouse gases emissions from manure are evaluated on the basis of environmental friendliness, economic viability and social responsiveness. The knowledge generated from the project will provide practical steps for inculcating digital innovations into crop-livestock system in Africa for sustainable intensification.

Keywords: Accelerometers, artificial intelligence, cassava brown streak disease, data management, manure management, sensors

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