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**“Potential regional trade implications of adopting B_t cowpea in
West and Central Africa”**

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ABSTRACT

The potential of enhancing food security on the African continent through genetic engineering to control plant pests and diseases for which no natural sources of resistance exist is well known. For instance, the productivity of cowpea (*Vigna unguiculata* (L.) Walp), the most economically important indigenous African grain legume, can be improved dramatically through genetic transformation of the crop with *Bacillus Thuringiensis* (B_t) genes to control pod borers (*Maruca testulalis*). This paper assessed the potential trade implications of African farmers adopting B_t cowpea using a spatial and temporal price equilibrium (SPE) model formulated in a mixed complementary programming framework and solved using GAMS/PATH. The analysis first examined the scenario where B_t cowpea is initially adopted in only Nigeria, the leading producer of cowpea in the world and advocate for biotechnology in West and Central Africa. Since B_t cowpea seeds would have to be produced and distributed, it was assumed that the area under Bt cowpea increased gradually from zero up to 80%, the typical refuge requirements for cowpeas. The second scenario assumed that all cowpea producing countries within the “Nigerian Cowpea Grainshed” comprising of Benin, Burkina Faso, Côte d’Ivoire, Ghana, Mali, Niger, Nigeria, Togo Cameroon, Chad, and Gabon, which accounts for 90% of cowpea trade in West and Central Africa, adopted B_t cowpea on limited scales resulting in at least 10% increase in cowpea yields. Cowpea unlike industrial raw material crops is traded within Africa and thus affords the opportunity to make the analysis without worrying about external trade policy implications should B_t cowpea be adopted on the continent.

The simulation results showed that regional cowpea prices would drop by 8% when Bt cowpea is planted on 10% of total cowpea area in Nigeria and by 48% when it is 80%. Beyond 80%, Nigeria could potentially be a net exporter but that exceeds the typical refuge limit. Increase in Nigeria's domestic supply would force Niger, its major import market, to re-direct part of its exports to Benin, Ghana and Togo. Chad and Cameroon would stop exporting to Nigeria and dump their grains on their domestic markets depressing prices. The welfare implications of such a policy at each level of production are that apart from Nigerian cowpea producers who would benefit from increased sales, producers would lose as a result of the depressed prices. However, overall regional welfare would increase because of the additional gains in consumer welfare. Adopting B_t cowpea in all cowpea producing countries would depress regional prices by 9.5% resulting in increased regional trade volume and demand by 8.5% and 19.2%, respectively. Corresponding regional welfare would increase by 8% (or US\$504 million) although producers would lose. The results thus emphasize the need for all cowpea producing countries to adopt the technology if available or risk losing out, but also draw attention to the need to devise ways to ensure acceptable welfare distribution among producers and consumers in adopting countries. Finally, this paper contributes to the literature on the application of spatial and temporal models in regional policy analysis.