

10. **Damalas CA**, Georgiou EB, Theodorou MG. Pesticide use and safety practices among Greek tobacco farmers: a survey. *Int J Environ Health Res* 2006;**16**:339–48.
11. **Lonsway JA**, Byers ME, Dowla HA, *et al*. Dermal and respiratory exposure of mixers/sprayers to acephate, methamidophos, and endosulfan during tobacco production. *Bull Environ Contam Toxicol* 1997;**59**:179–86.
12. **Ohayo-Mitoko GJA**, Heederick DJJ, Kromhout H, *et al*. Acetylcholinesterase Inhibition as an Indicator of Organophosphate and Carbamate Poisoning in Kenyan Agricultural Workers. *Int J Occup Environ Health* 1997;**3**:210–20.
13. **Ohayo-Mitoko GJ**, Kromhout H, Simwa JM, *et al*. Self-reported symptoms and inhibition of acetylcholinesterase activity among Kenyan agricultural workers. *Occup Environ Med* 2000;**57**:195–200.
14. **Cornwall JE**, Ford ML, Liyanage TS, *et al*. Risk assessment and health effects of pesticides used in tobacco farming in Malaysia. *Health Policy Plan* 1995;**10**:431–7.
15. **Kimura K**, Yokoyama K, Sato H, *et al*. Effects of pesticides on the peripheral and central nervous system in tobacco farmers in Malaysia: studies on peripheral nerve conduction, brain-evoked potentials and computerized posturography. *Ind Health* 2005;**43**:285–94.
16. **Salvi RM**, Lara DR, Ghisolfi ES, *et al*. Neuropsychiatric evaluation in subjects chronically exposed to organophosphate pesticides. *Toxicol Sci* 2003;**72**:267–71.
17. **Akhter F**, Mazhar F, Sobhan MA, *et al*. From Tobacco to Food Production: Assessing Constraints and Transition Strategies in Bangladesh. *Final Technical Report Submitted to the Research for International Tobacco Control (RITC) Program of the International Development Research Centre (IDRC)*. Ontario, Canada: International Development Research Centre, 2008:20.
18. **Khan DA**, Shabbir S, Majid M, *et al*. Risk assessment of pesticide exposure on health of Pakistani tobacco farmers. *J Expo Sci Environ Epidemiol* 2010;**20**:196–204.
19. **McBride JS**, Altman DG, Klein M, *et al*. Green tobacco sickness. *Tob Control* 1998;**7**:294–8.
20. **Oliveira PP**, Sihler CB, Moura L, *et al*. First reported outbreak of green tobacco sickness in Brazil. *Cad Saude Publica* 2010;**26**:2263–9.
21. **Almeida GEG**. *The Biopolitic of the Human Rights: A Reflection from Tobacco Contract System. [A biopolítica dos direitos humanos: uma reflexão a partir do sistema de integração rural da fumicultura]*. Master thesis. Brasília, Brazil: University of Brasília, Law Institute, 2008:201.
22. **Sauer J**, Abdallah JM. Forest diversity, tobacco production and resource management in Tanzania. *Forest Policy Econ* 2007;**9**:421–39.
23. **Mangora MM**. Ecological impact of tobacco farming in miombo woodlands of Urambo District, Tanzania. *Afr J Ecol* 2005;**43**:385–91.
24. **Abdallah JM**, Mbilinyi B, Ngaga YN, *et al*. Impact of flue-cured Virginia on Miombo woodland: a case of small-scale flue-cured Virginia production in Iringa region, Tanzania. *Discov Innov* 2007;**19**:92–106.
25. **Chapman S**. Tobacco and deforestation in the developing world. *Tob Control* 1994;**3**:191.
26. **Geist HJ**. Global assessment of deforestation related to tobacco farming. *Tob Control* 1999;**8**:18–28.
27. **Yanda PZ**. Impact of small scale tobacco growing on the spatial and temporal distribution of Miombo woodlands in Western Tanzania. *J Ecol Nat Environ* 2010;**2**:10–16.
28. **Bunnak HEP**, Kong M, Yel D. *Study on Tobacco Farming in Cambodia*. Southeast Asia Tobacco Control Alliance, 2009:54.
29. **Kweyuh PHM**. Tobacco expansion in Kenya: the socio-ecological losses. *Tob Control* 1994;**3**:248.
30. **Waluye J**. Environmental impact of tobacco growing in Tabora/Urambo, Tanzania. *Tob Control* 1994;**3**:252.
31. **Muwanga-Bayego H**. Tobacco growing in Uganda: the environment and women pay the price. *Tob Control* 1994;**3**:255–6.
32. **Kibwage JK**, Netondo GW, Odondo AJ, *et al*. Diversification of Household Livelihood Strategies for Tobacco Small-holder Farmers: A Case Study of Introducing Bamboo in South Nyanza Region, Kenya. *Final Technical Report submitted to the Research for International Tobacco Control (RITC) Program of the International Development Research Centre (IDRC)*. Ontario, Canada: International Development Research Centre, 2009:25.
33. **Gonçalves CS**, Rheinheimer D, Pellegrini JBR, *et al*. Qualidade da água numa microbacia hidrográfica de cabeceira situada em região produtora de fumo. *Revista Brasileira de Engenharia Agrícola e Ambiental* 2005;**9**:391–9.
34. **Griza FT**, Ortiz KS, Geremias D, *et al*. Avaliação da contaminação por organofosforados em águas superficiais no município de Rondinha/Rio Grande do Sul. *Quim Nova* 2008;**31**:1631–5.
35. **Bortoluzzi EC**, Rheinheimer DDS, Gonçalves CS, *et al*. Contamination of surface water by pesticides as a function of soil use in the Agudo watershed, RS. [Contaminação de águas superficiais por agrotóxicos em função do uso do solo numa microbacia hidrográfica de Agudo, RS]. *Revista Brasileira De Engenharia Agrícola e Ambiental* 2008;**10**:881–7.
36. **Merten GH**, Minella JP. Impact on Sediment Yield Due to the Intensification of Tobacco Production in a Catchment in Southern Brazil. *Ciência Rural* 2006;**36**:669–72.
37. **Vargas MA**, Campos RR. *Crop Substitution and Diversification Strategies: Empirical Evidence from Selected Brazilian Municipalities. The World Bank: HNP Discussion Paper, Economics of Tobacco Control*. 2005.
38. **Nguyen TH**, Hoang Van M, Kim Bao G, *et al*. *Impact of Tobacco Growing on the Livelihood and Health of Tobacco Farmers and the Environment: A Preliminary Study in Vietnam*. Southeast Asia Tobacco Control Alliance, 2009:72.
39. **John S**, Vaite S. *Tobacco and Poverty: Observations from India and Bangladesh. Mumbai. HealthBridge Report*. Hamilton, Ontario, Canada: PATH Canada, 2002.
40. **Loker WM**. The rise and fall of flue-cured tobacco in the Copan Valley and its environmental and social consequences. *Hum Ecol* 2005;**33**:299–327.
41. **Abdallah JM**. Economic and Productive Efficiency Analysis of Tobacco Production and its Environmental Impact in Miombo woodlands of Iringa Region. *PhD Thesis in Fulfillment of the Requirements for Doctor of Philosophy of Sokoine University of Agriculture*. Morogoro, Tanzania, 2006.
42. **Otanez MG**, Muggli ME, Hurt RD, *et al*. Eliminating child labour in Malawi: a British American Tobacco corporate responsibility project to sidestep tobacco labour exploitation. *Tob Control* 2006;**15**:224–30.
43. **McDaniel PA**, Intinarelli G, Malone RE. Tobacco industry issues management organizations: creating a global corporate network to undermine public health. *Globalization and Health* 2008;**4**:2. <http://www.globalizationandhealth.com/content/4/1/2>
44. **McDaniel PA**, Malone RE. British American Tobacco's partnership with Earthwatch Europe and its implications for public health. *Global Publ Health*. Published Online First: 23 February 2011. <http://dx.doi.org/10.1080/17441692.2010.549832>

Invited commentary

Apart from the authors' highlights on the environmental impacts of tobacco production,¹ additional problems include farmers smoking raw tobacco, which leaves the majority of them sick; for example, more than 75% of tobacco farmers in Tanzania smoke raw tobacco.² Farmers also die in curing barns due to carbon monoxide poisoning.³ Increased tobacco farming due to industry sensitisation has resulted in increased labour demands with people engaging in human trafficking; for example, in Tanzania, people sold to big farmers for between US \$80 and US \$100 are subjected to harsh conditions, working long hours for just food and substandard shelter, ending up as slaves.³

The problems of tobacco companies' policies and practices are common to both high income as well as low- and middle-income countries although the latter are more vulnerable. These companies lure government and other leaders into believing that tobacco is an economically viable crop and a major source of

revenue, while hiding the truth about the accompanying environmental and health losses. For example, while Tanzania earns about US \$50 million annually from tobacco revenue, more than US \$40 million is spent to treat tobacco-related cancers alone.⁴ Environmentally, tobacco farming is responsible for causing more than 4% of the desert area in Tanzania and, Urambo, one of the major tobacco growing districts, lost about 1.3 m³ trees worth more than US\$10.5 million in 2010/2011 alone.⁵ Tobacco companies also lie in claiming that farmers have no economically viable alternative crops. In Tanzania, more than 70% of tobacco farmers interviewed preferred alternative crops which they also identified; their only worry was sustainable markets for such crops.^{6,7}

Apart from further research to quantify the health impacts of tobacco farming and evaluate potential alternative crops, collaboration at national, regional and global levels is necessary to strategise on how best to counter the emerging solidarity among tobacco companies that are working towards paralysing tobacco control efforts, particularly in low- and middle-income countries.

Educating and sensitising government and other leaders and supporting tobacco farmers through the process of adopting alternative crops while securing sustainable markets will enhance environmental health sustainability efforts.

Lutgard Kokulinda Kagaruki

Correspondence to Lutgard K Kagaruki, Tanzania Tobacco Control Forum, Plot 677 Sinza A, Sam Nujoma/Igesa Rd. Opp Kobil Petrol St, P. O. Box 33105, Dar es Salaam, Tanzania; info@ttcf.or.tz

Funding Studies in Tanzania were funded in part by the Foundation Umverteilen and the Union for International Cancer Control.

Competing interests None.

Provenance and peer review Commissioned; internally peer reviewed.

Tobacco Control 2012;**21**:196–197. doi:10.1136/tobaccocontrol-2011-050380

REFERENCES

1. **Lecours N**, Almeida G, Abdallah J. Environmental health impact of tobacco farming: a review of literature. *Tob Control* 2012;**21**:191–6.
2. **Kagaruki LK**. Community-based advocacy opportunities for tobacco control: experience from Tanzania. *Glob Health Promot* 2010;**17**(2 Suppl):41–4.
3. **The Guardian**. Legislators, lobby decry poor tobacco control enforcement. 1 June 2011. <http://ippmedia.com>
4. **Kagaruki LK**, Mwaiselage J, Kahesa C, *et al*. An assessment of the relationship between smoking and cancer at Ocean Road Cancer Institute and Muhimbili National Hospital, Tanzania. 2008; (In press, Tanzania Journal of Health Research).
5. Tabora Region Semi-Annual Report. Tanzania: Forestry Reserve Department, Ministry of Natural Resources and Tourism, 2010/2011.
6. **Kagaruki LK**, Bituro A. An assessment of the environmental impact and farmers' perception on tobacco control in Tabora Region Tanzania. 2008; Technical Report presented to the American Cancer Society. *Promoting effective tobacco control in Tanzania through establishment of reliable data*; 13th WCTOH Tobacco Control Fellows Seed Grant Project, 2006–2007.
7. **Kagaruki LK**. *The Need for Tobacco Control in Tanzania. Paper Presented at the Members of Tanzania Parliament Sensitisation Seminar*. Parliamentary sub-office, Dar es Salaam Tanzania, 28 May, 2011.