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The impact of tobacco-growing on deforestation

Assessment of the situation based on independent publicly available information

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Abstract

Tobacco-growing is often portrayed as one of the major causes, if not the main one, of deforestation in the world, especially due to deforestation for crop expansion and for use of wood to cure tobacco.

The tobacco cultivated surface has decreased by 14% in the last 20 years, showing increase only in a very small number of countries. More than half of the tobacco grown world-wide does not make use of wood for curing, and in the cases where it does, there is also evidence of woodlot planting and responsible behaviour of the tobacco growers and the tobacco industry.

This document assesses the situation providing information from independent reliable sources.

Background

One of the main charges against tobacco-growing is that it is a major cause of deforestation.

The Framework Convention on Tobacco Control (FCTC) has set up a Working Group on economically sustainable alternatives to tobacco-growing. The Working Group summarized in such a way the impact of tobacco growing: “The study group addressed the environmental impact of tobacco growing, paying special attention to soil degradation and loss of vegetation. It noted that 90% of tobacco is grown in tropical dry forest and woodland areas – areas in developing countries with high population densities and high biodiversity losses. ….. Three triggers of vegetation loss are associated with tobacco growing: forest degradation, deforestation due to curing and deforestation due to clearance for more growing land. It was noted that, although the global share of agricultural land used for tobacco growing is less than 1%, its impact on global deforestation is 2–4%, making a visible footprint for climate change. **Research suggests that tobacco growing may be up to 10 times more aggressive than the sum of all other factors in deforestation**.”[1]

Tobacco growing and deforestation in the context of world agriculture

This small piece of research is based only on d independent organizations which have no vested interests in tobacco. The only data drawn from tobacco organizations regards specific production of tobacco varieties, when this is not available from independent organizations.

It is true that in some parts of the world tobacco farmers use wood to cure tobacco, either as fuel to cure Virginia tobacco or dark-fire cured tobacco, or as building material for Burley barns. However, what happens in relation of tobacco needs to be put in perspective compared to other human activities.

To give a sense of proportion to the issue, it is important to bear in mind that:

- The total surface cultivated with tobacco at world-wide level in 2010 is 3,980,218 ha,[2] which is an area smaller than Switzerland (4,128,500 ha). The current cultivated land shrunk by 14% compared to the level in 1990 (4,646,149 ha).

[1] FCTC : « Study group on economically sustainable alternatives to tobacco growing (in relation to Articles 17 and 18 of the Convention)”, 4.9.2008, http://apps.who.int/gb/fctc/PDF/cop3/FCTC_COP3_11-en.pdf

[2] FAOSTAT, http://faostat.fao.org/default.aspx

- The total agricultural area in the world is about 4.9 billion ha, of which 1.53 billion ha are arable land and land under permanent crops[3]. Tobacco cultivation represents about 0.25% of arable land and about 0.08% of agricultural land.

- Tobacco is grown in about 120 countries around the world, but 80% of it is grown in ten countries: China, Brazil, India (these three countries contributing by 64% of the world production), USA, Malawi, Indonesia, Argentina, Pakistan, Zimbabwe, Italy. Another 10% is grown in another ten countries*:* Zambia, Mozambique, North Korea, Thailand, Vietnam, Bangladesh, Turkey, Tanzania, South Korea, Bulgaria). The remaining 10% is grown in about 100 countries.

- 63% of the tobacco production takes place in Asia, 17% in Central and Southern America, 8% in Africa, 7% in North America and 5% in Europe.

In the following pages each major tobacco producing country will be examined, in order to allow an objective assessment of the FCTC Working Group's claim.

In order to make a worst case scenario, this paper accepts without challenging it the (mostly wrong) assumption of the Working Group experts that the expansion of tobacco cultivated land has always taken place at the expense of existing forests. In reality it is quite normal that agricultural expansion takes place in areas which have already been free of trees for several years. As seen before, the surface of agricultural land (land suitable for agricultural enterprise) is about 3.5 times bigger than the area really under cultivation, if the data showed by the FAO statistic website are correct.

The claims on the fact that tobacco is a major cause of deforestation also do not take in consideration another factor highlighted by the FAO: population growth is a major determinant of land clearing in shifting cultivation, through the growth in requirements for food and other agricultural products. The need for additional land, in this case, is roughly proportional to the growth in food requirements of the population living in the subsistence sub-sector of agriculture.[4]

China

The largest producer of tobacco in the world is China, representing one third of the world production: according to the FAO statistics website, 1,345,680 ha were cultivated with tobacco in 2010, compared to 1,600,200 ha in 1990. It is impossible to talk about deforestation linked to agricultural land expansion in the case of tobacco in China.

China is reported to use mostly coal for flue-curing[5]. Also a study published on the USAID website maintains that in China, like in the US and in Europe, petroleum, coal or natural gas are now common alternatives to wood for tobacco curing.[6]

[3] FAOSTAT, http://www.fao.org/economic/ess/other-statistics/socio-economic-agricultural-and-environmental-indicators

[4] FAO: "Population and deforestation", 2000, http://www.fao.org/sd/wpdirect/WPan0050.htm

[5] UNCTAD : « Economic role of tobacco production and exports in countries depending on tobacco as major source of income", 1995, http://r0.unctad.org/infocomm/comm_docs/docs/official/pocomd63.en.pdf

[6] USAID, Untitled report, http://www.usaid.gov/locations/latin_america_caribbean/environment/docs/ag&environ/Tobacco.PDF (as accessed on 20 December 2012)

Always according to the FAO, China has presented an increase of 35,205,000 ha of planted forest between 1990 and 2010.[7]

For these two reasons tobacco growing in China, which constitutes one third of the world area under tobacco cultivation, cannot be considered as a cause of deforestation.

Brazil

The second largest tobacco producer is Brazil, with 446,361 ha in 2010 compared to 274,098 ha in 1990 according to the FAO statistics website. However the agricultural land expansion due to tobacco is much lower than the one caused by other crops, always according to data available in the FAO statistics website:

Crop	Area Harvested 1990 (ha)	Area Harvested 2010 (ha)	Estimated share on the increase in agricultural area 1990 to 2010
Soybeans	11'487'300	23,293,100	62.3%
Maize	11'394'300	12,814,800	7.5%
Sugar cane	4'272'600	9,080,770	25.4%
Cashew nuts	582'818	752,021	0.9%
Sorghum	137'758	645,655	2.7%
Cashewapple	551'844	617,100	0.3%
Tobacco	274'098	446,361	0.9%

About 85% of the production, according to the Brazilian tobacco growers' association AFUBRA, consists of flue-cured and fire-cured tobacco, and 15% of burley and oriental tobacco:

In Brazil tobacco is cultivated mainly in the states of Rio Grande do Sul, Santa Catarina and Parana, which represent about 95% of the domestic production of this crop. In 2000 a term of agreement of compliant behaviour was signed in the state of Santa Catarina between the government, the tobacco industry and the farmers. The most important points of this document are:

- The tobacco companies must provide finance to farmers that are not self-sufficient in firewood to buy wood from reforestation with exotic species (from Eucalyptus species).
- The tobacco companies must launch campaigns to promote reforestation, native forest preservation and to inform the farmers about the risks of not complying with the environmental legislation.
- The tobacco companies must give incentives for and promote reforestation with exotic species to achieve self-sufficiency in firewood. Also the tobacco companies must provide technical assistance to farmers in terms of reforestation.
- The tobacco companies must provide transport of firewood from Eucalyptus to farmers that are not self-sufficient in firewood (farmers without land and with limited land available).
- The tobacco companies must add a clause to the annual contract with farmers that they will not buy tobacco cured with firewood from irregular origin (from native species and/or without license).

[7] "FAO: "The global forest resources assessment 2010", http://www.fao.org/forestry/fra/fra2010/en/

- The tobacco companies must not have contracts with farmers who were sued by the Environmental Protection Agency.
- The tobacco companies must provide annually an agreement signed by the farmers identifying the origin of the wood that will be used to cure the flue-cured tobacco.

The tobacco companies signed a similar agreement with the Parana State Environmental Protection Agency, IAP, in 2004. The State of Rio Grande do Sul did not laid down specific conditions, mainly because deforestation in this state is virtually non-existent due to the active control by the environment agency and very high penalties. Also there is good supply of wood (*Eucalyptus sp.* and *Acacia negra*) from independent afforestation schemes.

Even if tobacco growing in Brazil, where the crop represents about 12% of the current world surface cultivated with tobacco, shows land expansion, it is totally self-sufficient in terms of wood for curing.

A study by the Institute of Environmental Research of Amazonia shows that the major drivers of deforestation in Brazil are land clearance for cattle grazing and logging, followed by cultivation of soybeans. There is no mention of tobacco among the major causes of deforestation.[8] Also the National Wildlife Federation recognizes that three quarters of deforestation in Brazil is driven by cattle grazing, with no mention whatsoever of tobacco.[9] Another study from Greenpeace shows that soybean farming is one the major causes of deforestation in Brazil, again with no mention of tobacco.[10]

India

The third largest tobacco producer in the world is India, with 459,600 ha of tobacco cultivated land in 2010, compared to 413,100 ha in 1990 according to the FAO statistics website: even if there has been some land expansion in tobacco cultivation, it is negligible compared to what happened with other crops, according to the data in the FAO statistics website.

Crop	Area Harvested 1990 (ha)	Area Harvested 2010 (ha)	Estimated share on the increase in agricultural area 1990 to 2010
Banana	365,000	844,000	5.4%
Potatoes	940,000	1,835,300	10.2%
Cotton	7,439,600	11,000,000	40.6%
Sugarcane	3,439,000	4,200,000	8.7%
Wheat	23,501,900	28,520,000	57.3%
Tobacco	413,000	459,600	0.5%

[8] Instituto de Pesquisa Ambiental da Amazonia, « Tropical deforestation and climate change », 2005, http://www.rainforestcoalition.org/documents/Tropicaldeforestationandclimatechange.pdf

[9] National Wildlife Federation: « From Major Driver of Deforestation and Greenhouse Gas Emissions to Forest Guardians? New Developments in Brazil's Amazon Cattle Industry", 2010, http://www.nwf.org/Global-Warming/Policy-Solutions/~/media/4878226C49BF48EB9EB54C1B7C616327.ashx (as accessed on 13 January 2012)

[10] Greenpeace : « Cargill – Eating up the Amazon », 2006, http://www.greenpeace.org.br/amazonia/pdf/cargill.pdf (as accessed on 13 January 2012)

India is one of the countries where population has increased considerably in the last 20 years, passing from 849 million in 1990 to 1,171 million in 2010, reflected in the increase of land under edible crops.[11]

The Tobacco Board (part of the Ministry of Commerce and Industry) informs that the average production of flue-cured tobacco is 300,000 MT/year, when the country production in the country is 755,000 MT/year. With a small exception of Kentucky fire-cured tobacco, all other tobacco types in India are sun-cured or air-cured and do not require wood for curing. Therefore flue-cured tobacco accounts for only 35% of tobacco production in India and, according to an independent study, 37% of the flue-cured tobacco uses wood for curing while the rest is cured by agricultural waste.[12]

According to the India Tobacco Board, "growers use coal, wood or other materials like briquettes for curing of tobacco. The Tobacco Board obtains indents from the interested growers and arranges coal from M/s. Singareni Collieries, delivered at the growers' barn site in Andhra Pradesh & Karnataka. Since 2006-07 the growers' indent for supply of coal has been decreasing due to various reasons and the growers are using mostly wood and other materials. Most of the farmers in Andhra Pradesh use the wood of *Prosophis juliflora*, a wild shrub grown on roadsides, vacant lands, wastelands, on the bunds of rivers/ rivulets etc. for curing tobacco. The stubbles of Eucalyptus, Casuarina, subabul from the social forestry also accounts for a bulk of tobacco curing materials. In Karnataka, coffee husk, paddy husk, maize cobs and coconut shells are used for tobacco curing. Briquettes made of agri-waste are also under usage in Karnataka. Owing to sharp increase in wood material costs due to competition from bio power plants, the Board advises the farmers to raise their own wood fuel to meet their requirements for curing of tobacco."[13]

The Tobacco Board of India also promotes reforestation among tobacco farmers and research on solar energy to fuel tobacco curing barns.[14]

Tobacco is also not recorded as a major cause of deforestation in India according to NGO's reports which analyses the major causes of deforestation in this country. [15]. In addition, the FAO reports that India has increased its forest cover in the last five years, with an increase of 1.48 million ha of forest or woodlots/year.[16]

Therefore tobacco growing in India, which represents 11.5% of tobacco growing in the world, seems to have no impact on deforestation.

United States of America

The fourth largest producer of tobacco is the United States. According to the FAO statistic website, the production of tobacco in 2010 covered 136,561 ha, while in 1990 it covered

[11] World Bank, "Indicators Database", http://data.worldbank.org/indicator/SP.POP.TOTL/countries?display=default

[12] School of Management for Infrastructure and Development Studies: "Economics of tobacco – An overview", http://www.minds-india.org/Soft%20copies%20of%20STEM%20Project%20Reports/Microsoft%20Word%20-%20Economics%20of%20Tobacco%20in%20India.pdf (as accessed on 16 January 2012)

[13] India Tobacco Board : « Supply of inputs », http://tobaccoboard.com/content/view/40/67/lang,english/ (as accessed on 16 January 2012)

[14] http://tobaccoboard.com/content/view/58/74/lang,english/

[15] World Rainforest Movement, "Underlying Causes of Deforestation and Forest Degradation", (http://www.wrm.org.uy/deforestation/Asia/India.html), Environment Action Group India (http://enviroscope.iges.or.jp)

[16] FAO: "The global forest resources assessment 2010", http://www.fao.org/forestry/fra/fra2010/en/

296,760 ha, therefore it is impossible to speak of deforestation linked to cultivated land increase.

Approximately 50% of tobacco produced in the U.S. is flue-cured, and propane is the primary fuel used in the process. Almost all bulk-curing barns built since the early 1970s are equipped with propane gas burners.[17]

Indonesia

The fifth largest tobacco producer in the world is Indonesia, representing about 6.3% of the world surface cultivated with tobacco. According to the FAO statistics website Indonesia had a surface cultivated with tobacco of 251,300 ha in 2010 versus 235,866 ha in 1990. The growth of cultivated surface is minimal compared to that of other crops.

Crop	Area Harvested 1990 (ha)	Area Harvested 2010 (ha)	Estimated share on the increase in agricultural area 1990 to 2010
Coconuts	2,261,560	3,080,700	8.1%
Maize	3,158,090	4,143,250	9.8%
Palm oil	673,033	5,000,000	42.9%
Rice	10,502,400	13,244,200	27.2%
Rubber	1,865,610	3,064,600	11.9%
Tobacco	235,866	251,300	0.15%

Indonesia experienced a population growth of 30% in the last 20 years, passing from 185 million people in 1990 to 240 million in 2010%.[18]

According to a study of the Tobacco Free Initiative and the WHO, out of the total tobacco production of Indonesia only 25% needs fuel for curing. Sun-cured Indonesia type accounts for about 64% of all tobacco production in Indonesia, followed by Virginia (25%) and dark air-cured tobacco (11%).[19]

NGO studies on major drivers for deforestation in Indonesia do not highlight tobacco as one of these.[20] Therefore the contribution of Indonesian tobacco to deforestation can be considered very small. Also one of the major studies on deforestation linked to tobacco admits that "possible pressures emerging from the wood use of tobacco are not yet felt in Cambodia, Laos, Myanmar (Burma), Malaysia, and Indonesia (with low-to-minor crop-specific deforestation and still with large, forested areas)."[21]

[17] Propane Education and Consumer Council: "Tobacco Curing", http://www.choosepropane.org/cefarmcropstobacco.cfm (as accessed on 16 January 2012)
[18] World Bank, "Indicators Database", http://data.worldbank.org/indicator/SP.POP.TOTL/countries?display=default
[19] WHO/HNP discussion paper: "Smallholder tobacco growing in Indonesia: Cost and profitability compared to other agricultural enterprises", 2006, http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/281627-1095698140167/KeyserINDTobaccoGrowingFinal.pdf
[20] World Rainforest Movement (http://www.wrm.org.uy), Center for International Forestry Research (http://www.cifor.cgiar.org/)
[21] H. Geist: "Global assessment of deforestation related to tobacco farming", 1999, published in Tobacco Control, http://tobaccocontrol.bmj.com/content/8/1/18.full

It is clear from a study presented at the IUFRO (International Union of Forest Research Organizations) 20th world congress that Indonesia and Thailand were already using rubber wood for tobacco curing in the 1990s.[22]

Malawi

The sixth largest tobacco producer in the world is Malawi, representing 4.5% of the total area cultivated with tobacco in the world: according to the FAO statistics website, the area cultivated with tobacco in Malawi reached 180,600 ha in 2010 compared to 100,110 ha in 1990. However land expansion in tobacco growing is small compared to the expansion of many other crops, according to the FAO statistics website:

Crop	Area Harvested 1990 (ha)	Area Harvested 2010 (ha)	Estimated share on the increase in agricultural area 1990 to 2010
Beans	150'000	217,700	7.7%
Groundnuts	48'185	260,000	24.1%
Potatoes	34'299	241,400	23.6%
Cassava	61'506	149,400	10%
Maize	1,343,780	1,655,000	37.5%
Pigeon peas	110'000	236,100	14.4%
Rice	29'042	58,500	3.4%
Millet	19'583	38,800	2.2%
Tobacco	100'110	180,600	9.2%

The population increased nearly 60% in the last 20 years, from 9.38 million people in 1990 to 14.9 million people in 2010.[23] This certainly must have had a significant influence on deforestation linked to population pressure.

In Malawi 90% of the total production is Burley tobacco, which does not need fuel for curing and uses only a very small amount of wood to build curing sheds. On the other hand, a study published by the International Institute for Environment and Development in the UK investigates the impact that charcoal has on deforestation. 231,177 metric tons of charcoal are necessary only for the consumption of the population in the main four urban areas of Malawi, the production of which involves the cutting down of about 15,000 ha of forest per year.[24] According to the 1998 census of Malawi, only 11% of the population lives in the four main urban areas.[25] Therefore the total need of wood for domestic uses should be multiplied by nine, thus bringing the total surface deforested for domestic use to 135,000 ha/year.

A study by the Government of Malawi in 2009 shows that that the domestic consumption of wood is over 8 million tons/year, while the consumption of wood for tobacco curing is 102,000 tons/year, and the consumption of wood for tea drying per year is 87,000 tons/year. This puts tobacco curing to 1.2% of wood requirement compared to other domestic uses.[26]

[22] T. Hong: "Rubberwood utilization: a success story", http://www.metla.fi/iufro/iufro95abs/rsp19.htm
[23] World Bank, "Indicators Database", http://data.worldbank.org/indicator/SP.POP.TOTL/countries?display=default
[24] International Institute for Environment and Development (UK): "Charcoal: the reality - A study of charcoal consumption, trade and production in Malawi", 2007, http://pubs.iied.org/pdfs/13544IIED.pdf
[25] National Statistical Office, Malawi (http://www.nso.malawi.net/)
[26] Government of Malawi: "Malawi Biomass Energy Study", 2009, http://www.euei-pdf.org/uploads/media/14_BEST_Malawi_(revised).pdf

The tobacco sector sensitizes farmers on the issue of sustainable wood use. The Forestry Department of Malawi mentions the training of local communities in forest management provided by one of the two major tobacco dealers of Malawi, Limbe Leaf.[27]

The tobacco sector works with NGOs to develop better technologies to cure tobacco. The major leaf supplier Alliance One was reported to work with the German Agency for Technical cooperation GTZ in a regional programme (ProBEC) in Southern Africa on fuel reduction technology to decrease the need of wood in flue-cured tobacco barns, by building the so-called "rocket barns".[28]. In a different report the same organization reported working with the two major tobacco companies of Malawi, Alliance One and Limbe Leaf, on the development of a curing technology that increases fuel wood efficiency by more than 60% for new barns and 50% for modified existing barns. Other components of the cooperation were the setting up a barn supply structure to ensure that the new technology reaches the smallholder farmers, and a close cooperation with The Agriculture Research and Extension Trust (ARET) of Malawi in order to support their role and function for the smallholder tobacco farmers. The results of the tests showed that the rocket barn technology allowed reach a consumption of 3-3.5 kg of wood/kg of dry tobacco.[29]

Imperial Tobacco, the fourth largest tobacco product manufacturer of the world, has also financed research on rocket barns. A detailed report prepared by GTZ/ProBEC for Imperial Tobacco and also for the NGO Total Land Care, very active in Malawi, shows that the rocket barn technology allows a consumption of 1.5-4.9 kg of wood/kg of tobacco according to the barn model compared to 7.6-7.9 kg of wood/kg of dry tobacco necessary with the traditional type of barns.[30]

In the September 2010 newsletter of the Malawi Association of Christian Support, rocket barns are described as "an appropriate, affordable, easy-to-build tobacco barn that reduces wood consumption while improving the quality and quantity of produce, helping both smallholder farmers and the environment. There is no need for complicated tools or parts. Smallholder farmers are not only seeing their yields increase from using the Rocket Barn but are also getting better prices for their tobacco. Rocket barns have been reducing the amount of firewood used by 64% and it is expected that this year's model will reduce it by 75%. The barns are being developed and provided by Hestian Innovation. Almost 1,000 barns have been built."[31]

Argentina

The seventh largest tobacco producer is Argentina, with a surface under tobacco of 75,200 ha in 2010 compared to 43,931 ha in 1990. Argentina represents about 2% of the world area cultivated with tobacco. Even if the area grown with tobacco has increased since 1990, when

[27] Department of Forestry, Malawi: "Logistics for PEP participants field Visit, Malawi", 2008, http://www.povertyenvironment.net/files/PEP15-Field%20Visit.pdf

[28] GTZ: "ProBEC (Programme for Basic Energy and Conservation): "Malawi", http://www.probec.org/displaysection.php?czacc=&zSelectedSectionID=sec1194855430 (as accessed on 16 January 2012)

[29] GTZ: Rocket barn - A brief report from Malawi about the development of new energy efficient barns to cure flue cured tobacco", 2006, http://betuco.be/stoves/rocket%20barn%20malawi.pdf

[30] Peter Scott, GTZ/ProBEC: "Development of Improved Tobacco Curing Barn for Small Holder Farmers in Southern Africa, June 2008, http://bioenergylists.org/files/Final%20tobacco%20%20report%20for%20Imperial%20sept.pdf

[31] MACS - Malawi Association of Christian Support: "Nkhani Zaulere", 2010, http://malawimacs.org/downloads/Nkhani%20Sept%202010.pdf

it is put in proportion with the total increase of agricultural land and with the increase due to other crops, based on data available in the FAO statistic website, it is negligible:

Crop	Area Harvested 1990 (ha)	Area Harvested 2010 (ha)	Estimated share on the increase in agricultural area 1990 to 2010
Soybeans	4'961'600	18,130,900	93.7%
Barley	148'900	753,310	4.3%
Maté	101'842	204,221	0.7%
Rice	116'620	215,053	0.7%
Groundnuts	165'900	218,828	0.3%
Tobacco	43'931	75,200	0.2%

In addition, only 60% of the tobacco grown in Argentina needs fuel for curing, and growers are in the process of replacing all wood barns with gas-fuelled ones.[32]

The land expansion due to tobacco is minimal compared to other crops, while the amount of tobacco needing wood for curing is now estimated to be only 5% of the total domestic tobacco production.

Production of tobacco is mainly concentrated in cooperatives. The Cooperative of Misiones produces Burley tobacco (not requiring wood for curing) on a surface of about 10,500 ha and has afforested 20,000 ha with woodlots, with a plan of adding 10,000 ha/year over the next few years.[33]

Production of flue-cured tobacco takes place mainly in Jujuy over a surface of 19,000 ha[34], where tobacco growers and their association are institutional members of a model forest of about 130,000 ha, established in 1999. Strategic goals of the model forest are: the consolidation of an integrated process for planning and management of the natural resources in the region; the creation of solutions to the uncoordinated administration practices that are current in the natural resource management of the watershed; the involvement of the community in resource management and decision-making; the awareness-raising among the rural and urban populations of the value of conserving and preserving forest resources; the reversal of the process of erosion and deforestation through better land management and the sustainable use of natural resources; the restoration of the native forest and extend the use of sustainable forest management practices; the promotion of economic diversification and optimize the supply of regional products and the encouragement of active participation by the education sector at all levels. [35]

Pakistan

The eight largest tobacco producing country is Pakistan, which represents about 1.5% of the land surface grown with tobacco. Tobacco cultivation increased from 40,911 ha in 1990 to

[32] Republic of Argentina, Salta Province: "Economia y Produccion – Produccion tabacalera", http://www.economiadesalta.gov.ar/tabaco.htm (as accesssd on 19 January 2012)
[33] CTM, Cooperativa Tabacalera de Misiones, http://www.cooptabmis.com/forestacionespanol.html (as accessed on 19 January 2012)
[34] Cooperativa de Tabacaleros de Jujuy, http://200.43.187.13/cooperativa/home.asp?Idioma=2 (as accessed on 19 January 2012)
[35] International Model Forest Network: "Jujuy Model Forest", http://www.imfn.net/index.php?q=node/276 (as accessed on 19 January 2012)

55,800 ha in 2010, but this increase is minimal compared to the increase of cultivated land of other crops, as it can be evinced from the data available in the FAO website:

Crop	Area Harvested 1990 (ha)	Area Harvested 2010 (ha)	Estimated share on the increase in agricultural area 1990 to 2010
Rice	2,112,700	2,365,000	15.1%
Cotton	2,662,200	2,689,000	1.6%
Sugarcane	854,300	942,800	5.3%
Wheat	7,844,500	9,131,600	77.1%
Tobacco	40,911	55,800	0.9%

About 46% is flue-cured production, according to the Pakistan Tobacco Board.
Neither the FAO nor environmental NGO's recognize tobacco as a major cause of deforestation.[36]

The population of Pakistan increased 55% in the last 20 years, passing from 112 million people in 1990 to 173 million in 2010.[37] This certainly has played a role in deforestation linked to population pressure, since it has been estimated that 70–79% of Pakistani households use fuel wood as a main source of energy.[38]

Zimbabwe

Zimbabwe currently is the 9th largest producer of tobacco with a cultivated surface of 94,175 ha in 2010 versus 60,103 in 1990. The situation of Zimbabwe is probably the most difficult to assess as a result of the political situation and the new land tenure policy of the government. The cultivated land of most crops decreased in the 20 years between 1990 and 2010 with the exception of a few, as indicated by the FAO website, therefore it is possible to think that most of the current cultivation of tobacco is taking place on areas previously cultivated with other crops.

Crop	Area Harvested 1990 (ha)	Area Harvested 2010 (ha)	Estimated share on the increase in agricultural area 1990 to 2010
Maize	1,145,870	1,362,560	54.3%
Millet	233,260	237,818	1.5%
Sorghum	135,557	272,679	34.4%
Sugarcane	32,279	39,000	1.7%
Tobacco	60,103	94,175	8.6%

As acknowledged by the International Tobacco Control Network in 1994, Zimbabwe, then the fourth largest producer, mostly used coal to cure tobacco.[39] It therefore appears that the current use of trees is a novelty in tobacco farming, also confirmed by the comments of a local journalist: "Zimbabwe's land reform programme marked the increase in the number of

[36] FAO: "The Underlying Causes of Deforestation and Forest Degradation in Pakistan", http://www.fao.org/docrep/article/wfc/xii/0983-b1.htm
[37] World Bank, "Indicators Database", http://data.worldbank.org/indicator/SP.POP.TOTL/countries?display=default
[38] J. Ali, T. Benjaminsen: "Fuelwood, Timber and Deforestation in the Himalayas", http://www.mtnforum.org/sites/default/files/pub/5146.pdf
[39] The International Tobacco-Control Network: "Selected documents: Tobacco and Deforestation in the Developing World 04/12/97 - *Simon Chapman* - Tobacco Control 1994;3:191-3", http://www.globalink.org/tobacco/docs/misc-docs/9712deforestation.shtml (as accessed on 19 January 2012).

small-scale tobacco growers in the country. This has resulted in a massive shift in the tobacco-growing base, previously dominated by a few commercial white farmers who produced the bulk of the crop. However the change in the tobacco grower base has led to a major shift in the source of energy to cure tobacco from the traditional coal with wood now being preferred as an alternative. While coal supplies over the past years have been erratic, the collapse of the country's railway system resulted in high costs of transporting coal from major sources to tobacco farms. Consequently unsustainable harvesting of trees for tobacco curing continues threatening the country's indigenous and commercial woodlands, which are of economic importance to the country. The Forestry Commission of Zimbabwe says it is engaging farmers to plant fast growing tree species such as eucalyptus for tobacco curing as a way of conserving forests and providing affordable fuel to sustain tobacco farming."[40]

The only coal mine still operating in Zimbabwe is also making efforts to regularly supply tobacco farmers to enable them to cure their crop. [41]

Italy

Italy is the 10th largest tobacco producer in the world. However the tobacco-cultivated area passed from 87,707 ha in 1990 to 21,600 ha in 2010 according to the FAO website. It is hardly possible to talk about deforestation through land increase.

The protocols issued by the Ministry of Agriculture for the production of flue-cured tobacco, which represents about half of the Italian production, recommend the use of gas as fuel for curing.[42]

Ten countries make up for 10% of the world surface under tobacco

Ten other countries produce 10% of the tobacco grown world-wide: Turkey, Zambia, Mozambique, North Korea, Tanzania, Bangladesh, Vietnam, Thailand, Bulgaria, South Korea. Only five of these countries experienced some land increase in tobacco cultivation.

The same approach will be taken for these countries to show the impact of cultivation expansion and methods of curing and to put them in perspective with other factors possibly affecting deforestation.

[40] The Herald: "Zimbabwe: Woodlots – Alternative source to curing tobacco, April 2010, http://allafrica.com/stories/201004010463.html (as accessed on 19 January 2012)

[41] Zimbabwe Broadcasting Company: "Hwange Colliery in partnership with RDC's", http://www.zbc.co.zw/news-categories/business/3017-hwange-colliery-in-partnership-with-rdcs.html (as accessed on 26 January 2012)

[42] Italian Ministry of Agriculture: "Disciplinare di produzione del tabacco Virginia Bright", http://www.ritab.it/portale/static/disciplinareProduzioneTabaccoVirginiaBright.pdf (as accessed on 19 January 2012)

Country	Tobacco ha in 1990	Tobacco ha in 2000	Tobacco cultivation increase	% versus total world production 2010	Method of curing
Turkey	320,236	80,977	No	2%	97% sun cured
Zambia	5,071	59,988	Yes	1.5%	50% air cured & 50% flue-cured
Mozambique	2,853	59,200	Yes	1.5%	90% air cured & 10% flue-cured
North Korea	35,593	51,800	Yes	1.3%	Unknown
Tanzania	20,574	40,500	Yes	1%	100% flue-cured
Bangladesh	45,070	38,270	No	0.9%	50% air-cured, 50% flue-cured
Vietnam	26,478	31,484	Yes	0.8%	80% flue-cured
Thailand	63,095	30,641	No	0.8%	35% flue-cured, 65% air-cured
Bulgaria	52,897	25,161	No	0.6%	100% sun cured
South Korea	31,329	14,000	No	0.3%	60% flue-cured, 40% air-cured
Total	**603,196**	**432,021**			

Turkey

In Turkey, the land under tobacco cultivation currently represents 2% of the tobacco cultivated land at world level. The tobacco cultivated surface decreased from 320,236 ha in 1990 to 80,977 ha in 2010. According to the FAO, 97% of the crop is oriental tobacco which is dried under the sun.[43] Therefore it is impossible to say that tobacco growing in Turkey contributes to deforestation.

Zambia

In Zambia, tobacco cultivation has grown considerably in the last 20 years, representing an important cash crop for the country. However, the production surface of tobacco remained below 9,000 ha/year until 2000, and it increased considerably only in the last 10 years.

Crop	Area Harvested 1990 (ha)	Area Harvested 2010 (ha)	Estimated share on the increase in agricultural area 1990 to 2010
Cassava	103,159	198,000	12.9%
Maize	763,227	1,080,560	43.2%
Cotton	64,036	120,000	7.6%
Sugar cane	11,974	38,500	3.7%
Tobacco	5,071	59,988	7.5%
Groundnuts	70,000	254,566	25.1%

The increase of land under tobacco is small compared to other crops, even if tobacco represents by far the largest exported agricultural commodity and is 7.5 times more profitable per hectare than maize production and 14 times more profitable than cotton.[44]

[43] FAO: "Issues in the global tobacco economy", http://www.fao.org/DOCREP/006/Y4997E/y4997e0j.htm
[44] Zambia Development Agency: "Agriculture, livestock and fisheries sector profile", www.**zambia**hc.org.uk

The population of Zambia has also increased in the last 20 years, passing from 7.86 million people in 1990 to 13 million in 2010 (65% increase).[45]

A study by the UN Center reports that "Commercial farmers in Zambia, especially tobacco and coffee farmers, have formed a "Commercial Farmers Bureau" for tree-growing. Tobacco farmers in Choma and Kalomo districts have established woodlots of eucalyptus species, for curing Virginia tobacco, of sizes ranging between 10 and 30 ha."[46]

The FAO forestry assessment of 2010 reports that Zambia is one of the African countries with the lowest loss of forest cover (-0.33%) in the last ten years.[47]

Mozambique

In Mozambique the average yearly production was stable around 2,800 ha/year until 1999 and starting increasing only in 2000.During the 20 years between 1990 and 2010 the tobacco cultivated land increased from 2,853 ha to 59,200 ha. However if we compare the cultivated increase of land due to other crop, the land clearance caused by tobacco is much smaller.

Crop	Area Harvested 1990 (ha)	Area Harvested 2010 (ha)	Estimated share on the increase in agricultural area 1990 to 2010
Cassava	944,279	950,000	0.4%
Maize	1,010,900	1,573,000	42.1%
Cotton	65,000	370,000	22.8%
Sugar cane	25,000	215,000	14.2%
Sorghum	404,435	620,000	16.1%
Tobacco	2,853	59,200	4.2%

A survey among tobacco and cotton farmers conducted by the Ministry of Agriculture of Mozambique showed that "When it comes to cutting trees for other reasons, the percentages are generally higher, with tobacco growers still being one of the most important groups – about three quarters report doing so. Half of non-growers in tobacco areas, 62.7% of cotton growers, and close to 70% of non-growers in cotton areas cut trees for other reasons. Such reasons include uses for firewood, barn construction, tobacco treatment, house building, etc. In terms of the number of trees cut, tobacco growers and non-growers of cotton appear as the groups that cut more trees – an average of over 150 trees across all farmers, or 200 trees, when only cutters are accounted for." However, when it is the case of planting trees, "about a third (32.6%) of the tobacco growers planted some trees during the 2003/04 agricultural season. That compares with 10.7% of non-growers in those same tobacco areas, and about one fifth among growers and non-growers in cotton areas. Tobacco growers usually plant many more trees than any other group – on average each farmer (among those that plant) plants 177 trees, which compares to 139 trees among non-growers of tobacco in tobacco growing areas, 10 among cotton growers, and 11 among non-growers in cotton areas. Most of the tobacco growers obtain their seedlings from the company that provides the inputs for tobacco production while a few others get them from personal sources, and also that in tobacco growing areas where this study took place companies

[45] World Bank, "Indicators Database", http://data.worldbank.org/indicator/SP.POP.TOTL/countries?display=default

[46] United Nations Center for : "Application of biomass energy technologies", http://collections.infocollections.org/ukedu/en/d/Jh1490e/3.7.html

[47] FAO: "The global forest resources assessment 2010", http://www.fao.org/forestry/fra/fra2010/en/

have set up forestry divisions and are placing reforestation programs in place. In many areas where MLT and DIMON operate, farmers have received seedlings."[48]. Therefore it would appear that the balance between cut trees and planted trees, tobacco farmers do better than other farmers.

The FAO forestry assessment of 2010 reports that even if there is some forest loss cover, Mozambique is the second country in Africa (after Namibia) with the highest rate of increase in reforested area in the last 5 years (+20.9%).[49]

The shift in population pressure in Mozambique has been considerable in the last 20 years. Population passed from 13.5 million people in 1990 to 23.4 million in 2010, showing an increase of 73%, one of the highest in Africa.

North Korea

The case of North Korea seems to be another difficult case to judge because of the political situation. According to the FAO statistics website, the production of almost all important food crops has shrunk over the last 20 years

Crop	Area Harvested 1990 (ha)	Area Harvested 2010 (ha)	Estimated share on the increase in agricultural area 1990 to 2010
Cabbages	40,000	28,600	- 28.5%
Maize	680,000	503,000	- 26%
Potatoes	61,000	133,000	+ 118%
Rice	600,000	570,000	- 5%
Apples	65,905	72,800	+ 10.4%
Beans	353,000	242,800	- 31.2%
Soybeans	319,287	300,000	- 6%
Sweet potatoes	17,529	31,000	+ 76%
Tobacco	35,593	51,800	+ 45%

In a country where the population increased by 21% from 20.1 million in 1990 to 24.3 million in 2010 according to the World Bank[50], these data seem to indicate, in line with what the media report, of a desperate struggle to produce the most basic and easy to grow crops (roots) and the only cash crop with internal value in order to be able to afford other minimum purchases of other necessities. Considering how much cultivated land for food crops has shrunk, it is realistic to think that the increased land cultivated with tobacco has taken the place of other crops.

Tanzania

Tobacco cultivation in Tanzania passed from 20,574 ha in 1990 to 40,500 ha in 2010 according to the FAO statistic website. However, even if there has been some clearance of forest to increase cultivated area, it is very small compared to land clearance by other crops.

[48] Ministry of Agriculture of Mozambique: "The economics of smallholder households in tobacco and cotton growing areas of the Zambezi valley of Mozambique", 2005, http://www.aec.msu.edu/fs2/mozambique/wps59E.pdf

[49] FAO: "The global forest resources assessment 2010", http://www.fao.org/forestry/fra/fra2010/en/

[50] World Bank "Indicators Database", http://data.worldbank.org/indicator/SP.POP.TOTL

Crop	Area Harvested 1990 (ha)	Area Harvested 2010 (ha)	Estimated share on the increase in agricultural area 1990 to 2010
Cassava	590,210	798,000	9.6%
Maize	1,631,260	3,100,000	68.1%
Potatoes	34,146	145,000	5.1%
Rice	384,500	720,000	15.5%
Sugarcane	15,376	23,000	0.3%
Tea	12,570	18,000	0.2%
Tobacco	20,574	40,500	0.9%

All the tobacco cultivation in Tanzania is flue-cured. Even if there is evidence that tobacco farmers do not remove tree stumps in their fields in order to allow regeneration, regeneration of trees is not sufficient. There is also evidence that tobacco farmers plant trees, but also this does not seem sufficient.[51]

The population of Tanzania increased 76% in the last 20 years, passing from 25.4 million people in 1990 to 44.8 million in 2010.[52] This dramatic increase of population pressure certainly has had a more significant effect on deforestation than tobacco curing.

Bangladesh

In Bangladesh tobacco cultivation is reported to have started in the 1960s. The land cultivated with tobacco declined from 45,070 ha in 1990 to 38,270 ha in 2010. Therefore it is impossible to say that tobacco played a big role in cultivated land expansion.

In Bangladesh the main causes of deforestation have been identified in the increase of population (which passed from 40 million people in 1910 to 140 million people in 2010, therefore increasing by 3.5 times in the last hundred years, and by 40% in the last 20 years), clearance for agriculture, rubber plantations and tea plantations increase, shrimp production, timber production and wood consumption.[53], [54], [55]

Vietnam

In Vietnam, the land cultivated with tobacco increased from 26,478 ha in 1990 to 31,484 ha in 2010, according to the FAO statistic website. However this cultivated land increase is

[51] Institute of Resource Assessment, University of Dar Es Salaam: "Impact of small scale tobacco growing on the spatial and temporal distribution of miombo woodlands in Western Tanzania**",** http://www.academicjournals.org/jene

[52] World Bank, "Indicators Database", http://data.worldbank.org/indicator/SP.POP.TOTL/countries?display=default

[53] Teacher Support Site for Bangladesh Studies: "Deforestation", http://projects.cie.org.uk/banglao/textbook/environmentanddevelopment/environmental/deforestation (as accessed on 24 January 2012)

[54] M.A Salam, T. Noguchi (Faculty of Agriculture, Nagano University, Japan): "Factors influencing the loss of forest cover in Bangladesh: an analysis from socioeconomic and demographic perspectives" , http://www.springerlink.com/content/u3jj163422l92470/fulltext.pdf

[55] World Bank, "Indicators Database", http://data.worldbank.org/indicator/SP.POP.TOTL/countries?display=default

negligible compared to other crops, therefore it is impossible to say that tobacco has played a big role in the country's loss cover due to agricultural land expansion.

Crop	Area Harvested 1990 (ha)	Area Harvested 2010 (ha)	Estimated share on the increase in agricultural area 1990 to 2010
Cassava	256,800	496,054	7.1%
Coffee	61,857	514,400	13.5%
Maize	431,800	1,126,390	20.7%
Rice	6,042,800	7,513,700	43.8%
Rubber	81,100	438,563	10.6%
Sugarcane	130,800	266,300	4.0%
Tobacco	26,478	31,484	0.1%

Population increased 32% in the last 20 years, passing from 66 million people in 1990 to 87 million in 2010.[56]

In addition, the FAO reports that Vietnam has increased its forest cover in the last twenty years.[57]

Thailand

In Thailand the surface cultivated with tobacco declined from 63,095 ha in 1990 to 30,641 ha in 2010. Therefore it is impossible to say that tobacco has played a role in the country's loss of forest cover due to agricultural land expansion.

Tobacco production in Thailand consists of 35% of flue-cured tobacco and 65% of air and sun cured tobacco. It is clear from a study presented at the IUFRO (International Union of Forest Research Organizations) 20th world congress that Indonesia and Thailand were already using rubber wood for tobacco curing in the 1990s.[58]

The major drivers of deforestation in Thailand are identified with logging, slash and burn agriculture for maize and soybean production.[59]

The FAO forestry assessment of 2010 reports that Thailand has a net increase of planted forest area of 2.97%

Bulgaria

Bulgaria is the 19th largest tobacco producer in the world, producing only oriental tobacco, which is cured in the sun. The cultivated surface passed from 52,897 ha in 1990 to 25,161 ha in 2010. It is impossible to say that tobacco growing has caused any deforestation because of cultivated land expansion. In addition tobacco production in Bulgaria does not require any fuel for curing, as it is only oriental tobacco which is dried in the sun. Therefore it is impossible to say that tobacco growing is a cause of deforestation.

[56] World Bank, "Indicators Database", http://data.worldbank.org/indicator/SP.POP.TOTL/countries?display=default
[57] FAO: "The global forest resources assessment 2010", http://www.fao.org/forestry/fra/fra2010/en/
[58] T. Hong: "Rubberwood utilization: a success story", http://www.metla.fi/iufro/iufro95abs/rsp19.htm
[59] National University of Singapure: "Deforestation in NorthernThailand: The Result of Hmong Farming Practices orThai Development Strategies? ", http://www.ncsu.edu/project/amazonia/Delang.pdf

South Korea

South Korea is the 20th largest tobacco producer in the world, even if its share of world production is only 0.3%. According to the FAO statistic website, tobacco cultivated land declined from 31,329 ha in 1990 to 14,000 ha in 2010. Therefore it is impossible to say that tobacco growing in South Korea played any role in deforestation for land increase.

In terms of curing only 60% of tobacco curing in South Korea needs artificial heat.

Data on deforestation causes in South Korea are not very clear. The FAO forestry assessment of 2010 reports that deforestation in South Korea is decreasing.[60] According to another report it seems that trees are being actively planted and also wood is no longer used for energy reasons but it has been totally replaced by fossil fuels.[61]

It seems therefore very difficult to understand how the Study Group experts reach their claim that deforestation linked to tobacco represents 2-4% of global deforestation.

- Tobacco represents 0.07% of agricultural land (less than one tenth of what claimed by the experts of the Study Group)
- The surface cultivated with tobacco has decreased by 14% between 1990 and 2010 (contrary to what suggested by the experts of the Study Group)
- Out of 80% of the world tobacco grown by the ten largest producers, less than 50% uses wood for curing.

Examples of best practices in the tobacco sector

There are also examples quoted by independent organizations showing that the tobacco sector behaves responsibly towards the use of wood.

Ethical Performance describes the case of British American Tobacco: in the 1970s the group began to find that the small farmers it had long relied upon to grow tobacco were running out of the wood burnt to cure the crop. The problem surfaced first in Brazil, where 20% of the group's tobacco is grown. Thirty years ago, the local British American Tobacco company began supplying tree seedlings to its farmers in Southern Brazil, who owned small plots usually no bigger than one hectare. The original plan was simply to ensure a local supply of fuel for curing and cooking, but the group soon realized that as a global organization it was ideally placed to influence the management practices of its 250,000 growers in 23 countries. This was at a time when the environmental performance of firms was increasingly in the spotlight. Since that time, the group has extended its tree planting programme to a further 14 countries including Cambodia, India, Indonesia, Kenya and Uganda. In total, group companies and their tobacco farmers have planted 590 million trees to create the equivalent of 267,000 hectares (660,000 acres) of renewable woodland – making British American Tobacco one of the world's largest tree planters outside the timber and paper industries.

[60] FAO: "The global forest resources assessment 2010", http://www.fao.org/forestry/fra/fra2010/en/

[61] J.S Bae *et al.*; "Forest transition in South Korea", http://www.cifor.org/nc/online-library/browse/view-publication/publication/3515.html

Most of the species used – such as acacia, eucalyptus, ipil ipil, neem and shishu – grow quickly to provide the small farmers with a sustainable fuel source for cooking and tobacco-curing.[62]

In Argentina, Philip Morris funds a programme called "The New Roots", a joint initiative with Massalín Particulares and Washington State University, a programme of sustainability in agricultural systems through the preparation of management plans in 20 tobacco estates of Jujuy and Salta. The tobacco cooperative de Jujuy and the Chamber of Tobacco of Jujuy also take part in a project for the protection, knowledge and development of the Upper Rio Perico Valley.[63],[64]

In Brazil, a study by the FAO describes that one of the priorities for tobacco production is the supply of fuel wood for curing tobacco. Legislative restrictions on cutting natural forest require all farms to preserve 20% of their farm area as native forest, and this was seen as a threat to tobacco production. However, the tobacco companies have implemented a programme to restore forest coverage on production areas. This programme was intended to preserve native forests and to reforest as a means of supplying growers with fuel wood for curing and lumber for building, such as curing barns, while at the same time maintaining ecological balance. The tobacco companies, the producers' associations and industries invested heavily in campaigns based on their joint proposal to plant idle areas with native (acacia) and exotic (eucalyptus) species, reaching around 140,000 growers in the south, with the agreement covering all related supplies of services and necessary inputs, such as financing, licensing of nurseries supplying low-cost seedlings for reforestation, technical assistance and field research. Industry has committed itself to not purchase tobacco cured with fuel wood from irregular sources, and no grower will be registered without a commitment to reforesting part of their property.[65]

In Ghana, a study published by the International Institute for Environment and Development, shows that Pioneer Tobacco, part of the British American Tobacco Group, has a reforestation project for tobacco farmers, who have to plant 500 trees/year/ha.[66]

In Honduras, an FAO study describes the efforts of cigar company, Tabacalera Hondurena, of helping tobacco farmers of northern Honduras to reforest for fuel wood. Initially, farmers did not like the imposition of the company and asked why they should have to undertake the extra work of reforestation. But after 1994, when the first trees were harvested, farmers found that the cost of fuel wood in the tobacco curing process had decreased by 30%, mainly as a result of very low transport costs and better-quality fuel wood. Most of the farmers now support the programme and some are even planting much more than they need, looking ahead to a guaranteed fuel wood market in the near future as wood scarcity increases with deforestation.[67]

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[62] Ethical Performance: "Best Practice: British American Tobacco: greening tobacco", http://www.ethicalperformance.com/bestpractice/companyfocus/pages/cs5.php (as accessed on 16 January 2012)

[63] Model Forest Network, "Jujuy Model Forest", http://www.imfn.net/index.php?q=node/276 (as accessed on 19 January 2012)

[64] Ministry of Environment, Government of Argentina: "Bosque Modelo Jujuy – Listado de proyectos", http://www.ambiente.gov.ar/ (as accessed on 19 January 2012)

[65] FAO: "Issues in the global tobacco economy", 2003, http://www.fao.org/DOCREP/006/Y4997E/y4997e06.htm

[66] International Institute for Environment and Development: "Company-community forestry partnerships" , http://pubs.iied.org/pdfs/9132IIED.pdf

[67] FAO: « Forest replacement schemes in Latin America: An effective model to achieve sustainability of supply for industrial fuelwood consumers",1998, http://www.fao.org/docrep/w7126e/w7126e0a.htm

In Mozambique, a study conducted by the Ministry of Agriculture reports that tobacco leaf dealer companies have set up forestry divisions and are placing reforestation programs in place. In many areas where these companies operate, farmers have received seedlings.[68]

In Sri Lanka, a study by the local Ministry of Agriculture and the Asian Institute of Technology mentions that the tobacco sector not only is one of the smallest users of wood compared to domestic users (cooking) and other industries (coconut processing, rubber processing, tea processing, bricks and tiles production, pottery production, and bakery), but also that the tobacco industry has made substantial improvements in the form of energy efficient barns and the use of paddy husks has reduced the amount of fuelwood used in the tobacco industry.[69] Another study by the Bioenergy Association of Sri Lanka revealed that in thirty Grama Niladhari Divisions in Walapane Division alone the Ceylon Tobacco Company planted 4.5 million Gliricidia trees as fences. This is equivalent to more than 2,000 acres of dedicated plantations ready and waiting to be used.[70]

In Tanzania, the GTZ programme for energy conservation ProBEC (already mentioned in connection with Malawi), also mentions the cooperation with the Association of Tanzania Tobacco Traders ATTT in developing rocket barns for flue-cured tobacco curing.[71] In Tanzania the use of wood to process agricultural crops (which in Tanzania includes also tea in addition to tobacco) is estimated 1.6% of the total wood consumption.[72]

In Uganda, a study conducted by the Ministry of Energy and Mineral Development in cooperation with UNEP in 2001 reported that BAT was distributing tree seedlings to farmers and had introduced a more efficient barn model which allowed the halving of the consumption of wood needed for curing tobacco.[73]

In Zambia, the GTZ / ProBEC programe is also active providing rocket barn technology to tobacco growers association in cooperation with the international tobacco company Alliance One.[74]

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[68] Ministry of Agriculture of Mozambique: "The economics of smallholder households in tobacco and cotton growing areas of the Zambezi valley of Mozambique", 2005, http://www.aec.msu.edu/fs2/mozambique/wps59E.pdf

[69] Ministry of Agriculture of Sri Lanka & Asian Institute of Technologa: "A study of biomass as a source of energy in Sri Lanka", http://www.thaiscience.info/journals/Article/A%20study%20of%20biomass%20as%20a%20source%20of%20energy%20in%20sri%20lanka.pdf

[70] Bio Energy Association of Sri Lanka: "Use of biomass a s a source of energy", www.**lankagas**lk.com/.../introduction_to_biomass_energy_lpj_08090...

[71] GTZ/ProBEC: "ProBEC interventions in Tanzania; http://www.probec.org/displaysection.php?czacc=&zSelectedSectionID=sec1194880064 (as accessed on 16 January 2012)

[72] University of Daressalam: "The economics of climate change in Tanzania", http://economics-of-cc-in-tanzania.org/images/Yanda-Economics_of_Climate_Change_EDIT_ML.pdf

[73] Ministry of Energy and Mineral Development, Uganda : "Plan for development of Uganda's biomass energy strategy", 2001, http://uneprisoe.org/SEAF/PlanDevelopBioEnergyStrategy.pdf

[74] GTZ/ProBEC : « Zambia- Basic energy interventions and conservation » ; http://www.probec.org/displaysection.php?czacc=&zSelectedSectionID=sec1194685541 (as accessed on 16 January 2012)

Summary table

Country	Share of world tobacco production (ha)	Tobacco cultivated area 1990-2010	Tobacco cultivated area 1990-2010, increase compared to other crops	Curing methods				Impact of tobacco on deforestation	Forest loss 1990-2010 (ha) - Source FAO Forestry State Assessment 2010	Results in terms of world deforestation
				Tobacco type produced	Fuel used for types needing artificial heat	Major drivers of deforestation	Evidence of reforestation			
China	34.00%	decreased by 15.9%	0	100% flue-cured	Coal		Positive increase of forested area at national level.	China is not suffering of deforestation	China is showing positive increase in forested area	Based on evidence, the major tobacco producer in the world has no effect on deforestation.
Brazil	11.20%	increased by 62.8%	0.90%	85% flue-cured or fire cured	Wood from sustainble sources	Land clearance for cattle grazing, soybean production	Agreement of compliant behaviours in two of the three tobacco states. Reforestation programmes of the tobacco sector.	Tobacco cultivation increase in the last 20 years has contributed to may 0.9% of Brazilian deforestation by land clearance.	Brazilian national deforestation is 40% of world deforestation with 55,317,000 ha lost (World forest loss is 135,339,000)	Considering the agreements of the tobacco sector on wood use and the minimal land clearance compared to other crops, the impact of tobacco growing on deforestation is minimal.
India	11.50%	increased by 11.3%	0.50%	<50% flue-cured or fire cured	Coal by governmental contract, wood and biomass	Agricultural expansion	Tobacco not recognised as a crop causing deforestation.	Tobacco cultivation increase in the last 20 years has contributed to may 0.5% of India deforestation by land clearance	India shows a net increase of forests of 4,795,000 ha	Considering the materials used for curing tobacco and the very small percentage of land clearance, tobacco lays a minimal role on deforestation in India.
USA	3.60%	decreased by 53.9%	0	50% flue-cured	Gas		Major reforesting country in the world	Tobacco cultivation has shrunk considerable and all tobacco is cured with gas or goil.	The USA are showing a positive increase in forested area	Based on evidence, tobacco production in the USA does not have any impact on deforestation.
Indonesia	6.30%	increased by 6.5%	0.15%	25% flue-cured or fire-cured	Rubber wood	Palm oil	No evidence of deforestation linked to tobacco even in anti-tobacco studies.	0.15% of Indonesia deforestation by land clearance	Indonesian national deforestation is 17.8% of world deforestation with 24,113,000 ha	Based on evidence, even of anti-tobacco organisations, tobacco production does not have an impact on

Country	Share of world tobacco production (ha)	Tobacco cultivated area 1990-2010	Tobacco cultivated area 1990-2010, increase compared to other crops	Curing methods				Impact of tobacco on deforestation	Forest loss 1990-2010 (ha) - Source FAO Forestry State Assessment 2010	Results in terms of world deforestation
				Tobacco type produced	Fuel used for types needing artificial heat	Major drivers of deforestation	Evidence of reforestation			
									lost	deforestation.
Malawi	4.50%	increased by 80.4%	9.20%	10% flue-cured or fire cured. However burley barns are made of wood.	Wood	Charcoal production, population pressure	Even with forestry efforts by tobacco companies, there is evidence of deforestation linked to tobacco.	9.20% of Malawi deforestation by land clearance + 1.2% of national deforestation for tobacco curing	Malawian national deforestation is 0.4% of world deforestation with 659,000 ha of forest lost	Tobacco certainly plays a role in Malawi, even if minimal compared to other activities.
Argentina	1.90%	increased by 71%	0.20%	60% flue-cured	gas	Soybean and cattle grazing	Strong evidence of reforestation	0.2% of Argentina deforestation by land clearance	Argentinian national deforestation represents 3.9% of world deforestation with 5,393 ha of forest lost	Land clearance for tobacco production has been minimal compared to other crops. Most of the tobacco is cured with gas, and there is evidence of reforestation. Therefore the impact of tobacco production in Argentina is very small.
Pakistan	1.40%	increased by 36%	0.90%	<50% flue cured	In the lack of public information, assumed wood	Illegal logging of timber, population pressure	In the lack of other information, assumption all flue cured tobacco cured with wood	0.9% of Pakistan deforestation by land clearance and some due to tobacco curing	Pakistani national deforestation represents 0.6% of world deforestation with 840,000 ha lost	In the lack of public information on materials used for curing tobacco, it is prudent to assume that tobacco may play a role in some deforestation in Pakistan.

Country	Share of world tobacco production (ha)	Tobacco cultivated area 1990-2010	Tobacco cultivated area 1990-2010, increase compared to other crops	Curing methods				Impact of tobacco on deforestation	Forest loss 1990-2010 (ha) - Source FAO Forestry State Assessment 2010	Results in terms of world deforestation
				Tobacco type produced	Fuel used for types needing artificial heat	Major drivers of deforestation	Evidence of reforestation			
Zimbabwe	2.30%	increased by 56.7%	8.6% (Tobacco growing is currently taking place on farms previously growing other crops)	90% flue-cured	(up to a few years ago only coal. Wood use is a very recent development due to political crisis)	Charcoal production, maize	Reforestation activities from tobacco companies	Until 2005 tobacco curing used coal as fuel. Beginning of some deforestation due to curing in the last 6 years.	There are no data available on deforestation in Zimbabwe. Assuming it is 1% for worst case scenario and that tobacco represents 5% of it.	Deforestation for tobacco curing has been a late occurrence due to the land reforms. However the sector is struggling to go back to use coal for curing as in the several past decades.
Italy	0.50%	decreased by 75.3%	0	55% flue-cured	gas	Fires		No increase of land surface, and use of gas for curing mean that there is no deforestation linked to tobacco growing		Based on evidence tobacco production in Italy has no impact on deforestation
Turkey	2%	decreased by 75%	0	90% sun-cured	Not requested			0		Based on evidence, tobacco production in Turkey has no evidence on deforestation
Zambia	1.50%	increased by 10	7.5% (vs 43% by cotton and 25% by groundnuts)	50% flue-cured, 50% air cured	wood	Population pressure, charcoal production, maize, groundnuts	Evidence of woodlots created by tobacco farmrs	7.5% of Zambia deforestation by land clearance, possibly not sufficient reforestation by tobacco companies. Possible total deforestation due to tobacco 10%	Zambian national deforestation represents 2.5% of world deforestation with 3,332,000 ha of forest lost	Due to expansion of land under tobacco cultivation and to the use of wood, even in there is evidence of woodlots created by tobacco farmers, it is prudent to say that tobacco production has some impact on deforestation.

Country	Share of world tobacco production (ha)	Tobacco cultivated area 1990-2010	Tobacco cultivated area 1990-2010, increase compared to other crops	Curing methods				Impact of tobacco on deforestation	Forest loss 1990-2010 (ha) - Source FAO Forestry State Assessment 2010	Results in terms of world deforestation
				Tobacco type produced	Fuel used for types needing artificial heat	Major drivers of deforestation	Evidence of reforestation			
Mozambique	1.50%	increased by 20%	4.20%	90% air cured, 10% flue or fire cured	wood	Population pressure, maize, cotton	Evidence of tree planting by tobacco farmers	4.2% of Mozambique deforestation by land clearance	Mozambican national deforestation represents 3.2% of total deforestation with 4,356,00 ha of forest lost	0.13 percent
North Korea	1.30%	increased by 45%	Unknown. Most other crops have decreased. Reasonable to assume tobacco has replaced them.	unknown	unknown	Potatoes	unknown	Assumed 45% as worst case scenario between land clearance for cultivation and tree cutting	North Korean national deforestation represents 0.10% of world deforestation with 148,000 ha lost.	In the absence of any evidence, it may be possible to assume that tobacco production has an impact on deforestation in North Korea.
Tanzania	1%	increased by 96%	0.9%	100% flue-cured	wood	Population pressure, charcoal production, maize	Evidence of forest partial regeneration in tobacco areas and of tree planting by tobacco farmers	0.9% due to land clearance. Some deforestation due to tobacco curing, even if very small compared to other activities	Tanzanian national deforestation represents 5.9% of world deforestation with 8,067,000 ha lost	Due to rapid increase of production and the use of wood for curing it is possible to assume that tobacco production is a cause of deforestation in Tanzania, even if very small compared to other activities.
Bangladesh	0.90%	decreased by 15%	0	50% flue-cured, 50% air cured	assumed wood	Population pressure, Illegal timber, tea production, shrimp production, clearance for agriculture	No data publicly available apart from those of tobacco companies.	In the absence of any public data on curing methods, it is possible to assume that some deforestation may be caused by tobacco curing	Bangladesh national deforestation represents 0.04% of the world deforestation	As there is no public evidence on curing practices, it is prudent to assume that tobacco curing may cause some deforestation, even if very small compared to other activities.

Country	Share of world tobacco production (ha)	Tobacco cultivated area 1990-2010	Tobacco cultivated area 1990-2010, increase compared to other crops	Curing methods				Impact of tobacco on deforestation	Forest loss 1990-2010 (ha) - Source FAO Forestry State Assessment 2010	Results in terms of world deforestation
				Tobacco type produced	Fuel used for types needing artificial heat	Major drivers of deforestation	Evidence of reforestation			
Vietnam	0.80%	increased by 19%	0.1%	80% flue-cure, 20% air cured	wood and biomass	Population pressure, rice production	Evidence of reforestation at national level.	No evidence of deforestation in Vietnam	Vietnam shows a net forest increase of 4,434,000 ha	Based on evidence, tobacco production in Vietnam does not have any impact on deforestation.
Thailand	0.80%	decreased by 51%	0	35% flue-cured, 65% air-cured and sun cured	Rubber wood and biomass	Logging, maize and soybean production	Tobacco cured with commercial wood.	None for land expansion and none for curing	Thailand national deforestation represents 0.4% of world deforestation	Based on decreased production and the use of rubber wood for curing tobacco curing has no impact on deforestation.
Bulgaria	0.60%	decreased by 52%	0	100% sun cured	Not requested		No reforestation for tobacco use needed.	None for land expansion and none for curing		Based on evidence, tobacco production in Bulgaria does not have any impact on deforestation.
South Korea	0.30%	decreased by 55%	0	60% flue-cured, 40% air-cured	Fossil fuel		No reforestation for tobacco use needed.	None for land expansion and none for curing		Based on evidence, tobacco production in South Korea does not have any impact on deforestation.