Fire and livestock in Bolivia

by Pablo Solón and José Carlos Solón



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Bolivia is a country in flames between July and December each year. In 2014 the burnt area reached 19,271 km² (MMAyA, 2015b). It is almost as if half of the territory of Switzerland had been destroyed by fire or all the territory of El Salvador had been devoured by flames. These fires cover scrublands, bushes, grasslands and forests. Deforestation in Bolivia occurs mainly as a result of fire. The absolute majority of greenhouse gas emissions in this country are mainly due to the combustion of living nature.

These fires are triggered mainly by agricultural and livestock activities. In Bolivia, it is known as the "chaqueo" and is used to prepare land for agriculture, the cultivation of pasture for cattle raising and the expansion of grazing areas.

Could it be that agriculture and livestock in Bolivia are growing at such a fast pace that they require burning a region the size of Switzerland every two years? Between agriculture and livestock; which one is the most responsible for these fires, and which are accounted for under the technical name of "hot spots"? How large is livestock production in Bolivia? Is it a country with high levels of meat consumption and a major exporter of beef? What are the characteristics of cattle breeding in Bolivia and how does it contribute to grass fires and deforestation? And finally, what can be done to promote sustainable livestock and to reduce forest fires in order to achieve the Sustainable Development Goal of zero deforestation by 2020? This case study examines all of these questions.

The burnt face of Bolivia

Bolivia is a country located in the heart of South America, and, in 2015, had a population of 11.4 million inhabitants and an area of 1.098.581 km² (INE). It is a country that has a territory three times larger than Germany, but only one-seventh of its population. The population density of Bolivia is a little more than 10 people per km² compared with 270 inhabitants per km² in the UK or 134 inhabitants per km² in Thailand.

Although there is a lot of land and few inhabitants in Bolivia, it is one of the countries where a large part of its territory is burned each year. According to the *Technical Report of Hot Spots and Burnt Areas*, during the management of 2014, nearly two million hectares were burnt, across all nine country divisions. (MMAyA, 2015c).

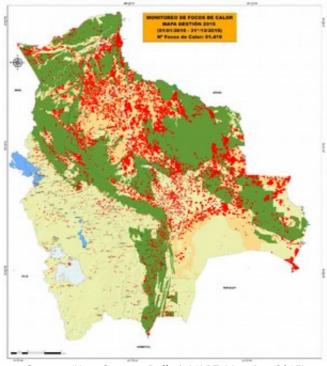
Burnt areas in 2014

No	Departamento	Superficie ha
1	Beni	733.487
2	Chuquisaca	4.930
3	Cochabamba	23.630
4	La Paz	122.779
5	Oruro	226
6	Pando	25.626
7	Potosí	1.539
8	Santa Cruz	971.631
9	Tarija	43.276
	Total	1.927.124

Source: 'Technical Report of Hot Spots and Burnt Areas' (MMAyA)

In its 2015 management report, the Audit and Social Control of Forests and Land Authority (ABT) points out that there were 51.419 hot spots throughout the national territory (ABT, 2015).

Monitoring of Heat Sources, Management Map of 2015

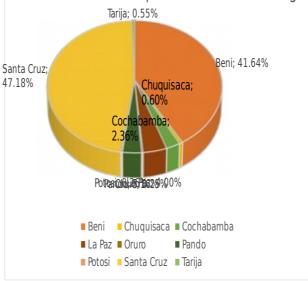


Source: 'Heat Sources Bulletin' (ABT, Mar-Dec 2015)

Eighty-nine percent of these heat sources were concentrated in only two of the nine departments of Bolivia—47% were located in the department of Santa Cruz and 42% in Beni.

Recording of heat sources at the departmental level. Management of 2015



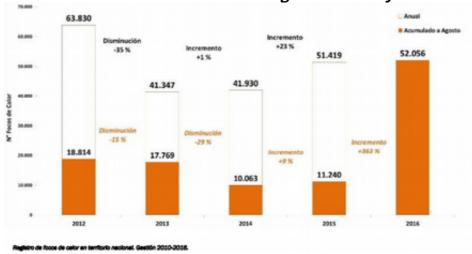


Source: 'Heat Sources Bulletin' (ABT, Mar-Dec 2015)

The burnt area is larger than the deforested area as fires occur not only in forest areas, but also in land used for agricultural and livestock purposes including scrublands, grasslands, bushes and wooded areas.

Heat sources were declining until 2014, but increased by 23% in 2015. By 17 August 2016, it had almost quintupled (ABT, 2016). This seems to indicate that the burnt area this year will exceed the 19.271 km² in 2014.

Heat sources 2012–2016 and the accumulated until August for each year



Source: 'Heat Sources Bulletin' (ABT, 17 August 2016)

Forests and fire

Bolivia is a country with a large forest cover. In 2000, 54% of its territory was covered by forests. However, according to official data entered in the

Technical Report of Forest Map 2013, prepared by the General Directorate for Management and Development under the Ministry of Environment and Water, 8.604.307 hectares of forest were lost between 2000 and 2013, i.e. 14% of the forests of Bolivia at the beginning of the century (MMAyA, 2015a).

When the Forest Map 2013 was developed, there were only 51,407,000 hectares out of the 60,091,307 hectares of forests that existed in 2000. That year, only 46% of the total surface of the country was covered by forest.

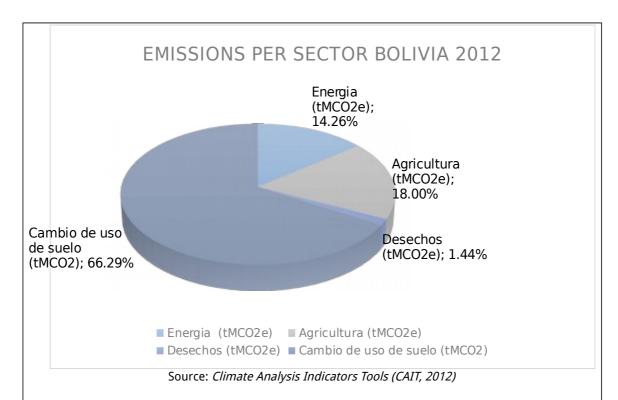
The deforestation process in Bolivia has been increasing during this century. The *Technical Report of Deforestation* claims that between 2000 and 2009 the annual deforestation fluctuated between 270,000 and 345,000 hectares. However, during 2010 forest fires were getting out of control and shot up affecting 4.343.156 hectares of forests (MMAyA, 2015b).

Between 2011 and 2013, according to the *Technical Report of Deforestation*, deforestation continued at an average annual rate of 163.000 hectares, leaving Bolivia with only 51,407,000 hectares of forests by 2013. In summary, between 2000 and 2013 Bolivia lost a forest area equivalent to two times the territory of Switzerland or similar to the territory of Austria.

Fire and greenhouse gas emissions

In Bolivia, CO_2e emissions were 136,47 million tons of carbon dioxide equivalent (MtCO₂e) in 2012 according to the Climate Data Explorer of the World Resource Institute (CAIT). Of this total, 66% of emissions were the result of land-use change and deforestation, and 18% were due to agriculture. In total, these two sectors accounted for 115 MtCO₂e, i.e., 84,3% of emissions of Bolivia.

CO₂e emissions per sector Bolivia 2012



Greenhouse gas emissions of Bolivia represent only 0,7% of emissions worldwide, however when we divide that amount among the population of Bolivia, we realise that there is an emission of 13 tons of CO₂e per capita which is higher than the emission per capita of several industrialized countries.

According to the following table that is based on data from the 2014 publication entitled *The context of deforestation and forest degradation in Bolivia*, the emissions of carbon dioxide per deforested hectare range between 550 and 367 tons in the Amazonia and Chiquitania.

CO2 emissions by type of forest in Bolivia

7 71	
Type of forest	CO2 per hectare
	in tons
Northern Amazonia	550
The rest of Amazonia	367
Chiquitania	367
Chaco	146
Yungas	367
Bosque tucumano - boliviano	367

Source: 'The context of deforestation and forest degradation in Bolivia' (Müller, et al., 2014)

Agriculture and livestock

According to the National Agricultural Census conducted in 2013 there are 861.608 agricultural production units (UPA) engaged in farming, livestock, extraction of timber and non-timber products, wildlife hunting or fishing (INE 2013). All the agricultural production units surveyed that year covered a total area of 346.549 km² (34.654.983,7 hectares), equivalent to 31,5% of the total land area.

BOLIVIA: NÚMERO DE UNIDADES DE PRODUCCIÓN AGROPECUARIA QUE TIENEN O TRABAJAN PARCELAS O TIERRAS Y SUPERFICIE TOTAL, SEGÚN DEPARTAMENTO, CENSO AGROPECUARIO 2013

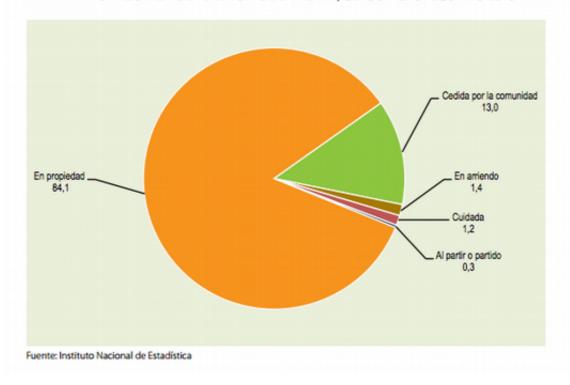
DEPARTAMENTO	UPA QUE TIENEN O TRABAJAN PARCELAS O TIERRAS	SUPERFICIE TOTAL (En hectáreas)	PARTICIPACIÓN PORCENTUAL	
BOLIVIA	861.608	34.654.983,7	100,0	
Chuquisaca	72.376	1.537.605,7	4,4	
La Paz	242.036	2.535.254,5	7,3	
Cochabamba	180.056	1.238.664,1	3,6	
Oruro	61.764	2.029.245,2	6,0	
Potosí	123.424	917.594,0	2,6	
Tarija	41.074	1.350.077,1	3,9	
Santa Cruz	113.639	14.046.720,7	40,5	
Beni	20.053	9.055.192,7	26,1	
Pando	7.186	1.944.629,7	5,6	

Twenty percent of the largest UPA account for 93,5% of the land area (324.024 km²) while the remaining 80% represent just 6,5% of the land area (22,525 km²).



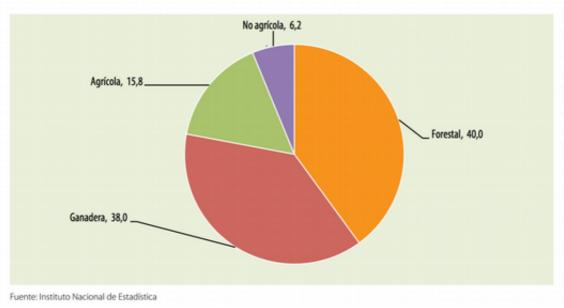
84,1% of the 34.654.983 hectares of land that UPA possess or work are under property tenure and 13% are donated by the community.

BOLIVIA: DISTRIBUCIÓN PORCENTUAL DE LA SUPERFICIE AGROPECUARIA POR RÉGIMEN DE TENENCIA DE LA TIERRA, CENSO AGROPECUARIO 2013



The 2013 Agricultural Census shows that only 15,8% of the registered land has an agricultural use and 38% is used for livestock. Another 40% is forest area and 6% of the registered land is not suitable for crops and includes roads, buildings, constructions, houses, rivers, lagoons and others.





In 2013, of the total 5.485.801 hectares of agricultural land, 2.760.238 hectares were cultivated in summer, 1.089.664 hectares were fallow land and 1.635.897 hectares consisted of land at rest. In 63 years since the 1950 census, the cultivated area of 654.258 hectares has increased by almost five times.

Forestry land-use reaches 13.844.734,6 hectares, of which 13.694.515 hectares are forests or mountains and only 150.219 hectares are forest plantations.

BOLIVIA: SUPERFICIE TOTAL DE LAS UNIDADES DE PRODUCCIÓN AGROPECUARIA POR DEPARTAMENTO, SEGÚN USO DE LA TIERRA, CENSO AGROPECUARIO 2013 (En hectáreas)

BOUWA	SANTA CRUZ	BEM	LA.PAZ	ORURO	PANDO	CHUQUISACA	TARUA	COCHABAMBA	POTOS
34.654.983,7	14.046.720,7	9.055.192,7	2.535.254,5	2.029.245,2	1.944.629,7	1.537.605,7	1,350,077,1	1.238.664,1	917.594,0
5.485.801,1	2.700.455,3	394.470,9	732,739,9	304.993,2	64.803,8	248.289,9	155,211,7	477.703,6	407.132,8
2,760,238,6	1,677,251,8	49.859,3	292.698,8	111.130,4	13.259,1	131.579,6	123.994,4	200.512,8	159.952,4
1.089.664,9	521.408,1	237.056,9	113.481,8	58.283,0	29.224,8	24.357,7	8.912,6	41.975,4	54.964,7
1.635.897,6	501,795,3	107.554,7	326.559,3	135,579,8	22.319,9	92.352,6	22.304,8	235.215,4	192.215,8
13.170.736,0	3.434.274,0	5.882.041,6	987.175,3	1.428.793,0	100.385,5	454.427,6	109.086,3	152,277,3	422.275,A
2.349.061,9	1.807.249,3	335.423,4	22.996,0	2,300,9	93.565,9	29.555,7	22.381,9	35.444,8	143,9
10.821.674,2	1.827.024,8	5.546.618,2	964.179,3	1.426.492,0	6.819,6	424.871,9	86,704,4	116.832,5	422.131,4
13.844.734,6	7.167.861,2	2.170.981,8	459,530,1	3.646,8	1.707.162,4	756.443,3	1.045.191,6	523.288,1	10.629,3
150,219,3	52.456,3	24,543,8	22.754,7	428,0	2.557,1	27.856,2	1.267,5	13.770,1	4.585,6
13.694.515,3	7.115.404,8	2.146.438,1	436,775,4	3,218,8	1,704,605,3	728.587,1	1.043.924,1	509.518,0	6.043,7
2.153.711,9	544,130,2	607.698,4	355.809,1	291.812,3	72.278,0	78.444,9	40.587,4	85.395,2	77.556,5
2.153.711,9	544.130,2	607,698,4	355,809,1	291.812,3	72.278,0	78.444,9	40.587,4	85.395,2	77.556,5
	34.654.983,7 \$.485.801,1 2.760.238,6 1.089.664,9 1.635.897,6 13.170.736,0 2.349.061,9 10.821.674,2 13.844.734,6 150.219,3 13.694.515,3 2.153.711,9	34.654.583,7 14.646.720,7 5.485.801,1 2.700.455,3 2.700.238,6 1.677.251,8 1.089.664,9 521.408,1 1.635.897,6 501.795,3 13.170.736,0 3.634.274,0 2.349.061,9 1.807.249,3 10.821.634,2 1.827.024,8 13.844.734,6 7.367.861,2 13.694.535,3 7.115.404,8 2.153.711,9 544.130,2	34.654.583,7 14.946.720,7 9.053.192,7 5.465.801,1 2.700.455,3 394.470,9 2.760.238,6 1.677.251,8 49.859,3 1.089.664,9 521.408,1 237.056,9 1.635.887,6 501.795,3 107.534,7 13.170.736,9 3.834.274,0 5.882.641,6 2.349.061,9 1.807.249,3 335.423,4 10.821.674,2 1.827.024,8 5.546.618,2 13.844.734,6 7.147.861,2 2.170.381,8 13.694.515,3 7.115.404,8 2.146.438,1 2.153.771,9 544.136,2 607.698,4	34654.983,7 14.946.728,7 9.855.192,7 2.335.254,5 5.485.801,1 2.700.455,3 394.470,9 732.739,9 2.760.238,6 1.677.251,8 49.859,3 292.498,8 1.089.664,9 521.408,1 237.056,9 113.481,8 1.635.887,6 501.795,3 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(Nota: hacer cuadro sólo con datos nacionales)

In summary, livestock employs more than double the land that is used for agriculture in Bolivia, but engages less than a quarter of people involved in agricultural activities. According to the agricultural census, 385.924 people over the age of 8 are involved in livestock activities while 1.654.813 persons are engaged in agriculture.

Natural pastures and cultivated grasses

Livestock in Bolivia covers an area of 13,170,736 hectares, equivalent to 12% of the total area of the country. Of this total, 82% of the area is devoted to livestock activities based on natural pastures (10,821,674 hectares) and only 18% uses cultivated grasses for livestock (2,349,061 hectares).

The department of Beni concentrates more than half of the area covered by natural pastures dedicated to livestock.

BOLIVIA: SUPERFICIE CON PASTOS NATURALES, SEGÚN DEPARTAMENTO, CENSO AGROPECUARIO 2013

DEPARTAMENTO	SUPERFICIE CON PASTOS NATURALES (En hectáreas)	PARTICIPACIÓN PORCENTUAL	
BOLIVIA	10.821.674,2	100,0	
Beni	5.546.618,2	51,3	
Chuquisaca	424.871,9	3,9	
Cochabamba	116.832,5	1,0	
La Paz	964.179,3	8,9	
Oruro	1.426.492,0	13,2	
Pando	6.819,6	0,1	
Potosí	422.131,4	3,9	
Santa Cruz	1.827.024,8	16,9	
Tarija	86.704,4	0,8	

On the contrary, Santa Cruz concentrates more than three quarters of the land area of cultivated grasses. According to the Agricultural Census of 2013, only 8,2% of all UPA in Bolivia have cultivated grasses.

BOLIVIA: SUPERFICIE CON PASTOS CULTIVADOS, SEGÚN DEPARTAMENTO, CENSO AGROPECUARIO 2013

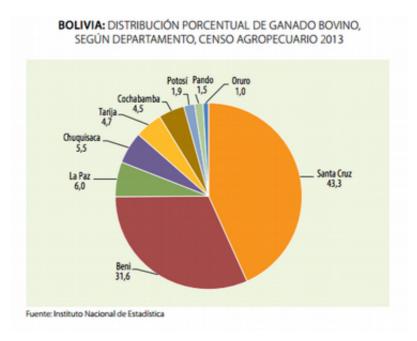
DEPARTAMENTO	SUPERFICIE CON PASTOS CULTIVADOS (En hectáreas)	PARTICIPACIÓN PORCENTUAL	
BOLIVIA	2.349.061,9	100,0	
Beni	335.423,4	14,2	
Chuquisaca	29.555,7	1,3	
Cochabamba	35,444,8	1,5	
La Paz	22.996,0	1,0	
Oruro	2,300,9	0,1	
Pando	93.565,9	4,0	
Potosí	143,9	0,0	
Santa Cruz	1,807,249,3	76,5	
Tarija	22.381,9	1,0	

As will be discussed later, areas of natural pastures and cultivated grasses have a different impact on burns and deforestation.

Cattle farming

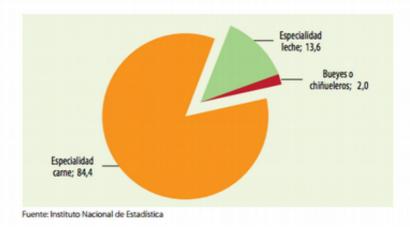
Livestock in Bolivia focus on the following species: cattle, sheep, pigs, goats, camelids, horses and birds. The bird population has increased the most, going from 1,7 million in 1950 to 42,2 million in 2013. Beef cattle were almost quadrupled during the same period, rising from 2,2 to 8,3 million head of cattle. However, if we compare the data of the national agricultural survey of 2008 and the Agricultural Census of 2013, in recent years the increase in beef cattle has been quite moderate, growing at a rate of 1,2% per year.

In 2013, 43,3% of head of cattle were in Santa Cruz and 31,6% were in Beni.



Of the 8,315,504 heads of cattle registered in Bolivia in 2013, 84,4% were dedicated to the production of meat, and only 13,6% were dairy.

BOLIVIA: DISTRIBUCIÓN PORCENTUAL DEL GANADO BOVINO, SEGÚN ESPECIALIDAD, CENSO AGROPECUARIO 2013



Most heads of cattle for the production of meat were in Santa Cruz with 42% of the total, and 35% were in Beni.

BOLIVIA: NÚMERO DE CABEZAS DE GANADO BOVINO POR ESPECIALIDAD, SEGÚN DEPARTAMENTO, CENSO AGROPECUARIO 2013

DEPARTAMENTO	TOTAL BOVINO	ESPECIALIDAD	TOTAL BUEYES O	
		Leche	Carne	CHIÑUELEROS
BOLIVIA	8.315.504	1.129.323	7.020.318	165.863
Chuquisaca	460.682	24.837	400.008	35.837
La Paz	501.753	162.990	332.333	6.430
Cochabamba	371.959	86.995	240.658	44.306
Oruro	79.950	36.548	42.684	718
Potosí	156.870	5.144	116.910	34.816
Tarija	393.650	33.294	339.531	20.825
Santa Cruz	3.598.955	661.258	2.930.688	7.009
Beni	2.631.013	113.074	2.502.840	15.099
Pando	120.672	5.183	114.666	823

Fuente: Instituto Nacional de Estadística

Extensive farming is prevalent in Bolivia. In the vast majority of the country, cattle graze freely on natural pastures, whereas intensive farming based on planted pastures is located in areas closer to markets.

The livestock department of Beni

Beni is the second largest department of Bolivia with about 213,564 km² and yet it is the penultimate at the population level. The largest livestock region of Bolivia is in the department of Beni which is economically sustained by extensive farming activities that were established during the seventeenth century. In 2013, Beni included 394.470 hectares of agricultural production and 5,8 million hectares that were used for cattle raising.

Between 1950 and 2013 livestock experienced a growth of 370% in terms of livestock, going from 706.837 to 2.631.013. The main economic activity of the department of Beni is livestock, even though most of its agricultural

production units are not dedicated to it. In Beni, 28.869 people are involved in agriculture and only 9.336 in livestock.

The territory of the department is a wide savannah that usually suffers flooding between December and May during the rainy season. Sometimes flooding in the department of Beni has reached 100.000 km². In other years, Beni is hit by drought and waves of fires that claim the lives of tens of thousands of livestock and generate losses of several hundred million dollars in livestock infrastructure, machinery and equipment, death of animals and grazing losses.

Production, consumption and export of beef

In 2015, 223.827 tons of beef were produced in Bolivia, of which the department of Santa Cruz contributed 104.106 tons, followed by Beni with 61.316 and La Paz with 13.819 tons (IBCE). By 2016, it is estimated that the production of beef will reach the figure of 242.547 tons. For reference, the beef production worldwide is 68 million tons according to the Food and Agriculture Organization of the United Nations (FAO) in 2014 which means that the Bolivian participation does not reach 0,37% of the total worldwide (FAO, 2014).

The absolute majority of beef production goes to the domestic market. According to the Federation of Breeders of Santa Cruz (FEGASACRUZ, 2012), domestic demand is 224.000 tons per year, and it is estimated that, by 2016, it could reach a record export figure of 18.000 tons which would be equivalent to 7,4% of the total domestic production. In global terms the export of beef from Bolivia is absolutely marginal as it represents less than 0,19% of the 9,4 million tons sold annually between countries (Errecart, 2015).

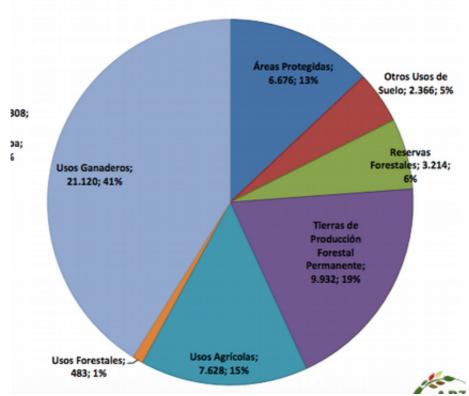
According to the Ministry of Productive Development and Plural Economy, consumption of beef in Bolivia has increased by 8% between 2005 and 2013, going from 18,5 kilos to 20 kilos per year per capita. Bolivia is far from being a country like Uruguay, Argentina and Brazil that have a consumption of 98 kilos, 56 kilos and 39 kilos of beef per year, per capita, respectively.

To sum up, beef production in Bolivia is small and mainly goes to the domestic market and in terms of per capita consumption is one of the lowest in the region. However, this beef production annually devours hundreds of thousands of hectares of forest and has burned more than a million hectares of land.

Livestock and heat sources

According to the Authority of Supervision and Social Control of Forests and Land, 41% of the 51.419 heat sources that were recorded nationwide in 2015 were located on land used for livestock, 15% on agricultural land, and 39% on wooded land including permanent production forests, forest reserves and protected areas (ABT, 2015).

Classification of heat sources by land use



Source: 'National Report of Heat Sources Management' (ABT, 2015)

Most of the burnt areas in the country are located in areas of livestock production. In addition, fires that occur in production forests, forest reserves and protected areas, are also the product of livestock activities.

These fires occur to "recover" pastures for livestock feed and clearing areas of forest and vegetation cover (fallow). This practice is known as "chaqueo", although some argue that this term has been misused as it is applied without any control and planning.

To make "chaqueo" and burning bushes is very natural in Bolivia. "I burn old and dry grasses to sprout new fodder for my animals," say the people who practice "chaqueo". This is an old and inexpensive practice as it is easy to apply and it has the advantage of setting micronutrients into the soil, ensuring good harvests during the first years after "chaqueo". Breeders burn natural pastures for the resprouting, pest control and livestock health, since the fire drives away snakes and flies, and ashes serve as deworming (Montaño, 2003).

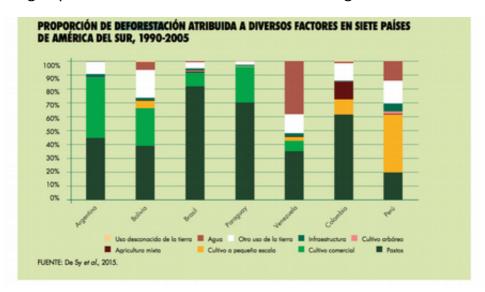
However, "chaqueo" has many disadvantages and crop yields fall rapidly, so that the soil loses its fertility. The producer enters a vicious circle in which he must continue deforesting to stay productive. The result is soil erosion and desertification, which has spread mainly in Santa Cruz, but also throughout the country.

Another factor that influences fires is the need of cattle ranch owners to maintain their presence with the burning of grasslands, especially during the periods of land remediation in which they must "demonstrate" the use of their land.

When the burning of pastures occurs in a dry year in which high temperatures and strong winds prevail, fire spreads uncontrollably affecting the same breeders and farmers who started it, burning their own cattle and barns, wildly consuming forests, filling the air with soot which is then deposited in the Andean glaciers, causing acute respiratory infections and even claiming human lives. In short, forest and grass fires cause an ecological collapse.

Livestock and deforestation

Livestock not only decisively influences the proliferation of heat sources and grass fires but also leads to deforestation. According to a FAO study, the main cause of deforestation in Bolivia during the period 1990–2005 was the harvesting of pastures for livestock and commercial agriculture.



According to the publication "The context of deforestation and forest degradation in Bolivia", the contribution of livestock to deforestation has become the most important factor. Between 1992 and 2004 livestock was responsible for 27,4% of deforestation, in the period from 2000 to 2010 its contribution to the loss of forest rose to 51,9%, and according to preliminary data mentioned in this investigation, taking into account deforestation only in the period from 2005 to 2010 the share of livestock in the destruction of forests is 60%.

Livestock that uses natural pastures is the one that leaves most burning areas; whereas livestock that is performed with sown pastures has the most impact on deforestation.

The clearing of forests occurs illegally most of the time. According to an ABT report of 2012, more than 80% of deforestation in Bolivia occurs without the respective legal authorizations. Deforestation for livestock occurs mainly in Chiquitania (especially near San Ignacio de Velasco, Concepción, San José de Chiquitos and Puerto Suarez) and, to a lesser extent, in the province of Vaca Díez of Beni, along the departmental border between Beni and La Paz, and in the department of Pando (Müller et al., 2014).

Deforestation for livestock occurs mainly in large areas of forests. An evaluation of a cattle census of SENASAG 2006 shows that 50% of cattle in Pando belong to only 20 families (Müller et al., 2014).

The following map developed by R. Müller and others in 2012 predicts the expansion of livestock by 2030 and shows the severity of its impact on the deforestation of the lowlands of Bolivia.

Guayaramerin Riberalta Cobija Rurrenabaque Trinidad San Matias La Paz Ignacio elasco lvirgarzana • Yapacani* Cochabamba Santa Cruz San José Ganadería: de Chiquitos Probabilidad Relativa de Expansión Futura Puerto Suarez < 1% 1 - 3% 3 - 10% Villamontes 10 - 30% Bosque estable 300 kilometros Sin Bosque en 2004

Relative probability of future expansion of livestock in Bolivia

Source: 'The context of deforestation and forest degradation in Bolivia' (Müller et al., 2014)

Since the 1980s, Bolivia has suffered one of the largest deforestation processes due to the expansion of commercial agriculture at medium and large scale. This dynamic was stimulated in part by Brazilian investors who took advantage of the low cost of the land and tariff preferences that were established under the CAN (Andean Community), which included Colombia,

Peru, Ecuador, Venezuela and Bolivia. Something similar could happen with the production of meat for export in the coming years, promoted largely by Brazilian investors. A growth of livestock to meet the international demand would have devastating impacts on the forests that still exist in the country.

Alternatives

For years, the issues of forest fires and "chaqueo" make the newspaper headlines of Bolivia during the second half of the year. Several proposals, projects and initiatives have been tested and yet the situation remains alarming.

The proposals that have been raised and were implemented partially or circumstantially covered different dimensions of the problem but have not been translated into systematic, comprehensive, consistent and sustained actions on the basis of an annual allocation of funds from the general budget of the nation.

To prevent the spread of "chaqueo" and to stop deforestation require promoting other forms of agricultural production, other learning processes, training and communication at different levels, stricter regulations and more effective institutional and social control mechanisms, allocations of financial funds, to promote changes in consumption patterns and to rethink the current agricultural vision, which is destroying Mother Earth as a consequence of growing, exporting more and achieving modernity.

Agriculture and livestock take place in many countries, but not in all of them the tradition of burning to rehabilitate the fields exists. In several countries instead of "chaqueo", rotational grazing is used to prevent the degradation of grasses by the growth of shrubs. Thus the "normal" biological decomposition of livestock manure and agricultural waste is allowed. The process is slow but prepares the land in a "natural" way, without burning it, and in many places the cattle is used to mix this natural manure with the soil. In general this process takes a year, and because it is not possible to replant, the farmer or breeder is obligated to practice rotation between the plots which avoids the overuse of land. Better pasture management is possible with division and rotational grazing, the construction of silos for feeding livestock during the dry season, and growing better forage crops.

Far from promoting forest clearing for agriculture or livestock production, it is necessary to promote agroforestry that allow us to live together with the forest. To continue with the expansion of the livestock area at the expense of the forest is the worst investment the country can make, both in ecological and economic terms. How much could the country earn with the addition of 100.000 hectares of forest for livestock and how much could it lose? Having an area of more than 13 million hectares for cattle use, the country should go for a more efficient and rational use and recover some of the land already available, instead of further expanding year after year the land for livestock.

With the current practices of burning and deforestation, the expansion of livestock will be devastating to forests. The virgin forest cannot be destroyed

for any reason, not even to promote the current type of livestock that exists in the country.

It is necessary to think about how to improve the existing livestock areas, how to recover eroded land, how to diversify production and to promote complementary initiatives, such as biogas production that uses the biological decomposition of plant and animal waste.

The development of alternative forms of agricultural production that does not include the burning of the nature should go along with processes of awareness, capacity building and the promotion of successful experiences of fire control in other parts of Amazonia, such as the inclusion in the school curriculum of the causes, factors and impacts of the use of fire. The articulation between producer associations, indigenous peoples, municipalities, governorates and the central government is essential, not only to raise awareness but also to establish policies and mechanisms of social control.

It is true that "chaqued" cannot be prohibited in Bolivia overnight but it is important to start by limiting the use of fire and to practice it in smaller spaces, appealing to the knowledge and practices of indigenous people as they have established a series of precautions. To assume that "there is no alternative to chaqued", as some authorities do, is a big mistake. The fact that it is an ancient practice does not mean that it is always appropriate, and even less that it can be extended to larger regions. We live in times of great ecological crisis, climate change, severe droughts and what once could be controlled at the level of a parcel today may easily become a disaster of incredible proportions.

The lack of payment of fines for illegal deforestation or burning, and the recent expansion of the area of forest clearing from 5 to 20 hectares have encouraged those practices. If sanctions become rhetorical then they will no longer be effective. The monetary fines for medium and large properties must be significant and progressive. It is necessary to encourage the social control of the community and the different types of partnerships, and to explore positive incentives for those who reduce burning and deforestation.

The rights of Mother Earth and, in particular, the rights of forests have to be fully established with concrete mechanisms to sue, prosecute and punish those who violate the rights of nature.

The issue of forest preservation and the reduction of burns cannot be marginal issues in the general budget of the nation, and it must include sufficient funds for the prevention, control, fire containment and funding of sustainable agro-livestock and agroforestry practices.

It is important to promote the consumption of protein needed for each Bolivian, but it is not necessary to replicate unsustainable patterns of meat consumption as it only aggravates the ecological and climate crisis. Making Bolivia an exporting country of cattle would be devastating for Amazonia. Livestock must be improved and may even have some minor surpluses for

export, but it should be done under the context of no further expansion of the existing land area for livestock use.

Burnings and forest fires in Bolivia are shooting up, not only due to unsustainable practices of agricultural production and the worsening of climate change but also because in recent years there is a call from the central government to expand at all costs the agricultural production for export without taking into account the risks and limits of this action.

The development of a sustainable livestock production, the reduction of burnings and the end of deforestation can only be achieved if there is a change in government vision, and the extractivism of the exporter is overcome, so there can be a return to the direction of the vision of Living Well that proclaims the harmony between human beings and the Mother Earth.

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