

Americas, new world for a more sustainable palm oil

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Abstract – Oil palm is the world’s leading oil crop, accounting for 36% of global vegetable oil production in 2020. Originally from Central and West Africa, oil palm plantations have been extended to Southeast Asia, partly at the expense of biodiversity-rich forests and peatlands storing large quantities of carbon. Negative environmental impacts have sometimes been accompanied by equally negative social impacts. Since the 2000s, oil palm plantations have been expanding rapidly in Latin America. The producing countries of the American continent have a number of characteristics in common, which differentiate them from Asia and Africa. Palm oil production costs are high, and oil palm fresh fruits bunches producers are dependent on the presence of extractive mills to purchase their production, sometimes with extensive mill supply basins based on networks of collect centers. Overall, edapho-climatic conditions are not as good as in Indonesia or Malaysia. Nevertheless, palm oil production represents an opportunity for the economic development of rural areas, and could help meet the needs in edible oil of domestic and regional markets in the continent’s producing countries. What are the expectations regarding the sector? What is the risk of expanding oil palm plantations at the expense of forests? Should we fear a scenario resembling Asian expansion dynamics? The development of a sustainable sector raises many challenges. This thematic issue explores some of them, and also highlights the need for further research on the American continent to support the sustainable development of the oil palm sector.

Keywords: development models / public politics / family farming / cropping system / elaeiculture

Résumé – **Les Amériques, nouveau monde pour une huile de palme plus durable.** Le palmier à huile est la première culture oléagineuse avec 36 % de la production mondiale d’huile végétale en 2020. Originnaire d’Afrique centrale et de l’Ouest, le palmier à huile a vu ses plantations s’étendre en Asie du Sud-Est, en partie aux dépens d’une forêt riche en biodiversité et de tourbières stockant de grandes quantités de carbone. Les impacts négatifs sur l’environnement ont été parfois accompagnés d’impacts sociaux tout aussi néfastes. Depuis les années 2000, les plantations de palmier à huile connaissent une forte dynamique d’expansion en Amérique latine. Les pays producteurs du continent américain présentent des caractéristiques communes qui le différencient de l’Asie et de l’Afrique. Les coûts de production de l’huile de palme y sont élevés, il existe une dépendance des producteurs de régimes de palmier à la présence d’usines extractrices d’huile pour acheter leur production, avec parfois des bassins d’approvisionnement d’usine étendus *via* des centres de collecte, les conditions édapho-climatiques sont globalement moins bonnes qu’en Indonésie ou Malaisie. Néanmoins la production d’huile de palme représente une opportunité de développement économique pour les zones rurales, et pourrait participer à répondre aux besoins en huile alimentaire des marchés domestiques et régionaux des pays producteurs du continent. Quelles sont les attentes de la société civile vis-à-vis du secteur? Quel est le risque d’une expansion des palmeraies aux dépens des forêts? Faut-il craindre un scénario se rapprochant des dynamiques d’expansion asiatiques? Le développement d’un secteur durable soulève de nombreux défis. Le dossier thématique qu’introduit cet article en explore quelques-uns, et met également en lumière le besoin de recherches supplémentaires sur le continent américain pour accompagner un développement durable du secteur élaéicole.

Mots-clés : modèle de développement / politiques publiques / Agriculture familiale / système de culture / élaéiculture

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1 Palm oil at the heart of controversies

Palm oil is the world's leading oilseed crop, accounting for 36% of global vegetable oil production in 2020. With an oil yield far superior to that of other oilseeds (on average 2.8t crude oil/ha/year, *i.e.* 6 times more than soybean, and 4 times more than rapeseed or sunflower), oil palm nevertheless occupies less than 9% of the area dedicated to oilseed crops worldwide (Ritchie and Roser, 2021). These figures call into question the validity of the crop's poor reputation with the general public. Why is there so much controversy about an oil crop that is so productive and uses so little space compared to other possible alternatives?

Beyond the lobbying carried out by competing oilseed sectors, it was the rapid expansion of plantations in Southeast Asia from the 1990s to 2010 that fueled the debate. Descals *et al.* (2024) have mapped nearly 24 million hectares of oil palm plantations, over 83% of which are located in Indonesia and Malaysia, while Ritchie and Roser (2021) estimate that 84% of global production in 2020 comes from these two countries. Originally from Central and West Africa, oil palm plantations have been expanded in Southeast Asia, partly at the expense of biodiversity-rich forest and peatlands storing large quantities of Carbon (Rival and Levang, 2014; Gaveau *et al.*, 2016; Gaveau *et al.*, 2019). The negative impacts on the environment – loss of wildlife habitat, release of carbon stored in plant biomass, soils and peat, deforestation and loss of ecosystem services provided by forests – have sometimes been accompanied by equally harmful social impacts: land grabbing, captive labor, non-respect of indigenous peoples' rights, non-respect of labor laws or even human rights, inequitable distribution of added value, abusive contracts between corporates and smallholders (McCarthy and Cramb, 2009; Sheil *et al.*, 2009). These negative impacts have also been reported in Africa (Cotula *et al.*, 2009; Feintrenie, 2014) and to a lesser extent in the Americas (Furumo and Aide, 2017; Castellanos-Navarrete *et al.*, 2020).

To respond to criticism and improve the sector's image and sustainability, several major industrial groups involved in palm oil production in Indonesia and Malaysia joined forces with non-governmental organizations (NGOs) to create the Roundtable for Sustainable Palm Oil (RSPO) in 2004. The RSPO offers specific certification for palm oil, and supports its members upstream of certification with technical and management advice, guides and protocols. Constantly judged and debated, certification remains open to criticism, particularly for the limits of its application to smallholders not under contract with a plantation firm (Bessou and Rival, 2020), and its inability to stop deforestation within certified firms' estates (Carlson *et al.*, 2018). Nevertheless, it has made the actions and impacts of oil-producing corporates visible, facilitated socio-environmental mobilization towards the sector's downstream industries so that they participate in the drive towards sustainability by committing to a majority certified oil supply, and ultimately helped reduce deforestation directly attributed to the expansion of oil palm plantations (Meijaard *et al.*, 2017; Carlson *et al.*, 2018). Subsequently, multinational groups have formulated voluntary commitments to source no deforestation, peatland conversion or human exploitation (NDPE, see Pacheco *et al.*, 2017). These commitments by international

corporates are binding on their subsidiaries, factories and plantations, as well as on their suppliers. Certification is therefore the most reliable guarantee of the origin and production conditions of the palm oil purchased. Last but not least, the pressure on the industry for greater sustainability and transparency has also been reinforced by import requirements issued by the European Union, among others, through the regulation on zero deforestation imported products, which came into force in 2023.

While the share of certified oil reached 19% of the global production, only half of it is bought as such (Bessou and Rival, 2020), which limits its impact and its profitability. Multinationals' commitment to sustainable oil sourcing has internationalized the demand for certified palm oil, even in producer countries where there is no such domestic market demand. In Africa and Americas, for example, the market for certified sustainable food and cosmetics is underdeveloped, but the local subsidiaries of multinationals committed to RSPO or NDPE certification are obliged to certify. In turn, farmers selling fresh oil palm bunches to their mills are also encouraged to become certified. The Round Table has had and continues to have a major influence on the evolution of the palm oil sector.

2 Oil palm in Americas

This review article introduces a thematic issue on "Oil palm in Mexico and in the Americas", published in the journal *Cahiers Agricultures* (Feintrenie *et al.*, 2025).

Since the 2000s, oil palm plantations have been experiencing a strong expansion dynamic in Americas. Furumo and Aide (2017) estimate that the sector grew at an annual regional rate of 7% between 2000 and 2014. Unlike in Southeast Asia, in the majority of American producing countries, oil palm plantations have not been a major cause of direct deforestation. According to the FAO, the leading cause of direct deforestation over the period 2000-2018 was the expansion of grasslands for cattle ranching, accounting for 47.7% of deforested areas (Branthomme *et al.*, 2023). This is followed by crops (14.9%), including soybeans, which is closely linked to livestock in its territorial expansion dynamics in the Amazon forest basin (Guéneau, 2021).

The 15 palm oil-producing countries on the American continent have a number of characteristics in common, which differentiate them from Asia and Africa. Palm oil production costs are high, due in part to more expensive agricultural labor, the absence of a small-scale processing sector as it exists in Africa (with the exception of Bahia in Brazil), and the dependence of palm smallholders on the presence of an oil extraction mill to buy their production, with sometimes extensive supply basins (using reds of local collect points), edapho-climatic conditions that are generally not as good as in Southeast Asia (cloudiness, irregular rainfall distribution, low minimum temperatures, variable soil potential), as presented by Dubos and Raïssac (2021), in this thematic issue in the case of Quinindé-Quevedo region in Ecuador, and growing pressure from extreme climatic events and irregular seasonality caused by the El Niño phenomenon, amplified by global climate change. Sanitary pressure on palm trees also varies greatly from one country to another. While Mexico is still free of bud

rot, this disease has decimated plantations in Panama, Colombia, Surinam, Brazil and Ecuador (Baron *et al.*, 2017). These factors limit production profitability and increase investment risks, especially in family farming (poor phytopathology prevention and low adaptation capacity).

As recalled by Lesage *et al.* (2021, this thematic issue), Pirker *et al.* (2016) estimate that over 83 million hectares are suitable for oil palm cultivation on the continent, excluding areas with high conservation (HCV) and Carbon storage (HCS) value. Palm oil production represents an opportunity for economic development in rural areas, and could help meet the edible oil needs of domestic and regional markets in the producing countries. By encouraging the development of plantations that respect HCV and HCS, new plantations could also contribute to strategies to control imported deforestation. The negative image of the sector within Latin American civil society, influenced by the negative impacts of plantation expansion in Southeast Asia, generates mistrust. However, the domestic market is not keen on labelled products, and few consumers of processed agri-food products look at the origin or possible certification of the palm oil used. What is the risk of expanding palm plantations at the expense of forests? Should we fear a scenario approaching Asian expansion dynamics?

The development of a sustainable sector raises a number of challenges: agronomic, in response to sub-optimal growing conditions and climatic and health risks; environmental, to preserve HCV and HCS ecosystems; economic, to make high-cost production profitable; and socio-political, to meet the needs of rural populations for equitable economic development and land.

These various aspects are explored in the papers that constitute this thematic issue of Cahiers Agricultures (Feintrenie *et al.*, 2025).

Lesage *et al.* (2021) describe the evolution of the oil palm sector in Americas, from the first experimental plantations to current production models. The development of the sector has historically been marked by the involvement of various governments and their support through subsidies, tax exemptions and other financial incentives that have attracted large private groups and investors, making the agro-industrial model the main production model encountered in Americas (Lesage *et al.*, 2021). However, since the 1990s, public policies on oil palm have called for territorial integration, social inclusion and environmental protection. In this context, two new production models have emerged. The first is defined in the literature as the “social sector”. In this model, the companies owning and managing the mills are partly or wholly owned by the smallholders and smallholders’ groups who supply them, and who are also shareholders. This model is particularly prevalent in Honduras and Mexico, as well as in Costa Rica, Peru and Panama. The second socially-oriented model is the strategic alliance model, a form of contract farming. The model is based on an exclusive sales agreement between firms owning mills and smallholders. The firm provide technical assistance to the smallholders. This model is particularly prevalent in Colombia and Brazil, where it is supported by the federal government (Lesage *et al.*, 2021).

Today, Americas is seen as a forerunner in terms of social production models favoring the inclusion of smallholders. Could it become a forerunner in sustainable agro-ecological production systems?

Lagunes-Espinoza *et al.* (2022, this thematic issue) analyze published work on oil palm and palm oil, and the participation of institutions in Americas, and more specifically Mexico, in the production of knowledge on the subject. The authors highlight the paucity of information available on the American oil palm sector in the international literature, despite a wealth of local research on the subject. The themes addressed in the scientific literature have evolved considerably over the years, from a focus on technical and agronomic aspects in the 1960s to sustainability issues in more recent publications.

The lack of technical knowledge to adapt to regional conditions, and to the effects of Climate Change, and El Niño highlighted by Lagunes-Espinoza *et al.* (2022), is confirmed by the work of Mendoza-Hernández *et al.* (2021).

Mendoza-Hernández *et al.* (2021, this thematic issue) highlight the need for more agronomic research, particularly to meet current climate challenges. One of the consequences of El Niño is an irregular distribution of precipitation over the year, with longer dry seasons and, in some years, more violent and abundant rainfall. What practices can be implemented to adapt to these irregularities, for a crop whose fruit production depends, among other things, on palm stress 2 years before flowering, whereas fruit ripening takes place 6 months after fertilization (Jacquemard, 2011)? Could irrigation be a solution, and under what conditions? Mendoza *et al.* (2021) explore the impact of irrigation on the production of Fresh Fruit Bunches (FFB) in plantations of varying age, on clay soils (gleysols).

More specifically, Dubos and Raïssac (2021, this thematic issue) question the El Niño / La Niña effect on FFB production in Ecuador, due to changes in cloud cover and therefore available light. This article highlights the difficulty of diagnosing the causes of palm yellowing. While successive experts focused on a mineral deficiency and recommended fertilization richer in magnesium (Mg), the authors demonstrate the need to take climatic factors and nitrogen (N) content into account. The El Niño effect is blamed for the drop in sunshine period that impacts directly the photosynthesis and indirectly the nitrogen uptake by palm trees. Here again, the results are preliminary and need to be confirmed by further research.

Finally, Brindis-Santos *et al.* (2021, this thematic issue) confirm the need for research, particularly into the potential of oil palm plantations to store Carbon in soils. Their exploratory study suggests that plantations could enhance soil Carbon storage in landscapes dominated by grazed grasslands. This ecosystem service provided by oil palm will remain lower in terms of the quantity of Carbon stored in the soil than the potential of a mature forest cover, and is highly dependent on the cropping practices regarding cover crops management implemented by farmers. Nevertheless, by following agro-ecological practices focused on preserving and improving soil fertility, oil palm growers could make a significant contribution to improving the carbon balance of the areas in which they operate.

3 Conclusion

Whatever the controversies, palm oil is a commercial agricultural commodity – and a daily food crop in Africa –

with many advantages for farmers. Palms can produce in conditions of high seasonality, low soil fertility and wind exposure, where agricultural alternatives may be few. Depending on the edapho-climatic conditions, the harvesting period can last from 6 to 12 months, guaranteeing producers a regular income. But the economic benefits of this production are, as with any commodity, dependent on the organization of the sector, the fairness of commercial agreements between actors, and the relations of power, dependence and competition between them. Latin American countries offer original organizational models, providing opportunities for sharing the added value of oil production between millers and farmers. These social-sector models are promising and could inspire other oil-producing countries. However, they are not all successes, and more studies are needed to support decision-makers.

And while plantation expansion has so far not been a major cause of deforestation on a continental scale, certain territories in southern Mexico, Guatemala and Colombia have seen their agricultural frontiers advance to the detriment of forests with high conservation values in the Amazon basin or the Mayan forest. It is therefore essential to define the limits of a sustainable production model and its conditions of application in America, including in terms of geographical expansion. Finally, the continent still benefits from low phytosanitary pressure, which facilitates the implementation of agro-ecological practices with limited use of chemical inputs. The time is therefore ripe for supporting agro-ecological innovation. The institutional framework is favourable in many American countries, with public policies geared towards agro-ecological transition, high-quality agricultural research and teaching institutions, and sometimes the organization of inter-professional actors to support farmers and technicians in this innovation (as in Colombia and Mexico, for example).

With this topical issue of *Cahiers Agricultures* (Feintrenie *et al.*, 2025), we aim to promote the studies carried out in Americas and give them international visibility, thus enabling all those interested in the oil palm sector in other regions of the globe, as well as in Americas, to benefit from knowledge of the region's specific production models and the conditions that could foster sustainable development in the sector.

Acknowledgments

The research received financial support from PalmElit SAS (Montpellier, France) under the contract n°21/2017. The funder had no role in the organization of the study, in data collection and interpretation, or in the presentation and publication of the results.

References

- Baron V, Rafflegeau S, Dubos B, Flori A, Burgos R, Louise C. 2017. Exposition des plantations de palmier à huile au risque de la pourriture du coeur dans le bassin de Quevedo, Équateur. *Cahiers Agricultures* 26 (5): 55002. <https://doi.org/10.1051/cagri/2017036>.
- Bessou C, Rival A. 2020. Palmier à huile : Etat des lieux sur la déforestation et les standards de durabilité. Rapport d'étude du CST Forêt, Cirad, Montpellier, France, 77 p.
- Branthomme A, Merle C, Kindgard A, Lourenço A, Ng WT, D'Annunzio R, *et al.* 2023. How much do large-scale and small-scale farming contribute to global deforestation? Results from a remote sensing pilot approach. Rome (Italy): FAO, 66 p. <https://doi.org/10.4060/cc5723en>.
- Brindis-Santos AI, Palma-López DJ, Mata-Zayas EE, Palma-Cancino DJ. 2021. Impacts of oil palm cultivation on soil organic carbon stocks in Mexico: evidence from plantations in Tabasco State. *Cahiers Agricultures* 30 (2021) 47. DOI: <https://doi.org/10.1051/cagri/2021033>
- Carlson KM, Heilmayr R, Gibbs HK, Noojipady P, Burns DN, Morton CD, *et al.* 2018. Effect of oil palm sustainability certification on deforestation and fire in Indonesia. *PNAS* 115 (1): 121–126. <https://doi.org/10.1073/pnas.1704728114>.
- Castellanos-Navarrete A, de Castro F, Pacheco P. 2020. The impact of oil palm on rural livelihoods and tropical forest landscapes in Latin America. *Journal of Rural Studies* 81: 294–304. <https://doi.org/10.1016/j.rurstud.2020.10.047>.
- Cotula L, Vermeulen S, Leonard R, Keeley J. 2009. Land grab or development opportunity? *Agricultural investment and international land deals in Africa*. IIED/FAO/IFAD, 145 p. <https://www.iied.org/12561iied>.
- Descals A, Gaveau DLA, Wich S, Szantoi Z, Meijaard E. 2024. Global mapping of oil palm planting year from 1990 to 2021. *Earth System Science Data Discussions* 16 (11): 5111–5129. <https://doi.org/10.5194/essd-2024-157>.
- Dubos B, de Raïssac M. 2021. El Niño modifies nutrient status in oil palm and helps foliage to recover from yellowing symptoms: new analysis and perspectives. *Cahiers Agricultures*, 30 (2021) 34. DOI: <https://doi.org/10.1051/cagri/2021021>.
- Feintrenie L. 2014. Agro-industrial plantations in Central Africa, risks and opportunities. *Biodiversity Conservation* 23: 1577–1589. <https://doi.org/10.1007/s10531-014-0687-5>.
- Feintrenie L, Vázquez Navarrete CJ, Lagunes Espinoza LC. 2025. Oil palm in Mexico and in the Americas. *Cahiers Agricultures*, thematic issue. <https://www.cahiersagricultures.fr/component/toc/?task=topic&id=1479>.
- Furumo PR, Aide TM. 2017. Characterizing commercial oil palm expansion in Latin America: land use change and trade. *Environmental Research Letters* 12 (2): 024008. <https://doi.org/10.1088/1748-9326/aa5892>.
- Gaveau DLA, Locatelli B, Salim MA, Yaen H, Pacheco P, Sheil D. 2019. Rise and fall of forest loss and industrial plantations in Borneo (2000–2017). *Conservation Letters* 12, e12622. <https://doi.org/10.1111/conl.12622>.
- Gaveau DLA, Sheil D, Husnayaen, Salim MA, Arjasakusuma S, Anrenaz M, *et al.* 2016. Rapid conversions and avoided deforestation: Examining four decades of industrial plantation expansion in Borneo. *Scientific reports* 6: 32017. <https://doi.org/10.1038/srep32017>.
- Guéneau S. 2021. État des lieux des systèmes de certification du soja et analyse de leur compatibilité avec la stratégie nationale de lutte contre la déforestation importée. *Cirad / CST Forêt, Paris, France*, 83 p.
- Jacquemard JC. 2011. *Le palmier à huile*. Editions Quae, Cta, Presses agronomiques de Gembloux. 240 p.
- Lagunes-Espinoza LC, Vázquez-Navarrete CJ, Rincón-Ramírez JA, Halvorsen KE. 2022. Oil palm crop: state and gaps of research and technological development at global scale, Latin America and Mexico. *Cahiers Agricultures* 31 (2022) 3. DOI: <https://doi.org/10.1051/cagri/2021038>.
- Lesage C, Cifuentes-Espinosa J, Feintrenie L. 2021. Oil palm cultivation in the Americas: review of the social, economic and

- environmental conditions of its expansion. *Cahiers Agricultures*, 30 (2021) 27. DOI: <https://doi.org/10.1051/cagri/2021015>
- McCarthy JF, Cramb RA. 2009. Policy narratives, landholder engagement, and oil palm expansion on the Malaysian and Indonesian frontiers. *The Geographical Journal* 175: 112–123. <https://doi.org/10.1111/j.1475-4959.2009.00322.x>.
- Meijaard E, Morgans C, Husnayaen H, Abram N, Ancrenaz M. 2017. An impact analysis of RSPO certification on Borneo forest cover and orangutan populations. *A Borneo Futures report for the Orangutan Land Trust and Wilmar International, Borneo Futures, Bandar Seri Begawan, Brunei Darussalam*, 39 p. https://www.researchgate.net/publication/313927667_An_impact_analysis_of_RSPO_certification_on_Borneo_forest_cover_and_orangutan_populations.
- Mendoza-Hernández JHR, Vázquez-Navarrete CJ, Lagunes-Espinoza LC, Rincón-Ramírez JA, del Rivero-Bautista N, Pérez-Bonilla MC, Gutiérrez-López J, Asbjornsen H. 2021. Effect of supplementary irrigation on the transpiration and reproductive development of oil palm trees during the dry season in Tabasco, Mexico. *Cahiers Agricultures* 30 (2021) 41. DOI: <https://doi.org/10.1051/cagri/2021026>
- Pacheco P, Hospes O, Dermawan A. 2017. Zero deforestation and low emissions development: Public and private institutional arrangements under jurisdictional approaches. Bogor (Indonesia): CIFOR, WUR, 8 p.
- Pirker J, Mosnier A, Kraxner F, Havlík P, Obersteiner M. 2016. What are the limits to oil palm expansion? *Global Environmental Change* 40: 73–81. <https://doi.org/10.1016/j.gloenvcha.2016.06.007>.
- Ritchie H, Roser M. 2021. Forests and Deforestation. *OurWorldIn-Data*, <https://ourworldindata.org/forests-and-deforestation>
- Rival A, Levang P. 2014. Palms of Controversies: Oil Palm and Development Challenges. Bogor (Indonesia): CIFOR, 68 p. <https://doi.org/10.17528/cifor/004860>.
- Sheil D, Casson A, Meijaard E, van Noordwijk M, Gaskell J, Sunderland-Groves J, *et al.* 2009. The impacts and opportunities of oil palm in Southeast Asia: What do we know and what do we need to know? Bogor (Indonesia): CIFOR, Occasional paper no 51, 80 p.

Cite this article as: Feintrenie L, Vázquez Navarrete CJ, Lagunes Espinoza LC. 2025. Americas, new world for a more sustainable palm oil. *Cah. Agric.* 34: 11. <https://doi.org/10.1051/cagri/2025009>