**Supplementary Text 1 – Systematic Mapping Methodology**

We used systematic mapping to quantify the extent of existing research on oil palm in Africa and to identify knowledge gaps. We adapted our methods from standard best practices published by the Collaboration for Environmental Evidence Systematic Review Guidelines (Sutherland et al., 2019), resulting in a five-stage workflow:

In the first stage, we defined the scope of our systematic map by outlining our inclusion and exclusion criteria. We defined our inclusion criteria as primary research that focussed on oil palm in an African context (i.e., based in Africa or, for instance, occurring outside of Africa but focussing on an oil palm germplasm that was collected in Africa or an oil palm-relevant species (e.g., *Fusarium oxysporum* f. sp. *elaeidis*) that was collected in Africa but examined elsewhere) and reported ecological, socioeconomic, or interdisciplinary outcomes. Ecological outcomes are those pertaining to organisms, the environment, and their relationships (e.g., biodiversity, ecosystem functioning, and land use change), while socioeconomic outcomes are those pertaining to humans and their values, preferences, decisions, and experiences (e.g., income, human health, and food security). Interdisciplinary outcomes integrate both ecological and socioeconomic outcomes. We did not include studies if they focussed on palm wine but did not specifically state that the wine was produced from *Elaeis guineensis*, to ensure that we did not capture studies focussed on palm wine from other palm species (e.g., *Raphia hookeri* or *Borassus aethiopum*).

In the second stage, we developed our search string. Before developing or running any search, we first selected ten ‘benchmark papers’ (Amoah et al., 1995; Burton et al., 2017; Dejean et al., 1997; Hamer et al., 2021; Humle & Matsuzawa, 2004; Ocampo-Ariza et al., 2019; Ordway et al., 2017; Strona et al., 2018; Tabe-Ojong et al., 2023; Wich et al., 2014), which were high-profile or well-known studies that met our inclusion criteria, based on MDP’s knowledge of the African oil palm literature. We then developed a two-part search string, of which the first part defined the subject (oil palm), and the second part defined the outcome (ecological, socioeconomic, or interdisciplinary). Our search string terms were determined by reviewing the titles, abstracts, and keywords of our benchmark papers; conducting a search of synonyms and alternative spellings of these terms in the Oxford English Dictionary; and including the names of all African countries, including recent and colonial names (for instance, we included both “Eswatini” and “Swaziland”). Our final search string, which was independently evaluated by M.D.P. and V.J.R., was:

TS = (“oil palm” OR “palm oil” OR “elaeis guineensis” OR “palm wine” AND TS = ("Africa\*" OR "Afro\*" OR "Nigeria" OR "Ethiopia" OR "Egypt" OR "Democratic Republic of the Congo" OR "Tanzania" OR “Swaziland” OR "South Africa" OR "Kenya" OR "Uganda" OR "Sudan" OR "Algeria" OR "Morocco" OR "Angola" OR "Mozambique" OR "Ghana" OR "Madagascar" OR "Cameroon" OR "Ivory Coast" OR "Côte d'Ivoire" OR "Cote d'Ivoire" OR "Niger" OR "Burkina Faso" OR "Burkina-Faso" OR "Mali" OR "Malawi" OR "Zambia" OR "Senegal" OR "Chad" OR "Somalia" OR "Zimbabwe" OR "Guinea" OR “Guinean” OR "Rwanda" OR "Benin" OR “Dahomey” OR "Burundi" OR "Tunisia" OR "South Sudan" OR "Togo" OR “Togolese Republic” OR "Sierra Leone" OR "Libya" OR "Republic of the Congo" OR "Congo" OR "Zaire" OR "DRC" OR "Liberia" OR "Central African Republic" OR "Mauritania" OR "Eritrea" OR " Namibia" OR "Gambia" OR "Botswana" OR "Gabon" OR "Lesotho" OR "Guinea-Bissau" OR "Guinea Bissau" OR "Equatorial Guinea" OR "Mauritius" OR "Eswatini" OR "Djibouti" OR "Comoros" OR "Réunion" OR “Reunion” OR "Sahrawi Arab Democratic Republic" OR “Western Sahara” OR "Cape Verde" OR “Cabo Verde” OR "São Tomé and Príncipe" OR “Sao Tome and Principe” OR "Seychelles")

We validated our search string by running it on ISI Web of Science Core Collection and ensuring that all benchmark papers were detected, which they were.

In the third stage, we searched the peer-reviewed literature for relevant studies by running our search string on the ISI Web of Science Core Collection on 9 June 2023. Our Web of Science search yielded 1824 publications. We also searched the references of our benchmark papers to find additional publications that potentially met our inclusion criteria, which resulted in another 306 publications. This resulted in a total of 2130 publications.

In the fourth stage, we screened the 2130 publications in two stages: reading only the title and abstract (1608 publications) or, when it was unclear whether the study met our inclusion criteria from the title and abstract alone, reading the full text (522 publications). When screening, we evaluated whether articles met our inclusion criteria using an adjusted PICOS (Population, Intervention, Comparator, Outcomes, Study design) model (Pullin et al., 2018). In our adjusted model, population was the research subject, intervention was any action or decision studied, comparator was the type of comparison (or lack thereof) that the study made, and outcome was the response variable affected by the intervention or comparison on the population (Figure 1). We did not record study design. We did not apply a date or language restriction (translating any non-English studies using Google Translate as needed and possible), although our systematic map is still biased linguistically since we ran our search string in English only.

Four reviewers (M.D.P., V.J.R., J.S., B.H.) screened publications. After reviewers screened their first 50 publications, another reviewer re-evaluated publications1–25 to cross-check for intra-reviewer consistency (Reviewer pairs: M.D.P. and B.H., V.J.R. and J.S.). If a discrepancy occurred, the publication was discussed by all four reviewers until consensus between reviewers was reached, and these discussions were used to adapt and clarify the inclusion/exclusion criteria. After that, we switched reviewer pairs (New pairs: M.D.P. and J.S., V.J.R. and B.H.), and reviewers re-evaluated publications1-50 and initiated another cross-check for intra-reviewer consistency. At both cross-checks, we calculated Cohen’s Kappa (*k*) to quantify intra-reviewer consistency in determining whether studies should be included or excluded (Carletta, 1996). At the first cross-check, *k* = 0.78. At the second cross-check, *k* = 0.91. These are above the accepted benchmark of *k* = 0.6 (Collaboration for Enviromental Evidence, 2013). Reviewers then screened all remaining publications, determining whether they met the inclusion criteria. After removal of 64 duplicates, 989 publications were removed at abstract level and 320 publications were removed at full text. The remaining 757 unique publications which met our inclusion criteria were taken forward to the classification stage.

In classification, we categorised data into parent categories (Study scope parent categories: Interventions, Comparisons, Contexts; Outcome parent categories: Environmental conditions, Production, Social Dynamics) and concentric sub-categories (hereafter called “codes”) that were established while conducting our reviewer cross-checking (see Supplementary Tables 1 and 2 for parent category and code definitions for study scopes and outcomes, respectively). We established parent categories and codes from our existing knowledge of the global oil palm literature and by consulting related systematic maps (e.g., Reiss-Woolever et al., 2021). Reviewers adjusted categories and codes as needed after screening their first 50 publications and following discussion with each other until consensus around final parent categories and codes was reached. We additionally recorded the date of publication for each study, and the country (or countries) in which publications occurred (for which we also noted if the study was conducted across Africa generally (i.e., in no specific country) or if the study occurred outside Africa but met our inclusion criteria (e.g., studies that used oil palm germplasms collected from Senegal, but which occurred in Malaysia)). As we had an a priori expectation that publications would be oriented towards oil palm as a crop, we also recorded whether they were conservation-oriented or focussed on traditional diets, uses, or practices associated with oil palm.

In the fifth stage, we analysed and visualised our findings using R and R Studio (packages *tidyverse* (Wickham et al., 2019) and *pheatmap* (Kolde, 2022)). First, we visualised changes in publication frequency over time. Then, we assessed whether the location of publications (assessed at country-level) tracked to palm oil production. To do this, we extracted country-level data on palm oil production (tonnes of oil produced, ‘*Production*’) from the database of the Food and Agriculture Organization (*FAOSTAT*, 2023), using 2019 values to prevent influence of the COVID-19 pandemic on our findings. Before plotting these data, we excluded publications that occurred across Africa generally (i.e., in no specific country; 36 studies) and publications that occurred outside Africa (e.g., studies in Malaysia that worked with oil palm germplasms from Senegal; 63 studies). A total of 658 publications remained. We did not assess whether the location of publications tracked to palm wine production, as palm oil is the dominant oil palm product globally and statistics on palm wine are less available. Finally, we produced a heatmap to assess co-occurrence between study scopes and outcomes and to identify areas with limited research. We included all 757 publications in our heatmap.

**Supplementary Table 1**. Definition of codes used for *study scopes* (Parent categories: Interventions, Comparisons, Context) for systematic map analysis.



**Supplementary Table 2**. Definition of codes used for *outcomes* (Parent categories: environmental conditions, production, social dynamics) for systematic map analysis.

**Supplementary Table 3.** Names, locations, and elevations of our 54 study plots in Sinoe County, Liberia. Plots are in three systems (forest, country palm, industrial oil palm), and arranged in six clusters (KBDE, TSTE, KPYE, BTWE, TJNS, TJNN). There are nine plots (three per system) in each cluster. Replicates with an asterisk (\*) were moved by < 200 m between our 2022 and 2023 field seasons, owing to disturbance from slash-and-burn agricultural practises in the immediate or surrounding area.

**Supplementary Table 4.** Number of years since country palm plots were farmed, and which crops were grown at time of farming. Data were collected by surveying local community members, with ethical approval obtained from the Cambridge Psychology Research Ethics Committee (Application number: PRE.2020.004). Surveys occurred during our 2023 field season. The asterisk (\*) indicates that no data were available for one plot, as we were unable to find the community member who previously farmed there.

**Supplementary Table 5.** Age of oil palm in our industrial oil palm plots. Palms are aged 4-10 years, depending on when each of Golden Veroleum Liberia’s farms were established. Reported ages are at the time of our 2023 field season.



**Supplementary Table 6.** Number of individual publications (N = 757) and research programmes (i.e., group of publications by similar authors and occurring in the same geographic space; N = 71) and the number of ecological outcomes they considered. We note that the only publication (Austin et al., 2017) considering six ecological outcomes (which also featured in the only research programme considering six ecological outcomes) was a mapping exercise based largely on already-collected ecological data (e.g., IUCN species distribution maps).



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**Supplementary Figure 1.** Our literature search yielded 2130 results, 1824 found from our ISI Web of Science search and 306 found from searching the references of our benchmark papers. After screening, we were left with 757 unique publications that met our inclusion criteria, and were included in our systematic mapping exercise.

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**Supplementary Figure 2**. Mean monthly temperature (A) and rainfall (B) in Sinoe County, Liberia, where our study is based. Values were calculated using data from 1970 – 2000 from WorldClim (https://www.worldclim.org), at a 30s resolution.

**A graph with numbers and lines

Description automatically generatedSupplementary Figure 3**. Number of studies on oil palm in Africa and globally over time. The bar chart (tracking to left-axis) indicates publications (N = 757) found by the search string used for our systematic mapping (Supplementary Text 1). The pink line (tracking to right axis) indicates studies (N = 26571) on oil palm globally, which were found using only the first part of our search string (i.e., not restricted to Africa): TS = (“oil palm” OR “palm oil” OR “elaeis guineensis” OR “palm wine”).

**References**

Amoah, F. M., Nuertey, B. N., Baidoo-Addo, K., Oppong, F. K., Osei-Bonsu, K., & Asamoah, T. E. O. (1995). Underplanting oil palm with cocoa in Ghana. *Agroforestry Systems*, *30*(3), 289–299. https://doi.org/10.1007/BF00705215

Austin, K. G., Lee, M. E., Clark, C., Forester, B. R., Urban, D. L., White, L., Kasibhatla, P. S., & Poulsen, J. R. (2017). An assessment of high carbon stock and high conservation value approaches to sustainable oil palm cultivation in Gabon. *Environmental Research Letters*, *12*(1), 014005. https://doi.org/10.1088/1748-9326/aa5437

Burton, M. E. H., Poulsen, J. R., Lee, M. E., Medjibe, V. P., Stewart, C. G., Venkataraman, A., & White, L. J. T. (2017). Reducing Carbon Emissions from Forest Conversion for Oil Palm Agriculture in Gabon. *Conservation Letters*, *10*(3), 297–307. https://doi.org/10.1111/conl.12265

Carletta, J. (1996). Assessing Agreement on Classification Tasks: The Kappa Statistic. *Computational Linguistics*, *22*(2).

Collaboration for Enviromental Evidence. (2013). Guidelines for Systematic Reviews in Environmental Management. *Environmental Evidence*, *4.2*(March), 80. https://doi.org/www.environmentalevidence.org/Documents/Guidelines/Guidelines4.2.pdf

Dejean, A., Djieto-lordon, C., & Durand, L. J. (1997). Ant Mosaic in Oil Palm Plantations of the Southwest Province of Cameroon: Impact on Leaf Miner Beetle ( Coleoptera: Chrysomelidae ). *Apiculture and Social Insects*, 1092–1096.

Hamer, K. C., Sasu, M. A., Ofosuhene, L., Asare, R., Ossom, B., Parr, C. L., Scriven, S. A., Asante, W., Addico, R., & Hill, J. K. (2021). Proximity to forest mediates trade‐offs between yields and biodiversity of birds in oil palm smallholdings. *Biotropica*, *53*(6), 1498–1509. https://doi.org/10.1111/btp.12997

Humle, T., & Matsuzawa, T. (2004). Oil Palm Use by Adjacent Communities of Chimpanzees at Bossou and Nimba Mountains, West Africa. *International Journal of Primatology*, *25*(3), 551–581. https://doi.org/10.1023/B:IJOP.0000023575.93644.f4

Kolde, R. (2022). *Package ‘pheatmap: Pretty Heatmaps.’* Accessed: https://cran.r-project.org/web/packages/pheatmap/index.html

Ocampo-Ariza, C., Denis, K., Njie Motombi, F., Bobo, K. S., Kreft, H., & Waltert, M. (2019). Extinction thresholds and negative responses of Afrotropical ant-following birds to forest cover loss in oil palm and agroforestry landscapes. *Basic and Applied Ecology*, *39*, 26–37. https://doi.org/10.1016/j.baae.2019.06.008

Ordway, E. M., Asner, G. P., & Lambin, E. F. (2017). Deforestation risk due to commodity crop expansion in sub-Saharan Africa. *Environmental Research Letters*, *12*(4), 044015. https://doi.org/10.1088/1748-9326/aa6509

Pullin, A. S., Frampton, G. K., Livoreil, B., & Petrokofsky, G. (2018). *Guidelines and Standards for Evidence Synthesis in Environmental Management*. www.environmentalevidence.org/information-for-authors

Reiss-Woolever, V. J., Luke, S. H., Stone, J., Shackelford, G. E., & Turner, E. C. (2021). Systematic mapping shows the need for increased socio-ecological research on oil palm. *Environmental Research Letters*, *16*(6), 1–19. https://doi.org/10.1088/1748-9326/abfc77

*FAOSTAT*. (2023). The United Nations. https://www.fao.org/statistics/en/

Strona, G., Stringer, S. D., Vieilledent, G., Szantoi, Z., Garcia-Ulloa, J., & Wich, S. A. (2018). Small room for compromise between oil palm cultivation and primate conservation in Africa. *Proceedings of the National Academy of Sciences of the United States of America*, *115*(35), 8811–8816. https://doi.org/10.1073/pnas.1804775115

Sutherland, W. J., Taylor, N. G., MacFarlane, D., Amano, T., Christie, A. P., Dicks, L. V., Lemasson, A. J., Littlewood, N. A., Martin, P. A., Ockendon, N., Petrovan, S. O., Robertson, R. J., Rocha, R., Shackelford, G. E., Smith, R. K., Tyler, E. H. M., & Wordley, C. F. R. (2019). Building a tool to overcome barriers in research-implementation spaces: The Conservation Evidence database. *Biological Conservation*, *238*(June). https://doi.org/10.1016/j.biocon.2019.108199

Tabe-Ojong, M. P. Jr., Molua, E. L., Nanfouet, M. A., Mkong, C. J., Kiven, V., & Ntegang, V. A. (2023). Oil palm production, income gains, and off-farm employment among independent producers in Cameroon. *Ecological Economics*, *208*, 107817. https://doi.org/10.1016/j.ecolecon.2023.107817

Wich, S. A., Garcia-Ulloa, J., Kühl, H. S., Humle, T., Lee, J. S. H., & Koh, L. P. (2014). Will oil palm’s homecoming spell doom for Africa’s great apes? *Current Biology*, *24*(14), 1659–1663. https://doi.org/10.1016/j.cub.2014.05.077

Wickham, H., Averick, M., Bryan, J., Chang, W., McGowan, L., François, R., Grolemund, G., Hayes, A., Henry, L., Hester, J., Kuhn, M., Pedersen, T., Miller, E., Bache, S., Müller, K., Ooms, J., Robinson, D., Seidel, D., Spinu, V., … Yutani, H. (2019). Welcome to the Tidyverse. *Journal of Open Source Software*, *4*(43), 1686. https://doi.org/10.21105/joss.01686