

## Renewables Global Status Report 2025 - Renewables in Agriculture - Endnotes

- 1 International Energy Agency, "World Energy Balances", 2025, https://www.iea.org/data-and-statistics/data-product/world-energy-balances.
- 2 International Energy Agency, "World Energy Balances", 2025, https://www.iea.org/data-and-statistics/data-product/world-energy-balances.
- 3 REN21, "Renewables 2025 Global Status Report: Global Overview", June 2025, https://www.ren21.net/gsr-2025/. Figure A 1 from International Energy Agency, "World Energy Balances", 2025, https://www.iea.org/data-and-statistics/data-product/world-energy-balances.
- 4 Food and Agriculture Organization, "Greenhouse Gas Emissions from Agrifood Systems. Global, Regional and Country Trends, 2000–2022", accessed 22 July 2025, https://www.fao.org/statistics/highlights-archive/highlights-detail/greenhouse-gas-emissions-from-agrifood-systems.-global--regional-and-country-trends--2000-2022/en.
- 5 Food and Agriculture Organization of the United Nations, "STATISTICAL YEARBOOK WORLD FOOD AND AGRICULTURE 2024", 2024, https://doi.org/10.4060/CD2971EN.
- 6 IRENA and FAO, "Renewable Energy for Agri-Food Systems: Towards the Sustainable Development Goals and the Paris Agreement", 2021, https://www.fao.org/documents/card/en/c/cb7433en.
- 7 Food and Agriculture Organization, "Home | Energy", accessed 18 July 2025, https://www.fao.org/energy/home/en/.
- 8 International Energy Agency, "World Extended Energy Balances," July 2024, https://www.iea.org/data-and-statistics/data-product/world-energy-balances; Manas Puri et al., "THE SMALL-SCALE FISHERIES AND ENERGY NEXUS Opportunities for Renewable Energy Interventions", Food and Agriculture Organization, 2023,
  - https://openknowledge.fao.org/server/api/core/bitstreams/7a3f05c9-8efe-4178-a6f3-e8ba15a40c50/content.
- 9 Manas Puri et al., "THE SMALL-SCALE FISHERIES AND ENERGY NEXUS Opportunities for Renewable Energy Interventions", Food and Agriculture Organization, 2023, https://openknowledge.fao.org/server/api/core/bitstreams/7a3f05c9-8efe-4178-
- 10 International Energy Agency, "World Energy Balances", 2025, https://www.iea.org/data-and-statistics/data-product/world-energy-balances.

a6f3-e8ba15a40c50/content.

- 11 Eurostat, "Agri-Environmental Indicator Energy Use", accessed 22 July 2025, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agri-environmental\_indicator\_-\_energy\_use; Eurostat, "Statistics Explained Glossary: Petroleum products", accessed 1 August 2025, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Petroleum\_products.
- 12 SNV, "Takeaways 2nd Eastern Africa Agroecology Conference", 4 April 2025, https://www.snv.org/update/takeaways-from-the-2nd-eastern-africa-agroecology-conference; IRENA and FAO, "Renewable Energy for Agri-Food Systems: Towards the Sustainable Development Goals and the Paris Agreement", 2021, https://www.fao.org/documents/card/en/c/cb7433en.
- 13 Max Tromssdorf et al., "Agrivoltaics: Opportunities for Agriculture and the Energy Transition", Fraunhofer Institute for Solar Energy Systems ISE, February 2024, https://www.ise.fraunhofer.de/en/publications/studies/agrivoltaics-opportunities-for-agriculture-and-the-energy-transition.html.
- 14 Cervicorn Consulting, "Agrivoltaics Market Size to Surpass USD 12.26 Billion by 2034", 20 March 2025, https://www.cervicornconsulting.com/agrivoltaics-market.
- 15 Max Tromssdorf et al., "Agrivoltaics: Opportunities for Agriculture and the Energy Transition", Fraunhofer Institute for Solar Energy Systems ISE, February 2024, https://www.ise.fraunhofer.de/en/publications/studies/agrivoltaics-opportunities-for-agriculture-and-the-energy-transition.html.
- 16 US Department of Energy, "Agrivoltaics: Solar and Agriculture Co-Location", Energy.gov, accessed 11 July 2025, https://www.energy.gov/eere/solar/agrivoltaics-solar-and-agriculture-co-location.
- 17 International Energy Agency, Photovoltaic Power Systems Programme, "Trends in PV Applications", 2024, https://iea-pvps.org/trends\_reports/trends-in-pv-applications-2024/.
- 18 France Nature Environnement, "Compte-Rendu: Webinaire FNE « Agrivoltaïsme, Enjeux Énergétiques et Agricoles » Du 13 Mars 2025" [Report: FNE Webinar "Agrivoltaics, Energy and Agricultural Issues" of 13 March 2025], March 2025, https://fne.asso.fr/system/files/inline-files/Webinaire%20AGriPV%202%20du%2013.03.2025%20-%20Compte%20ren du.pdf.
- 19 Carl Pump et al., "Agrivoltaics in Germany Status Quo and Future Developments", AgriVoltaics Conference Proceedings 2 (2024), https://agris.fao.org/search/en/providers/122436/records/67597e51c7a957febdf 8fea7.
- 20 Sara Fall, "Lighting the Way for Agrivoltaics: How NREL Empowers Communities To Capture the Benefits of Solar Energy, Agriculture, and Ecosystems", NREL, 21

- November 2024, https://www.nrel.gov/news/feature/2024/lighting-the-way-for-agrivoltaics; Open Energy Information, "InSPIRE/Agrivoltaics Map", accessed 22 July 2025, https://openei.org/wiki/InSPIRE/Agrivoltaics\_Map.
- 21 Alyssa Andrew et al., "United States Solar Grazing 2024 Census", American Solar Grazing Association, 18 August 2024, https://solargrazing.org/census/.
- 22 Tina Casey, "Massive 2-GW Agrivoltaic Project Will Restore Desert To Life", CleanTechnica, 19 April 2025, https://cleantechnica.com/2025/04/19/massive-2-gw-agrivoltaic-project-aims-to-restore-desert-in-china/.
- 23 People's Government of the Gannan Tibetan Autonomous Prefecture, "夏河:牧 光互补项目绘就高原生态新图景" [Xiahe: Pastoral-Solar Complementary Project Draws a New Picture of Plateau Ecology], 6 June 2025, http://www.gnzrmzf.gov.cn/info/1059/78949.htm.
- 24 People.cn, "活力青海 | "光伏羊",持証上崗! " [Vibrant Qinghai | 'Photovoltaic Sheep', Certified to Work!], 30 July 2024, http://gh.people.com.cn/BIG5/n2/2024/0730/c410697-40927883.html.
- 25 Tina Casey, "Massive 2-GW Agrivoltaic Project Aims To Restore Desert In China", CleanTechnica, 19 April 2025, https://cleantechnica.com/2025/04/19/massive-2-gw-agrivoltaic-project-aims-to-restore-desert-in-china/.
- 26 Lodestone Energy, "Kohirā Solar Farm", accessed 18 July 2025, https://lodestoneenergy.co.nz/kaitaia/; Farmers Weekly, "Rangitaiki Solar Farm Completed in BoP", 19 July 2024, https://www.farmersweekly.co.nz/technology/rangitaiki-solar-farm-completed-in-bop/.
- 27 Precedence Research, "Agrivoltaics Market Size to Surpass USD 13.88 Billion by 2034", 9 May 2025, https://www.precedenceresearch.com/agrivoltaics-market.
- 28 In the Netherlands, which has a substantial greenhouse sector, 53% of agricultural CO2 emissions were generated by greenhouses in 2021. Olaf Koops, P. Bogaart and K. Geertjes, "Emissies van de Nederlandse landbouw naar productgroepen" [Dutch agriculture emissions by product category], Centraal Bureau voor de Statistiek [Central Statistics Agency], 11 December 2024, https://www.cbs.nl/nl-nl/longread/aanvullende-statistischediensten/2024/emissies-van-de-nederlandse-landbouw-naar-productgroepenerratum/samenvatting.
- 29 Market Report Analytics, "Solar Green House 2025-2033 Trends: Unveiling Growth Opportunities and Competitor Dynamics", 5 April 2025, https://www.marketreportanalytics.com/reports/solar-green-house-61724#summary.
- 30 Market Report Analytics, "Solar Green House 2025-2033 Trends: Unveiling Growth Opportunities and Competitor Dynamics", 5 April 2025,

- https://www.marketreportanalytics.com/reports/solar-green-house-61724#summary.
- 31 Archive Market Research, "Greenhouse Solar System Unlocking Growth Potential: Analysis and Forecasts 2025-2033", 1 July 2025, https://www.archivemarketresearch.com/reports/greenhouse-solar-system-709675.
- 32 Bin Guo et al., "A Critical Review of the Status of Current Greenhouse Technology in China and Development Prospects", Applied Sciences 14, no. 13 (January 2024): 5952, https://doi.org/10.3390/app14135952.
- 33 T.M. Abir Ahsan, Md. S. Rahman and Md. S. Ahamed, "Geothermal Energy Application for Greenhouse Microclimate Management: A Review", Geothermics 127, March 2025,
  - https://www.sciencedirect.com/science/article/abs/pii/S0375650524002955.
- 34 Igor Todorović, "Turkey Accounts for One Third of World's Geothermal Greenhouses", Balkan Green Energy News, 5 August 2022, https://balkangreenenergynews.com/turkey-accounts-for-one-third-of-worldsgeothermal-greenhouses/; Stephanie Alexandra Pinnington and K. Rai, "Geothermal Energy: Unveiling the Socioeconomic Benefits", ESMAP, 2 January 2024, https://www.esmap.org/Geothermal\_Socioeconomic\_Benefits.
- 35 Igor Todorović, "Turkish Geothermal-Heated Greenhouse Firm Wants to Beat Netherlands in Food Exports", Balkan Green Energy News, 6 February 2024, https://balkangreenenergynews.com/turkish-geothermal-heated-greenhouse-firm-wants-to-beat-netherlands-in-food-exports/.
- 36 Carlo Cariaga, "Maasdijk, Netherlands geothermal greenhouse project celebrates start of operations", Think Geoenergy, 21 May 2025, https://www.thinkgeoenergy.com/maasdijk-netherlands-geothermal-greenhouse-project-celebrates-start-of-operations/.
- 37 Aardwarmte Maasdijk, "Aardwarmte Maasdijk" [Geothermal energy Maasdijk], accessed 21 July 2025, https://www.aardwarmtemaasdijk.nl/.
- 38 Huka Prawn Park, "New World Leading Low Carbon Heating System on a Grand Scale", accessed 21 July 2025, https://hukaprawnpark.co.nz/latest-news/new-world-leading-low-carbon-heating-system-on-a-grand-scale/; "History Huka Prawn Park", accessed 21 July 2025, https://hukaprawnpark.co.nz/about/history/.
- 39 Dana Shugrue, "Get to Know Fridheimar: The Geothermal Tomato Farm in Iceland", CEAg World, 10 July 2025, https://www.ceagworld.com/greenhouse-produce/get-to-know-fridheimar-the-geothermal-tomato-farm-in-iceland/; Fridheimar, "The Greenest Green", accessed 23 August 2025, https://fridheimar.is/sustainability.
- 40 New Zealand Ministry of Foreign Affairs and Trade, "Iceland: Green Transition & Renewable Energy September 2024", 27 September 2024,

- https://www.mfat.govt.nz/en/trade/mfat-market-reports/iceland-green-transition-and-renewable-energy-september-2024.
- 41 T.M. Abir Ahsan, Md. S. Rahman and Md. S. Ahamed, "Geothermal Energy Application for Greenhouse Microclimate Management: A Review", Geothermics 127, March 2025, https://www.sciencedirect.com/science/article/abs/pii/S0375650524002955.
- 42 M. Gustafsson et al., "A Perspective on the State of the Biogas Industry in 12 Member Countries of IEA Bioenergy Task 37" International Energy Agency, September 2024, https://www.ieabioenergy.com/wp
  - content/uploads/2024/10/IEA\_Bioenergy\_T37\_CountryReportSummary\_2024.pd f; International Energy Agency, "Outlook for Biogas and Biomethane Analysis", May 2025, https://www.iea.org/reports/outlook-for-biogas-and-biomethane.
- 43 M. Gustafsson et al., "A Perspective on the State of the Biogas Industry in 12 Member Countries of IEA Bioenergy Task 37" International Energy Agency, September 2024, https://www.ieabioenergy.com/wp-content/uploads/2024/10/IEA\_Bioenergy\_T37\_CountryReportSummary\_2024.pd f.
- 44 M. Gustafsson et al., "A Perspective on the State of the Biogas Industry in 12 Member Countries of IEA Bioenergy Task 37" International Energy Agency, September 2024, https://www.ieabioenergy.com/wp-content/uploads/2024/10/IEA\_Bioenergy\_T37\_CountryReportSummary\_2024.pd f.
- 45 M. Gustafsson et al., "A Perspective on the State of the Biogas Industry in 12 Member Countries of IEA Bioenergy Task 37" International Energy Agency, September 2024, https://www.ieabioenergy.com/wp-content/uploads/2024/10/IEA\_Bioenergy\_T37\_CountryReportSummary\_2024.pd f.
- 46 M. Gustafsson et al., "A Perspective on the State of the Biogas Industry in 12 Member Countries of IEA Bioenergy Task 37" International Energy Agency, September 2024, https://www.ieabioenergy.com/wp-content/uploads/2024/10/IEA\_Bioenergy\_T37\_CountryReportSummary\_2024.pd f
- 47 M. Gustafsson et al., "A Perspective on the State of the Biogas Industry in 12 Member Countries of IEA Bioenergy Task 37" International Energy Agency, September 2024, https://www.ieabioenergy.com/wp-content/uploads/2024/10/IEA\_Bioenergy\_T37\_CountryReportSummary\_2024.pd f
- 48 M. Gustafsson et al., "A Perspective on the State of the Biogas Industry in 12 Member Countries of IEA Bioenergy Task 37" International Energy Agency, September 2024, https://www.ieabioenergy.com/wp-

- content/uploads/2024/10/IEA\_Bioenergy\_T37\_CountryReportSummary\_2024.pd f.
- 49 EU Japan Centre for Industrial Cooperation, "The Market for Biogas Plants in Japan and Opportunities for EU Companies", January 2021, https://www.ecos.eu/files/content/downloads/publikationen/REPORT\_Biogas\_2 021.pdf.
- 50 International Energy Agency, "Outlook for Biogas and Biomethane Analysis IEA", May 2025, https://www.iea.org/reports/outlook-for-biogas-and-biomethane.
- 51 US Environmental Protection Agency, "Frequent Questions about Livestock Biogas Projects", accessed 21 July 2025, https://www.epa.gov/agstar/frequent-questions-about-livestock-biogas-projects.
- 52 Nora Goldstein, "Taking Pulse Of The Biogas Industry", BioCycle, 25 February 2025, https://www.biocycle.net/taking-pulse-of-the-biogas-industry/.
- 53 US Environmental Protection Agency, "AgSTAR Data and Trends", accessed 21 July 2025, https://www.epa.gov/agstar/agstar-data-and-trends.
- 54 The Business Research Company, "Electric Tractor Market Report 2025, Share Analysis, Forecast", January 2025, https://www.thebusinessresearchcompany.com/report/electric-tractor-global-market-report; Market Research Future, "Electric Tractor Market Size, Growth, Trends, Report 2034", July 2025, https://www.marketresearchfuture.com/reports/electric-tractor-market-33512.
- 55 Global Insight Lab, "New Energy Electric Agricultural Machinery Market Size, Trends, Key Highlights & Transformation Trends 2033", 15 July 2025, https://www.linkedin.com/pulse/new-energy-electric-agricultural-machinery-market-size-79xwf/.
- 56 J. Stakens, A. Mutule and R. Lazdins, "Agriculture Electrification, Emerging Technologies, Trends and Barriers: A Comprehensive Literature Review", Latvian Journal of Physics and Technical Sciences 60, no. 3 (June 1, 2023): 18–32, https://doi.org/10.2478/lpts-2023-0015; BKT Tires, "Insights & Forecasts: Electrification in Agricultural Machinery: Is It the Only Path Forward?", 29 November 2024, https://www.bkt-tires.com/ww/us/blog/agriculture-blog/electrification-in-agricultural-machinery-is-it-the-only-path-forward.
- 57 Martin Smits, "Start-Ups Also Focus on Electric Tractors", Future Farming, 27 November 2023, https://www.futurefarming.com/tech-in-focus/start-ups-also-focus-on-electric-tractors/; The Business Research Company, "Electric Tractor Market Report 2025, Share Analysis, Forecast", January 2025, https://www.thebusinessresearchcompany.com/report/electric-tractor-global-market-report; UK Research and Innovation, "Driving the Electric Revolution in Agrifood", November 2021, https://www.ukri.org/wp-

- content/uploads/2021/11/UKRI-241121-DrivingElectricRevolution-AgriFoodReport.pdf.
- 58 WorkTruck, "Electric Tractor Rental Now Available From Solectrac Utility Fleet", 28 June, 2023 https://www.worktruckonline.com/10201520/electric-tractor-rental-now-available-from-solectrac.
- 59 Jingxiu Qin et al., "Global Energy Use and Carbon Emissions from Irrigated Agriculture", Nature Communications 15 (April 10, 2024): 3084, https://doi.org/10.1038/s41467-024-47383-5.
- 60 IRENA, "Off-Grid Renewable Energy Statistics 2024", December 2024, https://www.irena.org/Publications/2024/Dec/Off-grid-Renewable-Energy-Statistics-2024.
- 61 IRENA, "Off-Grid Renewable Energy Statistics 2024", December 2024, https://www.irena.org/Publications/2024/Dec/Off-grid-Renewable-Energy-Statistics-2024.
- 62 Precedence Research, "Solar Water Pump Market Size to Hit USD 10.26 Bn by 2034", 2 October 2024, https://www.precedenceresearch.com/solar-water-pump-market.
- 63 CLASP, "Spotlight on Solar Water Pumps", CLASP (blog), accessed 31 May 2025, https://www.clasp.ngo/report/net-zero-heroes/spotlights/spotlight-on-solar-water-pumps/.
- 64 Oliver Reynolds and S. Paixão, "Insights from GOGLA's 2024 Sales and Impact Data", GOGLA (blog), 26 May 2025, https://gogla.org/reports/semi-annual-solar-market-report/insights-from-goglas-2024-sales-and-impact-data/.
- 65 European Commission, Directorate-General for Maritime Affairs and Fisheries, "Possibilities and Examples for Energy Transition of Fishing and Aquaculture Sectors", March 2023, https://medblueconomyplatform.org/wp-content/uploads/2023/03/2023\_possibilities-and-examples-for-energy-transition-of-fishing-and-aquaculture-sectors.pdf; United Nations Conference on Trade and Development, "Energy transition of fishing fleets; Opportunities and challenges for developing countries", 2024, https://unctad.org/system/files/official-document/ditcted2023d5\_en.pdf.
- 66 REN21, "REN21 Policy Database", 2025. Figure A 2 from REN21, "REN21 Policy Database", 2025.
- 67 REN21, "REN21 Policy Database", 2025.
- 68 REN21, "REN21 Policy Database", 2025; European Commission, "La Commissione approva un regime italiano da 1,7 miliardi di € a sostegno di impianti agrivoltaici" [The Commission approves an Italian scheme of €1.7 billion for agrivoltaics facilities", 10 November 2023, https://italy.representation.ec.europa.eu/notizie-ed-eventi/notizie/la-commissione-approva-un-regime-italiano-da-17-miliardi-di-eu-sostegno-di-impianti-agrivoltaici-2023-11-10\_it; Elmehdi El Azhary, "Agriculture: le Maroc

- mise sur l'énergie solaire pour révolutionner le secteur" [Agriculture: Morocco is banking on solar energy to revolutionise the sector], Telquel.ma, 21 May 2024, https://telquel.ma/2024/05/21/agriculture-le-maroc-mise-sur-lenergie-solaire-pour-revolutionner-le-secteur\_1873394; Government of the United Kingdom, "Funding for Farmers, Growers and Land Managers", 10 July 2025, https://www.gov.uk/guidance/funding-for-farmers.
- 69 John Dewar, "Electricity Regulation 2024", September 2023, https://www.milbank.com/a/web/hF5BRPhtLiNkNUbNvLUHGP/2024-electricity-regulation-global.pdf%20-%20page%20258.
- 70 Bloomberg, "Electric Farms Are Using Solar Power to Grow Profits And", 20 May 2022, https://www.energyconnects.com/news/renewables/2022/may/electric-farms-are-using-solar-power-to-grow-profits-and-crops/.
- 71 International Energy Agency, Photovoltaic Power Systems Programme, "Dual Land Use for Agriculture and Solar Power Production: Overview and Performance of Agrivoltaic Systems", March 2025, https://iea-pvps.org/key-topics/dual-land-use-agriculture-solar-power-production/.
- 72 Government of Croatia, "ACT ON AMENDMENTS TO THE PHYSICAL PLANNING ACT", Official Gazette 'Narodne Novine' 67/2023, 21 June 2023, https://mpgi.gov.hr/UserDocsImages/dokumenti/Propisi/Physical\_Planning\_Act\_ 67-2023.pdf; International Energy Agency, Photovoltaic Power Systems Programme, "Trends in PV Applications", 2024, https://iea-pvps.org/trends\_reports/trends-in-pv-applications-2024/; Pawel Czyzak and T. Mindekova, "Empowering farmers in Central Europe: the case for agri-PV", Ember Energy, 29 August 2024, https://ember-energy.org/latest-insights/empowering-farmers-in-central-europe-the-case-for-agri-pv/.
- 73 Government of Croatia, "ACT ON AMENDMENTS TO THE PHYSICAL PLANNING ACT", Official Gazette 'Narodne Novine' 67/2023, 21 June 2023, https://mpgi.gov.hr/UserDocsImages/dokumenti/Propisi/Physical\_Planning\_Act\_ 67-2023.pdf; International Energy Agency, Photovoltaic Power Systems Programme, "Trends in PV Applications", 2024, https://iea-pvps.org/trends reports/trends-in-pv-applications-2024/.
- 74 AFIR, "Detalii Şi Anexe Schemă ENERGIE" [Details and Annexes ENERGY Scheme], accessed 1 June 2025, https://www.afir.ro/domenii-de-interventie/detalii-si-anexe-schema-energie; Agricultura E. Pescas [Agriculture and Fisheries], "Portaria 274/2024/1, de 21 de Outubro" [Ordinance 274/2024/1, of 21 October], Diários da República, 21 October 2024, https://dre.tretas.org/dre/5936139/portaria-274-2024-1-de-21-de-outubro.
- 75 REN21, "REN21 Policy Database", 2025.
- 76 Ministry of Agriculture, Zambia, "National Agricultural Mechanisation Strategy 2024 2028", 2024, https://www.agriculture.gov.zm/wp-content/uploads/2024/07/NationalMechanizationPlann.pdf.

- 77 Federal Office for Agriculture, Switzerland, "Agriculture and Food Climate Strategy 2050", 28 May 2025, https://backend.blw.admin.ch/fileservice/sdwebdocs-prod-blwch-files/files/2024/07/29/626ebd80-f58d-49be-af58-50aaa5deadeb.pdf; definition of cascade principle: Kieran Campbell-Johnson et al., "The Circular Economy and Cascading: Towards a Framework", Resources, Conservation & Recycling: X, Vol.7, September 2020, https://www.sciencedirect.com/science/article/pii/S2590289X20300098?via%3 Dihub.
- 78 Ministry of Energy and Mineral Development, Uganda, "Energy Policy for Uganda 2023", National Renewable Energy Platform, 2023, https://nrep.ug/document/energy-policy-for-uganda-2023/.
- 79 Ministry of New and Renewable Energy, India, "Biogas Programme (Phase-I) for FY 2021-22 to 2025-26", accessed 22 July 2025, https://biogas.mnre.gov.in/about-the-programmes.
- 80 Ministry of Energy and Petroleum, Kenya, "Strategic Plan 2023-2027" July 2023, https://www.petroleum.go.ke/sites/default/files/Final%20Draft%20Strategic%20 Plan.pdf.
- 81 US Department of Agriculture, "Rural Energy For America Program (REAP)", accessed 23 July 2025, https://www.rd.usda.gov/inflation-reduction-act/rural-energy-america-program-reap.