

DAFTAR PUSTAKA

- ASTM (2013a) Standard D1762-84: Standard Test Method for Chemical Analysis of Wood Charcoal. ASTM International, West Conshohocken, PA.
- Artz, R.R.E, Chapman, S.J., Robertsso, A.H.J, Potts, J.M., Defarge, F.L, Gogo, S., Comont, L., Disnar, J.N. and Francez, A.J. 2008. FTIR spectroscopy can be used a screening tool for organic matter quality in generating cutover peat lands. *Journal Soil Biology and Biochemistry*. 40, 515-527.
- Balai Penelitian Tanah. 2015. Petunjuk Teknis Biochar. Badan penelitian dan Pengembangan Pertanian. Departemen pertanian bogor. 47 hal
- Bambang. 2012. Potential Mechanisms for Achieving Agricultural Benefits from Biochar Application To Temperate Soils: a review. *Plant and Soil*. 337, 1–18.
- Bird, M.I., Christopher M.W., Pedro H. de Paula Silva., Adrian M.B and Rocky de Nys. 2011. Algal biochar – production and properties. *Bioresource Technology*. 102,1886–1891
- Budai, A, Liang W., Morten G., Line T.St., Michael J. Antal J.r., Samuel A., Alba D.A., Andres A.C. and Daniel P.R. 2014. Surface Properties and Chemical Composition of Corncob andMiscanthus Biochars: Effects of Production Temperature and Method. *J. Agric. Food Chem*. 62, 3791–3799
- Camberato, J.J. 2001. *Cation Exchange Capacity – Everything you want to know and much more*. Clemson University, Crop and Soil environmental Science
- Cantrell K.B., Hunt P.G., Uchimiya M., Novak J.M., Ro K.S. 2012. Impact of Pyrolysis Temperature and Manure Source on Physicochemical Characteristics of Biochar. *Bioresour Technol*. 107, 419–428
- Cornell University. 2010. *Biochar soil management*. Soil Fertility Management and Soil Biogeochemistry. Department of Crop and Soil Sciences, Cornel University.
- Dariah, A., Nurida N.L. and Sutono. 2013. The Effect of Biochar on Soil Quality and Maize Production in Upland in Dry Climate Region. *In Proceeding 11thinternational Conference the East and Southeast Asia federation of Soil Science Societies*. Bogor, Indonesia
- Direktorat Jederal Perkebunan. 2017. Statistik Perkebunan Indonesia 2015 – 2017 Kelapa. Sekretariat Direktorat Jenderal Perkebunan, Kementerian Pertanian. Jakarta. 85 hal.

- Enders, A., Hanley K., Whitman T., Joseph S., Lehmann J. 2012. Karakterisasi Biochar untuk Menikmati Recalcitrance dan Kinerja Agronomi. *Bioresour Technol.* 114, 644–653.
- Endriani, Sunarti dan Ajidirman. 2013. Pemanfaatan Biochar Cangkang Kelapa Sawit Sebagai Soil Amandement Ultisol. Sungai Bahar Jambi. *J. Penelitian Univeritas Jambi Seri Sains.* Vol 5 (1).
- Erickson, C. 2003. Historical ecology and future explorations. In: J. Lehmann, D.C. Kern, B. Glaser, and W.I. Woods (eds.), *Amazonian Dark Earths: origin, properties, management.* Dordrecht, Kluwer Academic Publishers Pages: 455-500.
- Foth, H.D. and Turk, 1972. *Fundamentals of Soil Science*, fifth edition. Toppan Printing Co. (S) Pte. Ltd, Singapore. 454.
- Fuertes, A.B., Camps Arbestain M., Sevilla M., Macia-Agullo J.A., Fiol S., Lo´pez R., Smernik R.J., Aitkenhead W.P., Arce F. and Macias F. 2010. Chemical and Structural Properties of Carbonaceous Products Obtained by Pyrolysis and Hydrothermal Carbonisation of Corn Stover. *Aust J Soil Res.* 48, 618–626.
- Gani, A. 2009. Biochar Peneyelamat Lingkungan. *Balai Besar Penelitian Tanaman Padi.* Warta Penelitian dan Pengembangan Pertanian 31 (6): 15-16.
- Gani, A. 2010. *Multi guna Arang Hayati Biochar.* Sinar Tani Edisi 13-19 Oktober 2010.
- Glaser, B., Haumaier L., Guggenberger G., Zech W. 2001. *The ‘Terra Preta’ Phenomenon: a model for sustainable agriculture in the humid tropics.* *Naturwissenschaften.* 88(1), 37–41.
- Glaser, B., Lehmann J. and Zech W. 2002. Ameliorating Physical and Chemical Properties of Highly Weathered Soils in The Tropics with Charcoal – A review. *Biology and fertility of soils.* 35, 219–230.
- Haefele, S.M., Konboon Y., Wongboon W., Amarante S., Maarifat A.A., Pfeiffer E.M., and Knoblauch C. 2011. Effects and Fate of Biochar from Rice Residues in Ricebased Systems. *Field Crop. Res.* 123 (3), 430-440.
- Hernandez-Mena, L., Pecora A., Beraldo A., 2014. Pirolisis Lambat Biomassa Bambu: Analisis Sifat Biochar. *Teknik Kimia Transaksi.* 37, 115-120.
- Herviyanti, Maulana A, Prima S, Aprisal A, Crisna S.D, and Lita A.L. 2019. Effect of Biochar from Young Coconut Waste to Improve Chemical Properties of Ultisols And Growth Coffee [*Coffea Arabica L.*] Plant Seeds. IOP Conf. Series: *Earth and Environmental Science.* 497.

- Ippolito, J. A., Laird D. A. dan Busscher W. J. 2012. Environmental Benefits of Biochar. *J. Environ. Qual.* 41, 967–972.
- Iskandar, T. dan Umi R. 2017. Karakteristik Biochar Berdasarkan Jenis Biomassa dan Parameter proses Pyrolisis. *Jurnal Teknik Kimia.* Vol 12, No1.
- Joseph, S., Peacocke C., Lehmann J. and Monroe P. 2009. Developing A Biochar Classification and Test Methods. In *Biochar for Environmental Management: Science and Technology*. 1st edn. (Eds J Lehmann, S Joseph) Earthscan, London. 107–126.
- Komarayati, S., Gusmailina, dan Pari G. 2012. Arang dan Cuka Kayu: Produk Hasil Hutan Bukan Kayu untuk Meningkatkan Pertumbuhan Tanaman dan Serapan Hara. *Penelitian Hasil Hutan.* 31 (1), 49-62.
- Kondo Yan dan Arsyad Muhammad. 2018. Analisis Kandungan Lignin, Selulosa dan Hemiselulosa Serat Sabut Kelapa Akibat Perlakuan Alkali. Vol 5 (2), 94-97
- Kumar, U., Maroufi S., Rajarao R., Mayyas M., Mansuri I., Joshi R. K. 2010. Cleaner Production of Iron by Using Waste Macadamia Biomass as a Carbon Resource. *J. Clean. Prod.* 158, 218–224.
- Kuppusamy, S., Thavamani, P. and Megharaj, M. 2016. Agronomic and Remedial Benefits and Risks of Applying Biochar to Soil. *Current knowledge and future research directions Environment International.* [87](#), 1-12.
- Lee, Y., Park J., Ryu C., Gang K.S., Yang W., Park Y.K., Jung J., Hyun S. 2013. Comparison of Biochar Properties from Biomass Residues Produced by Slow Pyrolysis at 500°C. *Bioresource Technology* 148, 196–201.
- Lehmann, J., Silva J.P.D., Steiner C., Nehls T., Zech W., Glaser B. 2003. Nutrient Availability and Leaching in an Archaeological Anthrosol and a Ferralsol of the Central Amazon Basin: fertilizer, manure and charcoal amendments. *Plant and Soil.* 249, 343–357.
- Lehmann J and Joseph, S. 2009. Biochar for Environmental Management: An Introduction. *Science and Technology* (Johannes Lehmann and Stephen Joseph Eds.). First published by Earthscan in the UK and USA in 2009. Pages: 12 .
- Lehmann, J., J.P. da Silva Junior, Steiner C., Nehls T., Zech W and Glaser B. 2011. Nutrient Availability and Leaching in an Archaeological Anthrosol and a Ferralsol of the Central Amazon Basin: Fertilizer, manure and charcoal amendments. *Plant and Soil.* 249, 343-357.
- Lu, H., Zhang Y.Y, Huang X., Wang S., Qiu R., 2012. Relative Distribution of Pb²⁺ Sorption Mechanisms by Sludge-Derived Biochar. *WatRes* 46,854–862

- Neves, E.G., James B.P., Robert N.B. and Carlos A.D.S, 2003. Historical and Socio-Cultural Origins of Amazonian Dark Earths. *J. Lehmann, et al. (eds.)*, Amazonian Dark Earths: Origin, Properties, Management, 29-50.
- Nurida, N.L., Dariah A. dan Rachman A. 2009. Kualitas Limbah Pertanian Sebagai Bahan Baku Pembuat Berupa Biochar untuk Rehabilitasi Lahan. *Prosiding Seminar Nasional dan dialog Sumberdaya Lahan Pertanian*. Hal 209-215.
- Nurida, N.L., dan Rachman A.. 2012. Alternatif Pemulihan Lahan Kering Masam Terdegradasi dengan Formula Pembuat Tanah Biochar di Typic Kanhapludults Lampung. *Prosiding Teknologi Pemupukan dan Pemulihan Lahan terdegradasi*. Hal 639-648
- Nurida, N.L., Dariah A. dan Rachman A. 2013. Peningkatan Kualitas Tanah Dengan Pembuat Tanah Biochar Limbah Pertanian. *Jurnal tanah dan Iklim* 37(2); 69-78.
- Madison, W.I., Sherrod L.A., Dunn G., Peterson G.A. and Kolberg R.L. 2002. Soil Science Society of America, Inorganic carbon analysis by modified pressure-calcimeter method. *J Soil Sci Soc Am* . 66,299–305.
- Maftu'ah, E. dan Nursyamsi D. 2015. Potensi Berbagai Bahan Organik Rawa Sebagai Sumber Biochar. Seminar Nasional Masyarakat Biodiv Indonesia. (4), 776-781.
- Mukherjee, A, Zimmerman AR, Harris W. 2011. Surface Chemistry Variations Among a Series of Laboratory Produced Biochars. *Geoderma*.163, 247–255.
- Mukherjee, A. and Lal R. 2014. The Biochar Dilemma. *Soil Research*. 52, 217–230
- Nigussie, A., Kissi E., Misganaw M. and Ambaw G. 2012. Effect of Biochar Application on Soilproperties and Nutrient Uptake of Lettuces (*Lactuca Sativa*) Grown in Chromium Pollutedsoils. *American-Eurasian Journal of AgriculturL& Environmental Science*. 12(3) pages: 369-376.
- Ogawa, M. 2006. Carbon Sequestration by Carbonization of Biomass and Ferestation: *Three Case Studies*. 133-146.
- Okuno, T., Sonoyama N., Hayashi JI., Li CZ., Sathe C., Chiba T. 2005. Primary Release of Alkali and Alkaline Earth Metallic Species During the Pyrolysis of Pulverized Biomass. *Energy and Fuels*. 19, 2164–2171.
- Pansu, M., Gautheyrou J. 2006. Handbook of Soil Analysis: Mineralogical, Organic and Inorganic Methods. SpringerVerlag. Berlin.19, 993.

- Park, B.B., Yani R.D., Sahm J.M., Lee D.K and Abrahamson L.P. 2004. Wood Ash Effect on Plant and Soil in a Willow Bioenergy Plantation. *Water, Air and Soil Pollution*. 159, 209-224.
- Rajkovich, S., Enders A., Hanley K., Hyland C., Zimmerman A.R., Lehmann J. 2012. Corn Growth and Nitrogen Nutrition After Additions of Biochars With Varying Properties to a Temperate Soil. *Biology and Fertility of Soils*. 48, 271–284.
- Rehrah, D., Reddy M.R., Novak J.M., Bansode R.R., Schimmel K.A., Yu J., Watts D.W. and Ahmedna M. 2014. Production and Characterization of Biochars From Agricultural Byproducts for Use in Soil Quality Enhancement. *Journal of Analytical and Applied Pyrolysis*. 108,301
- Riley, J.T. 2007. Routine Coal and Coke Analysis: Collection, Interpretation, and Use of Analytical Data. ASTM International, West Conshohocken, PA
- Santi, L. P dan Goenadi D.H. 2012. Pemanfaatan Biochar Asal Cangkang Kelapa Sawit sebagai Bahan Pembawa Mikroba Pemantap Agregat. *Buana Sains* 12, 7-14.
- Satriawan B. D and Handayanto E. 2015. Effects of Biochar and Crop Residues Application on Chemical Properties of a Degraded Soil of South Malang, and P Uptake by Maize. *Journal of Degraded*. 2, 271-280.
- Schmidt, H.P and Taylor P. 2014. Kon-Tiki Flame Curtain Pyrolysis For The Democratization Of Biochar Production. Ithaka Institute Australia Arbaz, Switzerland. *Journal Biochar*. 14 -24.
- Schnell, R. W., Vietor D. M., Provin T. L., Munster C. L., dan Capareda S. 2011. Capacity of Biochar Application to Maintain Energy Crop Productivity: Soil Chemistry, Sorghum Growth, and Runoff Water Quality Effects. *Jurnal of Enviromental Quality*. 41(4), 44-51.
- Scroder, Eliabeth. 2006. Experiment on the Generation of Activated Carbon From Biomass. Institute for Nuclear and energy Technologies Forschungs Karlsruhe. hal 106-111, Germany.
- Singh, B., Singh B.P. and Cowie A.L. 2010. Characterisation and Evaluation of Biochar for Their Application as a Soil Amandemen. *Australian journal of soil research*. 48, 516-525.
- Singh, B., Camps-Arbestain M., and Lehmann J. 2017. Biochar a Guide to Analytical Methods. Massey University. Australia 310 pages.
- Siruru, H., Syafii W., Wistara N.J. and Pari G. 2018. Pengaruh Durasi Steam Terhadap Kualitas Arang Aktif Limbah Sagu. UNPATTI. Ambon. *Jurnal Ilmu dan Teknologi Kayu Tropis*. [16, 2.](#)

- Sismiyanti, Hermansah dan Yulnafatmawita. 2018. Klasifikasi Beberapa Sumber Bahan Organik dan Optimalisasi Pemanfaatannya Sebagai Biochar. Universitas Andalas. Padang. Vol : 8-16 .
- Situmeang, Y.P. dan Sudewa, K.A. 2013. Respon Pertumbuhan Vegetatif Tanaman Jagung pada Aplikasi Biochar Limbah Bambu. *Prosiding Seminar Nasional*. Fakultas Pertanian Universitas Warmadewa. Denpasar hal: 144-147.
- Smider, B. and Singh B. 2014. Agronomic Performance of a High Ash Biochar in Two Contrasting Soils. *Agriculture, Ecosystems and Environment*. [191](#), 99-107.
- Soegiman. 1982. *Ilmu Tanah*. Terj. Buckman, H. O., dan Brady, N.C. The Nature Properties of Soil. Bhratara karya aksara Jakarta. 788 hal
- Soliman, Z. M and H. M. Anawar. 2015. Application of Biochars for Soil Constraints: Challenges and Solution. *Pedos*. 25, 631-638.
- Sombroek, W.G., M.L. Ruivo, P.M. Fearnside, B. Glaser, and J. Lehmann. 2003. Amazonian Dark Earths as Carbon Stores and Sinks. In : J. Lehmann, D.C. Kern, B. Glaser and W.I. Woods (eds.), Amazonian dark earths: origin, properties, management. Dordrecht, *Kluwer Academic Publishers*. 125-139.
- Spokas K.A., Cantrell K.B., Novak J.M., Archer D.W., Ippolito J.A., Collins H.P., Boateng A.A., Lima I.M., Lamb M.C., McAloon A.J., Lentz R.D., Nichols K.A. 2012. Biochar: a synthesis of its agronomic impact beyond carbon sequestration. *J Environ Qual*. 41, 973–989.
- Sulaiman, W., Harsh J.B., Abu-Lail N.I., Fortuna A.M., Dallmeyer, I. and Garcia-Perez, M. 2016. Influence of Feedstock Source and Pyrolysis Temperature on Biochar Bulk and Surface Properties. *Biomass Bioenergy*. 84,37–48.
- Sumner, M.E. and Miller W.P. 1996 Cation Exchange Capacity and Exchange Coeffi Cients. In *Methods of Soil Analysis. Part 3. Chemical Methods*. SSSA Book Series No. 5. (Ed. DL Sparks) pp. 1201–1229. Soil Science Society of America, Madison, WI.
- Thies, J.E. and Rillig M.C. 2009. Characteristics of Biochar: biological properties (Ch. 6). In: Lehmann J, Joseph S (eds) *Biochar for Environmental Management*. Earthscan, Gateshead, 85–105.
- Tomczyk, A., Sokołowska Z. and Boguta P. 2020. Biochar Physicochemical Properties: pyrolysis temperature and feedstock kind effects Institute of Agrophysics. *Polish Academy of Sciences*. Dos´wiadczalna Lublin, Poland. 19, 191–215.

- Shen, J., Xiao S.W., Manuel G.P., Daniel M., Martin J. and Chun-Z.L, 2009. Effects of Particle Size on the Fast Pyrolysis of Oil Mallee Woody Biomass. *J. Shen et al./Fuel* 88, 1810–1817
- Sukartono, W.H., Utomo Z., Kusuma Z. and Nugroho W.H. 2011. Soil Fertility Status, Nutrient Uptake, and Maize (*Zea Mays* L.) Yield Following Biochar and Cattel Manure Application on Sandy Soils of Lombok, Indonesia. *Journal of Tropical Agriculture*. 49 (1-2), 47-52.
- Ueno, M., Kawamitsu Y., Komiya Y., and Liya S. 2008 *In Proceedings of the XXVI Congress of the International Society of Sugar Cane Technologists*. ICC, Durban, 29 July–2 August 2007. pp. 1194–1201. International Society of Sugar Cane Technologists, Quatre-Bornes, Mauritius.
- Vassilev, S.V., Baxter D., Andersen L.K., Vassileva C.G. 2010 An overview of the Chemical Composition of Biomass. *Fuel* 89(5), 913–933.
- Vassilev, S.V., Baxter D., Andersen L.K. and Vassileva, C.G. 2013. An Overview of the Composition and Application of Biomass Ash. Part 2. *Potential utilisation, technological and ecological advantages and challenges*. [105](#) pages: 19-39
- Wang, T., Camps-Arbestain M., Hedley M., Singh B.P., Calvelo Pereira R., Wang C. 2014. Determination of C- Carbonate in Biochars. *Soil Research*. 52,495–504
- Widowati, Asnah dan Sutoyo. 2012. Pengaruh Penggunaan Biochar dan Pupuk Kalium Terhadap Pencucian dan Serapan Kalium pada Tanaman Jagung. *Jurnal Penelitian Ilmu-Ilmu Kelaman: Buana Sains*. *Tribhuana Press*. Vol 12:No. 1. Hal: 83-90
- Xie, T., Reddy K.R., Wang C., Yargicoglu E. and Spokas K. 2015. Characteristics and Applications of Biochar for Environmental Remediation: a review. *Critical Reviews in Environmental Science and Technology*. 45, 939-969.
- Yang, H., Yan R., Chen H., Lee D. H. and Zheng, C. 2007. Characteristics of Hemicellulose, Cellulose and Lignin Pyrolysis. *Fuel*. 86(12–13), 1781–1788.
- Yuan, J.H., Xu R.K. and Zhang H. 2011. The Forms of Alkalis in the Biochar Produced from Crop Residues at Different Temperatures. *Bioresource Technology*. 12, 3488-3497.
- Yuwono, M. 2008. Dekomposisi dan Mineralisasi beberapa Macam Bahan Organik. *Agronomi* 12 (1) pages: 1-8
- Zhao, L., Xinde C., Ondrej M., and Andrew Zimmerman. 2013. Heterogeneity of Biochar Properties as a Function of Feedstock Sources and Production Temperatures. *Journal of Hazardous Materials*. 1-28.

Zhu, Q., Peng X., Huang T., Xie Z. and Holden N.M. 2014. Effect of Biochar Addition on Maize Growth and Nitrogen Use Efficiency In Acid Red Soil. *Pedosphere* 24 (6), 699-708.

