

## DAFTAR PUSTAKA

- Abbas, M.M., A.O. Hajray, W.K. Al-Azzawi, W.K. Alkhafaje, O.K.A. Alkadir, S.A. Al-Zubaidei, S. Ahjel, A.A.N. Alhakeem, H.T. al Salami, D.A. Hamad, K.T. Falih, O. Baaj. 2022. Practice of intercropping and its impact on legume productivity in Egypt. *Caspian Journal of Environmental Sciences*, 20(4): 757-764.
- Abedi, T. & Pakniyat, H. 2010. Antioxidant enzyme changes in response to drought stress in ten cultivars of oilseed rape (*Brassica napus* L.). *Czech J. Genet. Plant Breed.* 46(1): 27-34.
- Adiku, S.G.K., Harry Ozier-Lafontaine, H., & Bajazet, T. 2001. Patterns of root growth and water uptake of a maize-cowpea mixture grown under greenhouse conditions. *Plant and Soil*. 235: 85-94.
- Adwita-Arsa, I.G.B. 1998. Perancangan teknologi produksi jagung varietas lokal di daerah semiringkai secara terpadu untuk menunjang pertanian yang berkelanjutan. Penelitian Faperta Undana. Kupang.
- Affoh, R., Zheng, H., Zhang, X., Yu, W., & Qu, C. 2023. Influences of meteorological factors on maize and sorghum yield in Togo, West Africa. *Land* 12, 123.
- Ahmad I, Zhu G, Zhou G, Song X, Ibrahim MEH, Salih EGI. 2022. Effect of N on growth, antioxidant capacity, and chlorophyll content of sorghum. *Agronomy* 12:501.
- Ahmed A, Din AMU, Aftab S, Titriku JK, Ahmed S et al. 2021. Physiological and nutritional significance of potassium application under sole and intercropped maize (*Zea mays* L). *Italian Journal of Agronomy* 16: 1737.
- Alnopri. 2004. Optimasi prosedur assay aktivitas nitrat reduktase daun manggis. Bengkulu. *Jurnal Akta Agrosia* 7(2): 62-66.
- Arnon, D.I. 1949. Copper enzymes isolated chloroplasts, polyphenoloxidase in *Beta vulgaris*. *Plant Physiology*. 24(1): 1-15.
- Ayele H.M. 2020. Evaluation of the effect of maize-legume intercropping on soil moisture improvement in arid area of Bena-Tsemay district, South omo zone, Southern Ethiopia. *Int. J. Agril. Res. Innov. Tech.* 10 (1): 80-86.
- Badan Pusat Statistik (BPS) Provinsi NTT. 2018. Nusa Tenggara Timur dalam Angka. Kupang.
- Badan Pusat Statistik (BPS) Provinsi D.I. Yogyakarta. 2018. Daerah Istimewa Yogyakarta dalam Angka. Yogyakarta.
- Badan Pusat Statistik (BPS) Provinsi NTT. 2017. Statistik Pertanian Provinsi Nusa Tenggara Timur. Kupang. 66 p
- Badan Pusat Statistik (BPS) Provinsi NTT. 2018. Jumlah Curah Hujan menurut Kabupaten/Kota dan Bulan. <https://ntt.bps.go.id/linkTableDinamis/view/id/389>. (diakses 10 Nopember 2018).
- Badan Pusat Statistik (BPS) Indonesia. 2018. Produktivitas Jagung menurut Provinsi <https://www.bps.go.id/dynamictable/2015/09/09/869/produktivitas-jagung-menurut-provinsi-kuintal-ha-1993-2015.html>. (diakses 17 September 2018).
- Baghdadi, A., R.A. Halim, R. Othman, M.M. Yusof, & A.R.M. Atashgahi. 2016. Productivity, relative yield and plant growth of forage corn intercropped with soybean under different crop combination ratio. *Legume Research*, 39 (4): 558-564.

- Basuki, T. & B. de-Rosari. 2017. Pemanfaatan kearifan lokal dan teknologi pertanian mendukung pembangunan pertanian wilayah. *In*: E. Pasandaran., M. Syakir., R. Heriawan., M.P. Yufdy (Eds.). *Pembangunan Pertanian Wilayah Berbasis Kearifan Lokal dan Kemitraan*. IAARD Press. Jakarta. 63-88.
- Basuki, T., B. de-Rosari, Syamsuddin, Hosang, E.Y., Ngongo, Y., *et al.* 2018. Grand design pembangunan pertanian lahan kering kepulauan Nusa Tenggara Timur. Dinas Pertanian dan Balai Pengkajian Teknologi Pertanian (BPTP) NTT. 254 p.
- Bates, L.S., R.P. Walden, and I.D. Teare. 1973. Rapid determination of free proline for water stress studies. *Plant and Soil* 39: 205–207.
- Barrs, H.D. and Weatherley, P.E. (1962) A re-examination of the relative turgidity techniques for estimating water deficits in leaves. *Australian Journal of Biological Sciences*, 15: 413-428.
- Bertolino LT, Caine RS, Gray JE. 2019. Impact of stomatal density and morphology on water-use efficiency in a changing world. *Front. Plant Sci.* 10:225.
- Beyer, W.F., and I. Fridovich. 1987. Assaying for superoxide dismutase activity: some large consequences of minor changes of conditions. *Anal. Biochem.* 161: 559-566.
- Bo PT, Bai Y, Dong Y, Shi H, Htet MNS *et al.* 2022. Influence of different harvesting stages and cereals–legume mixture on forage biomass yield, nutritional compositions, and quality under loess plateau region. *Plants* 11: 2801.
- Bouslama M. & W.T. Schapaugh. 1984. Stress tolerance in soybeans. I. Evaluation of three screening techniques for heat and drought tolerance. *Crop Science* 24: 933-937.
- Brahma M. & B. Goswami. Electrical methods of soil moisture measurement: A review. *ADBU Journal of Electrical and Electronics Engineering (AJEEE)* | 1 (2): 14-17.
- Brownlee C. 2018. Stomatal physiology: Cereal successes. *Current Biology* 28: R551-R553.
- Brukhin V. and N. Morozova. 2011. Plant growth and development - basic knowledge and current views. *Math. Model. Nat. Phenom.* 6(2): 1-53.
- Buckley TN. 2019. How do stomata respond to water status? *New Phytologist* 224:221-36.
- Buhaira. 2007. Respons kacang tanah (*Arachis hypogaea* L) dan jagung (*Zea Mays* L) terhadap beberapa pengaturan tanam jagung pada sistem tanam tumpangsari. *Jurnal Agronomi*. 11 (1): 41-45.
- Callaway, R.M. 1995. Positive interactions among plants. *The Botanical Review* 61 (4): 306-349.
- Casper, B.B. & R.B. Jackson. 1997. Plant competition underground. *Annual Review of Ecology and Systematics* 28: 545-570.
- Carolina & E.W. Hidajat. 2016. Kajian agroekologi terhadap strategi pemenuhan kebutuhan pangan masyarakat di Kabupaten Belu Nusa Tenggara Timur. *Pangan* 25 (2): 83-94.
- Chang, J.F. 1981. An analysis of competition between intercropped cowpea and maize. *Retrospective Theses and Dissertations*. 6896. <https://lib.dr.iastate.edu/rtd/6896>. (diakses 9 Oktober 2018).

- Ceunfin, S., M.U. Humoena, S.M.A. Boyfalaa, A.H. Serana & A. Lelanga. 2018. Pengaruh model defoliiasi daun jagung dan jumlah benih terhadap hasil jagung dan kacang nasi pada sistem tumpangsari Salome (kearifan lokal Timor). *Savana Cendana*. 3(1): 8-10.
- Choudhary VK, Dixit A, Chauhan BS. 2016. Resource-use maximisation through legume intercropping with maize in the eastern Himalayan region of India. *Crop & Pasture Science* 67: 508-519.
- Civeira G. 2019. Soil moisture *In*: G. Civeira (Eds.). *Soil Moisture*. IntechOpen. United Kingdom. 1-5.
- Costa, C., Dwyer, L.M., Dutilleul, P., Foroutan-pour, K., Liu, A., Chantal Hamel, C. and Smith, D.L. 2003. Morphology and fractal dimension of root systems of maize hybrids bearing the leafy trait. *Can. J. Bot.* 81: 706-713.
- Dannowski M. & A. Block. Fractal geometry and root system structures of heterogeneous plant communities. *Plant and Soil* 272: 61-76.
- da Silva, A.J., Filho, J.R.M., Sales, C.R.G., de Matos Pires, R.C. & Machado, E.C. 2018. Source-sink relationships in two soybean cultivars with indeterminate growth under water deficit. *Bragantia, Campinas*, 77(1): 23-35.
- Dhar PC, Awal MA, Sultan MS, Rana MM, Sarker A. 2013. Interspecific competition, growth and productivity of maize and pea in intercropping mixture. *Scientific Journal of Crop Science* 2(10): 136-143.
- Dimu-Heo, Y.H., Y. Radja-Kana & I.G.B. Adwita-Arsya. 1999. Daya hasil beberapa varietas jagung lokal NTT yang ditanam dalam satu lubang tanam dengan kacang nasi di dataran rendah Oesao. *Fakultas Pertanian Universitas Nusa Cendana*.
- Dong, N., Tang, M.M., Zhang, W.P., Bao, X.G., Wang, Y., Christie, P. & Li., L. 2018. Temporal differentiation of crop growth as one of the drivers of intercropping yield advantage. *Nature Scientific Reports* 8: 3110.
- Driesen, E., Wim Van den Ende, W., De Proft, M. & Saeys, W. 2020. Influence of environmental factors light, CO<sub>2</sub>, temperature, and relative humidity on stomatal opening and development: A review. *Agronomy* 10, 1975.
- Dusa, E.M. & Roman, G.H. 2015. Productivity and harvest quality of maize and pea in intercropping, in the organic agriculture system. *Agronomy* LVIII: 185-189.
- Dwamena, H.A., Tawiah, K., Kodua, A.S.A. 2022. The effect of rainfall, temperature, and relative humidity on the yield of cassava, yam, and maize in the Ashanti Region of Ghana. *International Journal of Agronomy* 9077383.
- Edmeades, G.O., Trevisan, W., Prasanna, B.M. & Campos, H. 2017 Tropical Maize (*Zea mays* L.). *In*: H. H. Campos, P.D.S. Caligari (Eds.). *Genetic Improvement of Tropical Crops*. Springer International Publishing. 57-109.
- Efendi, R., & M. Azrai. 2015. Kriteria indeks toleran jagung terhadap cekaman kekeringan dan nitrogen rendah. *Prosiding Seminar Nasional Serealia*. 12 p.
- Elsaid, S.M., Elmorshedy, M.A., Galal, A.H., Abdel-Motagally F.M.F. and Abdullah, M.A.M. 2019. Effect of intercropping maize with cowpea on the yield and its quality. *Assiut J. Agric. Sci.*, 50(3): 39-47.

- Eskandari, H. 2012. Intercropping of maize (*Zea mays*) with cowpea (*Vigna sinensis*) and mungbean (*Vigna radiata*): Effect of complementarity of intercrop components on resource consumption, dry matter production and legumes forage quality. J. Basic. Appl. Sci. Res., 2(1): 355-360.
- Eviati, Sulaeman, Herawaty, L., Linca Anggria, L., *et al.* 2023. Analisis Kimia Tanah, Tanaman, Air, dan Pupuk. Petunjuk Teknis Edisi 3. Balai Pengujian Standar Instrumen Tanah dan Pupuk. Kementerian Pertanian Republik Indonesia. 271 p.
- Fall, L., D. Diouf, M.A. Fall-Ndiaye, F.A. Badiane & M. Gueye. 2003. Genetic diversity in cowpea (*Vigna unguiculata* (L) Walp) varieties determined by ARA and RAPD techniques. African Journal of Biotechnol. 2 (2): 48-50.
- Fan H, Yin W, Zhao C, Yu A, Fan Z *et al.* 2022. Photophysiological mechanism of dense planting to increase the grain yield of intercropped maize with nitrogen-reduction application in arid conditions. Agronomy 12:2994.
- Fan X, Zhou X, Chen H, Tang M, Xie X. 2021. Cross-talks between macro- and micronutrient uptake and signaling in plants. Front. Plant Sci. 12:663477.
- Fan Y, Wang Z, Liao D, Raza MA, Wang B *et al.* 2020. Uptake and utilization of nitrogen, phosphorus and potassium as related to yield advantage in maize-soybean intercropping under different row configurations. Nature Scientific Reports 10:9504.
- Faralli, M. & Lawson, Y. 2019. Natural genetic variation in photosynthesis: an untapped resource to increase crop yield potential?. The Plant Journal 101: 518–528.
- Fernandez, J.A. & Ciampitti, I.A. 2021. Corn grain weight: dependence upon nitrogen supply and source-sink relations. Kansas Agricultural Experiment Station Research Reports: 7 (5). 10 p.
- Fernandez, G.C.J. 1992. Effective selection criteria for assessing stress tolerance. *In*: Kuo, C.G. (Ed). Proceedings of the International Symposium on Adaptation of Vegetables and Other Food Crops in Temperature and Water Stress, AVRDC Publication. 257-270. Tainan.
- Filho, J.M.P.L. 2000. Physiological responses of maize and cowpea to intercropping. Pesq.agropec.bras. 35 (5): 915-921.
- Fischer A.B & Maurer R. 1978. Drought resistance in spring wheat cultivars. I. Grain yield responses. Aust. J. Agric. Res. 29: 897-912.
- Fitter, A.H. dan R.K.M. Hay. 1991. Fisiologi Lingkungan Tanaman. Gadjah Mada University Press. Yogyakarta. 421 p.
- Fornari EZ, Gaviraghi L, Basso CJ, Pinheiro MVM, Vian AL, Santi AL. 2020. Relationship between photosynthetic pigments and corn production under nitrogen sources. Pesquisa Agropecuária Tropical 50: e63661.
- Gabatshale, M.L., K.M. Teko & M. Witness. 2012. Effects of intercropping on the performance of maize and cowpeas in Botswana. International Journal of Agriculture and Forestry, 2 (6): 307-310.
- Gardner, F.P., R.B. Pearce & R.L. Mithell. 1991. Fisiologi Tanaman Budidaya. Edisi Terjemahan. Herawati Susilo. Universitas Indonesia. Jakarta. 428 p.
- Golberg, D.E. 1996. Simplifying the study of competition at the individual plant level: consequences of distinguishing between competitive effect and response for forest vegetation management. New Zealand Journal of Forestry Science 26 (1/2): 19-38.

- Govindaraj, T., N. Maragatham., S.P. Ramanathan., V. Geethalakshmi & M.K. Kalarani. 2023. Light interception and radiation use efficiency (RUE) in maize (*Zea mays* L) intercropping with greengram (*Vigna radiata* L.). Journal of Applied and Natural Science, 15 (3), 1044-1050.
- Gu, J., Yang X., Xueyun D., Hongfeng W dan Zhengguan W. 2014. Root diameter variations explained by anatomy and phylogeny of 50 tropical and temperate tree species. Tree Physiology 34: 415–425.
- Gutu, T. 2017. Performances of different varieties and population of soybean (*Glycine max* L.) under intercropping systems with maize (*Zea mays* L.). Advances in Life Science and Technology. 53: 5-12.
- Halliwell, B. 2006. Reactive species and antioxidants. redox biology is a fundamental theme of aerobic life. Plant Physiology. 141: 312–322.
- Hauggaard-Nielsen, H. & E.S. Jensen. 2005. Facilitative root interactions in intercrops. Plant and Soil 274:237-250.
- Habte A, Kassa M, Sisay A. 2016. Maize (*Zea mays* L) - common bean (*Phaseolus vulgaris* L) intercropping response to population density of component crop in Wolaita zone southern Ethiopia. Journal of Natural Sciences Research 15(6): 69-74.
- Hair, J.H.Jr., Hult, G.T.M., Ringle, C.M., Sarstedt, M., Danks, N.P., Ray, S. 2021. Partial least squares structural equation modeling (PLS-SEM) using R. Gewerbestrasse, Switzerland. 208 p.
- Hartiko H. 1983. Leaf and root in vivo nitrate reductase activities of coconut (*Cocos nucifera* L) cultivars and hybrids. Disertation. Sub mitted to the Faculty of the Graduate School University of the Philippines at Las Banos, Philippines.
- He, H., L. Yang, L. Zhao, H. Wu, L. Fan, Y. Xie, Y. Zhu & C. Li. 2012. The temporal-spatial distribution of light intensity in maize and soybean intercropping systems. J. Resour. Ecol. 3 (2): 169-173.
- Hellmuth, E.O. 1970. Measurement of leaf water deficit with particular reference to the whole leaf method. Journal of Ecology. 58(2): 409-417.
- Hernita, D. 2001. Kajian ragam tumpangsari antara labu kuning dan jagung. Thesis. Fakultas Pertanian Universitas Gadjah Mada. Yogyakarta.
- Hinsinger, P., E. Betencourt, L. Bernard, A. Brauman, C. Plassard, J. Shen, T. Xiaoyan & F. Zhang. 2011. P for two, sharing a scarce resource: Soil phosphorus acquisition in the rhizosphere of intercropped species. Plant Physiology 156:1078–1086.
- Hosang, E.Y., M.W. Shuterland, N.P. Dalglish & J.P.M. Whish. 2010. Agronomic performance of landrace and certified seeds of maize in West Timor, Indonesia. In: H. Dove and R.A. Culvenor (Eds.). Food Security from Sustainable Agriculture Proceeding of the 5th Agronomy confrence. Lincon 15-18 November 2010.
- Ighodaro, O.M. & O.A. Akinloye, O.A. 2018. First line defence antioxidants-superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPX): Their fundamental role in the entire antioxidant defence grid. Alexandria Journal of Medicine 54: 287-293.



- Ion, V., G. Dicu, M. Dumbravă, G. Temocico, I.N. Alecu, A.G. Băşa & D. State. 2015. Harvest index at maize in different growing conditions. *Romanian Biotechnological Letters*. 20(6): 10952-10960.
- Iriany, R.N., M. Yasin H.G & A.Takdir. 2007. Asal, sejarah, evolusi, dan taksonomi tanaman jagung. *In Jagung: Teknik Produksi dan Pengembangan*. Pusat Penelitian dan Pengembangan Tanaman Pangan. Bogor. 1-15.
- Jafari A., F. Paknejad & M.J. Al-Ahmadi. 2009. Evaluation of selection indices for drought tolerance of corn (*Zea mays* L.) hybrids. *Int. J. of Plant. Prod.* 3 (4): 33-38.
- Jangir C.K., A. Thakur, H. Bijani, P. Thakur, S. Kumar, R.S. Meena, S. Bedwal, K. Rani, U.N. Shukla, A.K. Meena & P.Dev. 2022. Residual nitrogen for succeeding crops in legume-based cropping system. *In: R.S. Meena, S. Kumar (Eds.). Soil Health Management. Advances in Legumes for Sustainable Intensification*. Academic Press. United Kingdom. 113-132.
- Jodha, N.S. 1980. Intercropping in traditional farming systems. *The Journal of Development Studies*. 16 (4): 427-442.
- Kamara YA, Tofa AI, Ademulegun T, Salomon R, Shehu H, Kamai N, Omoigui L. 2019. Maize-soybean intercropping for sustainable intensification of cereal-legume cropping systems in Northern Nigeria. *Expl Agric*. 55(1): 73-87
- Kermah M, Franke AC, Adjei-Nsiah S, Ahiabor BDK, Abaidoo RC, Giller EK. 2018. N<sub>2</sub>-fixation and N contribution by grain legumes under different soil fertility status and cropping systems in the Guinea savanna of northern Ghana. *Agriculture, Ecosystems and Environment* 261: 201-210.
- Kermah M, Franke AC, Ahiabor BDK, Adjei-Nsiah S, Abaidoo RC, Giller EK. 2019. Legume–maize rotation or relay? Options for ecological intensification of smallholder farms in the Guinea savanna of northern Ghana. *Expl Agric*. 55(5): 673-691.
- Kour, M., N.P. Thakur., P. Kumar, & A.S. Charak. 2015. Productivity and profitability of maize (*Zea mays*) as Influenced by intercropping of Rajmash (*Phaseolus vulgaris*) and nutrient management techniques under sub-alpine conditions of Jammu, India. *Legume Research*, 39 (6) 2016: 970-975.
- Kumawat A., S.D. Bamboriya, R.S. Meena, D. Yadav, A. Kumar, S. Kumar, A. Raj & G. Pradhan. 2022. Legume-based inter-cropping to achieve the crop, soil, and environmental health security. *In: R.S. Meena, S. Kumar (Eds.). Soil Health Management. Advances in Legumes for Sustainable Intensification*. Academic Press. United Kingdom. 307-328.
- Kurnia, U., F. A. Adimihardja, A. Rachman *et al.* 2022. Sifat Fisik Tanah dan Metode Analisisnya. Edisi 2 Revisi. Balai Penelitian Tanah. Kementerian Pertanian. 322 p.
- Lawson, T. and Violet-Chabrand, S. 2018. Speedy stomata, photosynthesis and plant water use efficiency. *Tansley insight, New Phytologist*. 15330.
- Legwaila, G.M., T.K. Marokane & W. Mojeremane. 2012. Effects of intercropping on the performance of maize and cowpeas in Botswana. *International Journal of Agriculture and Forestry*. 2 (6): 307-310.
- Levis, L.R., K. Sukesi, Sugiyanto, Y. Yulianti. 2017. Farmers behaviour regarding food security by practicing the ‘Salome’ farming system as local wisdom in West Timor, East Nusa Tenggara Province, Indonesia. *Tropical and Subtropical Agroecosystems*. 20: 231-236.

- Leki-Seran, Y., da Silva, H. dan Kario N. 2021. Productivity of maize in the marginal dryland in East Nusa Tenggara province – Indonesia. E3S Web of Conferences 232, 01011.
- Levitt, J. 1980. Responses of Plants to Environmental Stress. 2<sup>nd</sup> edition. Academic Press. New York. 307p.
- Li, C., Stomph, T.J., Makowski, D., Li, H., C. Zhang, F. Zhang, W. van der Werf. 2023. The productive performance of intercropping. PNAS 120, 2. e2201886120.
- Li, C., E. Hoffland, T.W. Kuyper, Y. Yu, C. Zhang, H. Li, F. Zhang & W. van der Werf. 2020. Syndromes of production in intercropping impact yield gains. Nature Plants 6: 653-660.
- Li, T., Uma Maheswari Rajagoplan U.M., & Kadono, H. 2019. Fractal based complexity analysis of wheat root system under different heavy metals. Plant Biotechnology 36: 77-84.
- Libang Pertanian. 2018. Karakteristik sumber daya genetik kacang tunggak. <http://www.litbang.pertanian.go.id/berita/one/2619/>. (diakses 12 Oktober 2018).
- Liu, J. & Zhang J. 2017. Effect of nitrogen on photosynthetic pigments of relay strip intercropping soybean under drought stress. Advances in Engineering Research 120: 892-895.
- Liu, W., Hou, P., Liu, G., et al. 2020. Contribution of total dry matter and harvest index to maize grain yield - A multisource data analysis. Food Energy Secur. 00:e256.
- Liu, X., T. Rahman., F. Yang, C. Song, T. Yong, J. Liu, C. Zhang & W. Yang. 2017. PAR interception and utilization in different maize and soybean intercropping patterns. PLoS ONE 12 (1): 1-17.
- Mahdy, A.Y. 2018. Effect of intercropping on the performance of maize and cowpea. Assiut J. Agric. Sci. 49 (4): 64-74.
- Mackay, A.D., & S.A. Barber. 1985. Soil moisture effect on potassium uptake by corn. Agronomy Journal. 77: 524-527.
- Matusso, J.M.M., Mugwe, J.N., Mucheru-Muna, M. 2014. Effect of different maize (*Zea mays* L.) – soybean (*Glycine max* (L.) Merrill) intercropping patterns on yields, light interception and leaf area index in Embu West and Tigania East sub counties. Acad. Res. J. Agric. Sci. Res. 2(2): 6-21.
- Mashingaidze, A.B., Nyakanda, C., Chivinge, O.A., Mwashireni, A. & Dube, K.W. Influence of a pumpkin live mulch on weed dynamics and maize yield. African Plant Protection 6(1): 57-63.
- Menge, D. & Y. Leki Seran. 2016. Penampilan jagung lokal dan peranannya sebagai sumber pangan utama bagi masyarakat di lahan kering Nusa Tenggara Timur. In: Alfon, Jane s B (Eds.). Prosiding Seminar Nasional Mewujudkan Kedaulatan Pangan Pada Lahan Sub-Optimal Melalui Inovasi Teknologi Pertanian Spesifik Lokasi. Ambon, 12 – 13 Oktober 2016.139-145.
- Monteith J.L. & Unsworth M.H. 1973. Principles of Environmental Physics, 2<sup>nd</sup> ed. Edward Arnold, London.
- Momirović, N., S. Oljača, T. Dolijanović, M. Simić, M. Oljača & B. Janošević. 2014. Productivity of intercropping maize (*Zea mays* L.) and pumpkins (*Cucurbita maxima* Duch.) under conventional vs. conservation farming system. Turkish Journal of Field Crops. 20 (1): 92-98.

- Mudita, I.I., C. Chiduzza, S.J. Richardson-Kageler & F.S. Murungu. 2008. Performance of maize (*Zea mays* L.) and soya bean (*Glicine max* (L) Merrill) cultivar of varying growth habit in intercrop in sub-humid enviroments of Zimbabwe. *Journal of Agronomi* 7 (3): 229-236.
- Ndiso, J.B., G.N. Chemining'wa, F.M. Olubayo & H.M. Saha. 2017. Effect of cropping system on soil moisture content, canopy temperature, growth and yield performance of maize and cowpea. *Int.J. of Agric. Sci.* 7 (3): 1271-1281.
- Novak, V & Vidovic J. 2003. Transpiration and nutrient uptake dynamics in maize (*Zea mays* L). *Ecological Modelling* 166: 99-107.
- Ngapo TM, Bilodeau P, Arcand Y, Charles MT, Diederichsen A et al. 2021. Historical indigenous food preparation using produce of the three sisters intercropping system. *Foods* 10: 524.
- Ngongo Y., Basuki, T., deRosari, B., Hosang, E.Y., Nulik, J., daSilva, H., et al. 2022. Local wisdom of West Timorese farmers in land management. *Sustainability*. 14: 6023.
- Nuningsih, R. & D. Prayitno. 1990. Kajian sistem pertanaman tupangsari jagung (*Zea mays* L) dan kacang nasi (*Phaseolus calcaratus* Roxb). Thesis Faperta Universitas Gadjah Mada. Yogyakarta.
- Oelbermann, M., A. Regehr & L. Echarte. 2015. Changes in soil characteristics after six seasons of cereal-legume intercropping in the Southern Pampa. *Geoderma Regional* 4: 100-107.
- Oforili, F., & W.R. Stern. 1987. Cereal-legume intercropping systems. *In*: N. C. Brady (Ed). *Advances In Agronomy*. 41: 41-90.
- Öner, F., & Aykutlu, H.M. 2019. The effect of maize-soybean intercropping systems on a set of technological and physiological properties. *Applied ecology and environmental research* 17(2):2149-2165.
- Palaniappan, S.P. 1985. Cropping System in the Tropic: Principles and Management. Willey Eastern Limited and Tamil Nadu Agricultural University. India. 215 p.
- Paris, H.S. 2016. Genetic resources of pumpkins and squash, cucurbita spp. *In* Grumet, R., Katzir, N., Garcia-Mas, J (eds.). *Genetics and Genomics of Cucurbitaceae, Plant Genetics and Genomics: Crops and Models*. Springer, Cham 111-154.
- Pérez-Hernández R.G., M.J.Cach-Pérez, R. Aparicio-Fabre., H. Van Der Wal & U. Rodríguez-Robles. 2021. Physiological and microclimatic effects of different agricultural management practices with maize. *Botanical Sciences* 99 (1): 132-148.
- Pierre HMJ, Kinama JM, Olubayo FM, Wanderi SW, Muthomi JW, Nzuve FM. 2018. Effect of intercropping maize-soybean on grain quality traits in Kenya. *J. of Agric. Sci.* 10(2): 341-351.
- Pandey, R., Paul, V., Das, M., Meena, M., Meena, R.C. 2017. Plant growth analysis. Manual of ICAR Sponsored Training Programme on "Physiological Techniques to Analyze the Impact of Climate Change on Crop Plants. Division of Plant Physiology, IARI, New Delhi. 103 – 107.
- Qamar-Uz-Zaman, Malik MA. 2000. Ricebean (*Vigna umbellata*) productivity under various maize-ricebean intercropping systems. *Int. J. Agri. Biol.* 2(3): 255-257.



- Rahayu, M. 2019. Mekanisme interferensi gulma secara fisiologis dan agronomis terhadap beberapa kultivar jagung. Disertasi. Fakultas Pertanian. Universitas Gadjah Mada. Yogyakarta.
- Raza MA, Khalid MHB, Zhang X, Feng LY, Khan I et al. 2019. Effect of planting patterns on yield, nutrient accumulation and distribution in maize and soybean under relay intercropping systems. *Scientific Reports* 9:4947.
- Ren, H., Qi, H., Zhao, M., Zhou, W., Wang, X., Gong, X., Jiang, Y. & Li, C. Characterization of source–sink traits and carbon translocation in maize hybrids under high plant density. *Agronomy* 12, 961.
- Ren, Y., Zhang, L., Yan, M., Zhang, Chen, Y., Palta, J.A., & Zhang, S. 2021. Effect of sowing proportion on above- and below-ground competition in maize-soybean intercrops. *Nature Scientific Reports* 11:15760.
- Sanchez, B., Rasmussen A., & Porter J.R. 2014. Temperatures and the growth and development of maize and rice: a review. *Global Change Biology*. 20: 408-417.
- Saravanan, T., R. Bhaskaran, and M. Muthusamy. 2004. *Pseudomonas fluorescens* induced enzymological changes in banana roots (Cv. Rasthali) against fusarium wilt disease. *Plant Pathology*. 3 (2): 72–80.
- Sarjoni. 2013. Pengaruh bahan organik dan waktu tanam pada hasil tumpangsari jagung dan kacang tanah. *Widyariset* 16(30): 457-466.
- Schwalbert R, Amado TJC, Horbe TAN et al. 2018. Corn yield response to plant density and nitrogen: spatial models and yield distribution. *Agronomy Journal* 10: 1-13.
- Seebauer JR, Singletary GW, Krumpelman PM, Ruffo ML, Below FE. 2010. Relationship of source and sink in determining kernel composition of maize. *Journal of Experimental Botany* 61(2): 511-519.
- Sehgal A, Sita K, Siddique KHM, Kumar R, Bhogireddy S et al. 2018. Drought or/and heat-stress effects on seed filling in food crops: Impacts on functional biochemistry, seed yields, and nutritional quality. *Front. Plant Sci.* 9:1705.
- Sergiev, I., Alexieva, V., Karanov E. 1997. Effect of spermine, atrazine and combination between them on some endogenous protective systems and stress markers in plants. *Compt. Rend. Acad. Bulg. Sci.* 51(10):121–124.
- Sharma, P., Jha, A.B., Dubey, R.S. and Pessarakli, M. 2015. Reactive oxygen species, oxidative damage, and antioxidative defense mechanism in plants under stressful conditions. *Journal of Botany*. 217037. 26 p.
- Silva G.S.F., A.S. de Andrade Júnior., M.J. Cardoso & R.B. de Araújo Neto. 2020. Soil water dynamics and yield in maize and *Brachiaria ruziziensis* intercropping. *Pesq. Agropec. Trop.* 50, e59809.
- Silwana, T.T., & E.O. Lucas. 2002. The Effect of planting combinations and weeding on the growth and yield of component crops of maize/bean and maize/pumpkin intercrops. *Journal of Agricultural Science* 138: 193-200.
- Sitompul, M.S. dan B. Guritno. 1995. Analisis Pertumbuhan Tanaman. Yogyakarta: UGM Press.
- Sivaraman, K. & SP. Palaniappan. 1994. Turmeric-maize and onion intercropping systems. I. Yield and land use efficiency. *Journal of Spices & Aromatic Crops*. 3 (1): 19-27.

- Sivaraman, K. & SP. Palaniappan. 1995. Turmeric-Maize and Onion Intercropping Systems. II. Leaf area index and dry matter accumulation. *Journal of Spices & Aromatic Crops*. 4 (2): 145-155.
- Sivaraman, K. & SP. Palaniappan. 1996a. Turmeric-maize and onion intercropping systems. III. Nutrient uptake. *Journal of Spices & Aromatic Crops*. 5 (1): 49-57.
- Sivaraman, K. & SP. Palaniappan. 1996b. Turmeric-maize and onion intercropping systems. IV. PAR interception. *Journal of Spices & Aromatic Crops*. 5 (2): 139-142.
- Song, Ail N., & Y. Banyo. 2011. Konsentrasi klorofil daun sebagai indikator kekurangan air pada tanaman. *Jurnal Ilmiah Sains*. 11 (2): 166-173.
- Stagnari, F., A. Maggio, A. Galieni & M. Pisante. 2017. Multiple benefits of legumes for agriculture sustainability: An overview. *Chemical and Biological Technologies in Agriculture*. 4:2
- Su, B.Y., Song, Y.X., Song, C., Cui, L., Yong, T.W., and Yang, W.Y. 2014. Growth and photosynthetic responses of soybean seedlings to maize shading in relay intercropping system in Southwest China. *Photosynthetica* 52: 332–340.
- Suarni & S. Widowati. 2007. Struktur, komposisi, dan nutrisi jagung. *In Jagung: Teknik Produksi dan Pengembangan*. Pusat Penelitian dan Pengembangan Tanaman Pangan. Bogor. 410-426.
- Subagio, H., & M. Aqil. 2013. Pemetaan pengembangan varietas unggul jagung di lahan kering iklim kering. *Seminar Nasional Serealia 2013*. 11-19.
- Subekti, N.A.S., R. Efendi & S. Sunarti. 2007. Morfologi tanaman dan fase pertumbuhan jagung. *In Jagung: Teknik Produksi dan Pengembangan*. Pusat Penelitian dan Pengembangan Tanaman Pangan. Bogor. 16-28.
- Sufardi. 2019. Pengantar Nutrisi Tanaman. Bina Nanggroe, Banda Aceh. 378 p
- Suryanto, P., Suwignyo, B., Prianto, S.D., Putra, E.T.S. & Alam, T. 2017. Morpho-physiological characters and soybean productivity on alfisol and vertisol under intercropping with kayu putih (*Melaleuca cajuputi*). *Agrivita Journal of Agricultural Science*. 39(2): 153-159.
- Suseno, S., M. Kamal, & Sunyoto. 2014. Respons pertumbuhan dan hasil beberapa varietas tanaman jagung (*Zea mays* L.) terhadap sistem tumpangsari dengan tanaman ubikayu (*Manihot esculenta* Crantz). *Jurnal Agrotek Tropika*. 2 (1): 78-82.
- Szabados, L. & Savoure, A. 2009. Proline: a multifunctional amino acid. *Trends in Plant Science* 15(2): 89-97.
- Tatsumi, J., Akira Yamauchi & Yasuhiro Kono. 1989. Fractal analysis of plant root system. *Annals of Botany* 64: 499-503.
- Thilakarathna MS, McElroy MS, Chapagain T, Papadopoulos YA, Raizada MN. 2016. Belowground nitrogen transfer from legumes to non-legumes under managed herbaceous cropping systems. *Agron. Sustain. Dev*. 2016: 36-58.
- Tjitrosoepomo, G. 1985. Morfologi Tumbuhan. Gajah Mada University Press. Yogyakarta. 268 p.
- Trenbath, B.R. 1983. The dynamic properties of mixed crops. *In: Roy, S.K. (Ed.). Frontiers of Research in Agriculture*. Calcutta, India: Indian Statistical Institute.

- Trustinah. 1998. Biologi Kacang Tunggak. *In*: A. Kasno, & A. Winarto (Eds). Kacang Tunggak. Monograf Balitkabi. 3: 1-19
- van Steenis, C., G.G.J, G. den Hoed, S. Bloembergen, P.J. Eyma & Nazar Nur. 1997. Flora untuk Sekolah di Indonesia. Pradnya Paramita. Jakarta, 495p.
- Vasal, S.K. & S. Taba. 1998. Conservation and utilization of maize genetic resources. *In*: R.S. Paroda, R.K. Parora, K.P.S. Chandel (Eds.). Plant Genetic Resources-Indian Perspective. Proceeding of the National Symposium on Plant Genetic Resources NBPGR. New Delhi. 91-107.
- Vasilas, B.L., Nelson, R.L., Fuhrmann, J.J & Evans, T.A. 1995. Relationship of nitrogen utilization patterns with soybean yield and seed-fill period. *Crop Sci.* 35:809-813.
- Velikova, V., I. Yordanov & A. Edreva. 2000. Oxidative stress and some antioxidant systems in acid rain-treated bean plants. Protective role of exogenous polyamines. *Plant Science* 151: 59–66.
- Verbruggen, N. & Christian Hermans, C. 2008. Proline accumulation in plants: a review. *Amino Acids* 35:753–759.
- Wang X, Deng X, Pu T., Song C., Taiwen Yong T., Yang F., Sun X, Liu W., Yan Y., Du J., Liu J., Su K & Yang W. 2017. Contribution of interspecific interactions and phosphorus application to increasing soil phosphorus availability in relay intercropping systems. *Field Crops Research* 204: 12-22.
- Wang, Z., X. Zhao, P. Wu, J. He, X. Chen, Y. Gao & X. Cao. 2015. Radiation interception and utilization by wheat/maize strip intercropping systems. *Agricultural and Forest Meteorology* 204: 58-66.
- Wang Q., Z. Sun, W. Bai, D. Zhang, Y. Zhang, R. Wang, W. Van Der Werf, J.B. Evers, T.J. Stomph, J. Guo & L. Zhang. 2021. Light interception and use efficiency differ with maize plant density in maize-peanut intercropping. *Front. Agr. Sci. Eng.* 8 (3): 432-446.
- Waqas, M.A., Wang, X., Zafar S.A., Noor, M.A., Hussain, H.A., Nawaz, M.A. & Farooq, M. 2021. Thermal stresses in maize: Effects and management strategies. *Plants*, 10, 293.
- Warnock, R.E. 1970. Micronutrient uptake and mobility within corn plants (*Zea mays* L.) in relation to phosphorus-induced zinc deficiency. *Soil Science Society of America Proceedings* 34: 765-769.
- Wnuk, A., A.G. Górny, J. Bocianowski & M. Kozak. 2013. Visualizing harvest index in crops. *Communications in Biometry and Crop Science* 8 (2): 48–59.
- Xue, Y., H. Xia, P. Christie, Z. Zhang, L. Li & C. Tang. 2016. Crop acquisition of phosphorus, iron and zinc from soil in cereal/legume intercropping systems: A critical review. *Annals of Botany* 117: 363-377.
- Yang, C., L. Yang, Y. Yang & Z. Ouyang. 2004. Rice root growth and nutrient uptake as influenced by organic manure in continuously and alternately flooded paddy soils. *Agricultural Water Management* 70: 67-81.
- Yang, F., X. Wu, Y. Cheng, Q. Liu & L. Feng, J. Chen, Z. Wang, X. Wang, T. Yong, & W. Liu. 2018. Auxin-to-gibberellin ratio as a signal for light intensity and quality in regulating soybean growth and matter partitioning. *Front. Plant Sci.* 9(56).13 p.
- Yang, H., Chai, Q., Yin, W., Falong, H., Qin, A., Fan, Z., Yu, A., Zhao, C. & Fan, H. 2022. Yield photosynthesis and leaf anatomy of maize in inter- and mono-cropping systems at varying plant densities. *The Crop Journal* 10: 893–903.

- Yavas, I. & Unay, A. 2016. Evaluation of physiological growth parameters of maize in maize-legume intercropping system. *The Journal of Animal & Plant Sciences* 26(6): 680-1687.
- Ye D., J. Chen, X. Wang, Y. Sun, Z. Yu, R. Zhang, M.A.Bakar Saddique, D. Su & M.A. Muneer. 2023. Coupling effects of optimized planting density and variety selection in improving the yield, nutrient accumulation, and remobilization of sweet maize in Southeast China. *Agronomy* 13: 2672.
- Yilmaz, S., M. Atak & M. Erayman. 2008. Identification of advantages of maize-legume intercropping over solitary cropping through competition indices in the East Mediterranean region. *Turkey J. Agric For.* 32: 111-119.
- Yuwariah Y., D. Ruswandi, A.W. Irwan. 2017. Pengaruh pola pertanaman tumpangsari jagung dan kedelai terhadap pertumbuhan dan hasil jagung hibrida dan evaluasi tumpangsari di Arjasari Kabupaten Bandung. *Jurnal Kultivasi* 16 (3): 514-521.
- Yuwono, N.W. 2009. Membangun kesuburan tanah di lahan marginal. *Jurnal Ilmu Tanah dan Lingkungan* 9(2): 137-141.
- Zelitch I. 1982. The close relationship between net photosynthesis and crop yield. *BioScience* 32(10): 796-802.
- Zeng, Q., & P.H. Brown. 2000. Soil potassium mobility and uptake by corn under differential soil moisture regimes. *Plant and Soil* 221: 121-134.
- Zhang X., G. Huang., Q. Zhao. 2014. Differences in maize physiological characteristics, nitrogen accumulation, and yield under different cropping patterns and nitrogen levels. *Chilean J. Agric Research* 74(3): 326-332.
- Zhang D., Z. Sun, L. Feng, W. Bai, N. Yang, Z. Zhang, G.Du, C. Feng, Q. Cai, Q. Wang, Y. Zhang, R. Wang, A. Arshad, X. Hao, M. Sun, Z. Gao, L. Zhang. 2020. Maize plant density affects yield, growth and source-sink relationship of crops in maize/peanut intercropping. *Field Crops Research* 257: 107926.
- Zhang, X.X., .Whalley, P.A., Ashton, R.W., Evans, J., Hawkesford, M.J., Griffiths, S., Huang, Z.D., Zhou, H., Mooney, S.J. & Whalley, W.R. 2020. A comparison between water uptake and root length density in winter wheat: effects of root density and rhizosphere properties. *Plant Soil.* 451:345-356.
- Zhao Y, Fan Z, Hu F, Yin W, Zhao C, Yu A, Chai Q. 2019. Source-to-sink translocation of carbon and nitrogen is regulated by fertilization and plant population in maize-pea intercropping. *Front. Plant Sci.* 10:891.