

## MANAGEMENT OF SOIL SYSTEM USING PRECISION AGRICULTURE TECHNOLOGY

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**Abstract:** To maximize the productivity from the limited natural resources on a sustainable manner, the only way left is to increase the resource input use efficiency. It is also certain that even in developing countries, availability of labour for agricultural activities is going to be in short supply in future. The time has now arrived to exploit all the modern tools available by bringing information technology and agricultural science together for improved economic and environmentally sustainable crop production. In this context, Precision agriculture merges the new technologies borne of the information age with a mature agricultural industry. It is an integrated crop management system that attempts to match the kind and amount of inputs with the actual crop needs for small areas within a farm field. This goal is not new, but new technologies now available, allow the concept of precision agriculture to be realized in a practical production setting.

**Keywords:** Management, Precision agriculture, Soil system

### REFERENCES

Adamchuk, V.I., Lund, E.D., Reed, T.M. and Ferguson, R.B. (2007). Evaluation of an on-the-go technology for soil pH mapping. *Prec. Agric.*, 8: 139-149.

Adamchuk, V.I., Hummel, J.W., Morgan, M.T. and Upadhyaya, S.K. (2004). On-the-go soil sensors for precision agriculture. *Comp. Electr. Agric.*, 44: 71- 91.

Atreya, K., Sharma, S., Bajracharya, R.M. and Rajbhandaric, N.P. (2008). Developing a sustainable agro-system for central Nepal using reduced tillage and straw mulching. *J. Environ. Manag.*, 88: 547- 555.

Bah, A., Balasundram, S.K. and Husni, M.H.A. (2012). Sensor technologies for precision soil nutrient management and monitoring. *American Journal of Agricultural and Biological Sciences* 7 (1): 43-49.

Balasundram, S.K., Mulla, D.J. and Robert, P.C. (2007). Spatial data calibration for site-specific phosphorus management. *Int. J. Agric. Res.*, 2: 888-899.

Balasundram, S.K., Husni, M.H.A. and Ahmed, O.H. (2008a). Spatial variability of pineapple yields on a tropical peat. *Crop Manag.* (Online). DOI: 10.1094/CM-2008-0418-01-RS

Balasundram, S.K., Husni, M.H.A. and Ahmed, O.H. (2008b). Application of geostatistical tools to quantify spatial variability of selected soil chemical properties from a cultivated tropical peat. *J. Agronomy*, 7: 82-87.

Barton, A.P., Fullen, M.A., Mitchell, D.J., Hockinga, T.J. and Liub, L. (2004). Effects of soil conservation measures on erosion rates and crop productivity on subtropical Ultisols in Yunnan province, China. *Agric. Ecosyst. Environ.*, 104: 343-357.

Brevik, E.C., Fenton, T.E. and Lazari, A. (2006). Soil electrical conductivity as a function of soil water content and implications for soil mapping. *Prec. Agric.*, 7: 393-404.

Chang, C.W., Laird, D.A., Mausbach, M.J. and Jr., C.R.H. (2001). Near-Infrared Reflectance Spectroscopy– Principal Components Regression Analyses of Soil Properties. *Soil Sci. Soc. Am. J.*, 65: 480-490. Grift, T.E., M.Z. Tekeste and R.L. Raper, 2002. Acoustic compaction layer detection. *Trans. ASAE*, 48: 1-8.

Hatfield, Jerry, L. (2000). Precision Agriculture and Environmental Quality: Challenges for Research and Education. a national workshop, "Precision Agriculture and the Environment: Research Priorities of the Nation," held in cooperation with the USDA's Natural Resources Conservation Service and Agricultural Research Service.

Kim, H.J., Sudduth, K.A. and Hummel, J.W. (2009). Soil macronutrient sensing for precision agriculture. *J. Environ. Monit.*, 11: 1810-1824. King, J.A., P.M.R. Dampney, R.M. Lark, H.C. Wheeler and R.I. Bradley *et al.*, 2005. Mapping Potential Crop Management Zones within Fields: Use of Yield-map Series and Patterns of Soil Physical Properties Identified by Electromagnetic Induction Sensing. *Prec. Agric.*, 6: 167-181.

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- King, J.A., Dampney, P.M.R., Lark, R.M., Wheeler, H.C. and Bradley, R.I. et al.** (2005). Mapping Potential Crop Management Zones within Fields: Use of Yield-map Series and Patterns of Soil Physical Properties Identified by Electromagnetic Induction Sensing. *Prec. Agric.*, 6: 167-181.
- Larson, W.E. and Pierce, F.J.** (1991). Conservation and the enhancement of soil quality. P. 175203. In *Evaluation for a Sustainable Land Management h. Pap. Int in the Developing World. Vol. 2. Tec Board for Soil Res. and Management.* Bangkok. Thailand.
- Larson, W.E., Lamb, J.A., Khakural, B.R., Ferguson, R.B. and Rehm, G. W.** (1997). Potential of site-specific management for nonpoint environmental protection. *The Site-Specific Management for Agricultural Systems*, F.J. Pierce and W.W. Frye, ed. American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, Madison, WI.
- Manor, G. and Clark, R.L.** (2001). Development of an Instrumented Subsoiler to Map Soil Hard-Pans and Real-Time Control of Subsoiler Depth. 1st Edn., ASAE, USA., pp: 12.
- McCormick, S., Jordan, C. and Bailey, J.S.** (2009). Within and between-field spatial variation in soil phosphorus in permanent grassland. *Prec. Agric.*, 10: 262-276.
- Mortensen, D.A., Johnson, G.A., Wyse, D.Y. and Martin, A.R.** (1994). Managing spatial variable weed populations. In *Site-Specific Management for Agricultural Systems*. P.C. RoLert, R.H. Rust, and W.E. Larson (eds.). 2nd Intern. Conf. On site-specific Management *for* Agricultural Systems. 2i7-30 March, Minneapolis, MN.
- National Research Council** (1993). *Soil and water quality: an agenda for agriculture*. National Academy Press, Washington. D.C.
- PPI** (1999). *Site-Specific Management Guidelines*. 1<sup>st</sup> Edn., Potash and Phosphate Institute, Atlanta.
- Rao, S., Mylavaram and Wonsuk Daniel Lee** (2002). A fact sheet of the Soil and Water Science Department, UF/IFAS Extension. Published February 2002. <http://edis.ifas.ufl.edu>.
- Rossel, R.A.V., Walvoort, D.J.J., McBratney, A.B., Janik, L.J. and Skjemstad, J.O.** (2006). Visible, near infrared, mid infrared or combined diffuse reflectance spectroscopy for simultaneous assessment of various soil properties. *Geoderma*, 131: 59-75.
- Schirrmann, M. and Domsch, H.** (2011). Sampling procedure simulating on-the-go sensing for soil nutrients. *J. Plant Nutr. Soil Sci.*, 174: 333-343.
- Srinivasan, A.** (2006). *Handbook of Precision Agriculture: Principles and Applications*. 1st Edn., Routledge, New York, ISBN: 1560229543, pp: 683.
- Stafford, J. and Werner, A.** (2003). *Precision Agriculture*. 1st Edn., Wageningen Academic Publishers, Wageningen, ISBN-10: 9076998213, pp: 783.
- Sudduth, K.A., Kitchen, N.R., Bollero, G.A., Bullock, D.G. and Wiebold, W.J.** (2003). Comparison of electromagnetic induction and direct sensing of soil electrical conductivity. *Agron. J.*, 95: 472-482.
- Sun, B., Zhou, S.L. and Zhao, Q.G.** (2003). Evaluation of spatial and temporal changes of soil quality based on geostatistical analysis in the hill region of subtropical China. *Geoderma*, 115: 85-99.
- Van De Grift, T., Wolfman, S. A., Yasuhara, K. and Anderson, R. J.** (2002). "Promoting interaction in large classes with a computer-mediated feedback system," *Washington State University*, pp. 1-10.
- Wagenet, R.J., and Hutson, J.L.** (1992). LEACHM: Leaching estimation and chemistry model. A process-based model of solute movement, transformations, plant uptake, and chemical reactions in the unsaturated zone. Version 3. Dep. Of Soil, Crop, and Atmospheric Sciences, Res. Series No. 92-3. Cornell University, Ithaca, NY.
- Wollenhaupt, N.C., Mulla, D.J. and Gotway Crawford, C. A.** (1997). Soil sampling and interpolation techniques for mapping spatial variability of soil properties. In Pierce, F.J., and E.J. Sadler (eds.) *the State of Site-Specific Management for Agriculture*. American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, Madison, WI. Pp. 19-53.