BOOK REVIEW

Precision agriculture for grain production systems, by Brett Whelan and James Taylor, Collingwood, Victoria, CSIRO Publishing, 2013, 208 pp., AUD $89.95 (paperback), ISBN 9780643107472

This excellent little book will be of great interest to many readers of this journal, in that it treats in considerable detail the concepts, tools, and techniques of precision agriculture (PA), to help ensure food security for future generations. All over the world, more and more grain farmers are adopting the PA methodology, as well as in a broad range of other cropping industries.

The book, written by two recognized experts in this field, consists of eight chapters. Chapter 1 gives a very concise introduction to PA. This is followed by a good chapter on the Global Navigation Satellite Systems (GNSS) and PA. This describes in very clear terms the agricultural uses for Global Position System (GPS). Chapters 3 and 4 describe the hardware and software required for PA. It is followed by a chapter on data management, Chapters 6 and 7 go into much more detail on how to make and interpret maps for PA and on yield variability and site-specific crop management. The final chapter is on the economics of PA in Australian grain crops. The following paragraphs describe in more detail about the content of these chapters.

The introductory chapter gives two very good definitions of PA. The first one is: ‘PA is an integrated information- and production-based farming system that is designed to increase long-term, site-specific, and whole-farm production efficiency, productivity, and profitability while minimizing unintended impacts on wildlife and the environment’.

The second definition narrows down the PA philosophy of timely management of variation down to its implementation in cropping systems, what the authors call ‘site-specific crop management’ (SSCM), defined as: ‘A form of PA whereby decisions on resource application and agronomic practices are improved to better match soil and crop requirements as they vary in the field’. SSCM, the authors show can help achieve the farmers’ objectives of optimizing production efficiency, optimizing quality, minimizing the environmental impacts of farming practices, and minimizing risk. The chapter contains some nice figures, diagrams, and tables on the role of georeferencing, and on stages for the progressive adoption of PA in grain production.

Chapter 2 on GNSS has a very good section on all the possible errors of GPS measurements, which may be critical for high accuracy applications of PA. It also contains a useful section on GNSS-based vehicle navigation systems, which can help
the farmer reduce soil compaction, have improved water management, increased yield, and better inter-row planting, cultivation, and spraying. Again, the chapter is well illustrated by figures and tables.

The chapter on hardware for PA describes yield monitoring systems, soil sensing systems, and the role of airborne and satellite optical imagery. The authors show how to combine such data with that from a multi-sensor terrain vehicle. Chapter 4 on software for PA is rather short, and describes rather simple techniques for farm record-keeping, yield data processing, spatial data analysis, and decision support systems, and how to analyze harvest trial data. The fifth chapter on data management shows how farmers can use both manual file organization of the data, and also discusses issues of data ownership and how farmers can pool and share their data.

The next chapter on making and interpreting maps for PA is one of the better chapters. It is illustrated by many, full color images and maps, in both raster and vector formats. It also gives the authors’ experience on how to interpret such maps. Chapter 7 on yield variability and site-specific crop management gives a good overview of spatio-temporal variability, and how to incorporate SSCM into farm management practices. The final chapter on the economics of PA lists many benefits of PA. Besides a good description of the balance sheet approach, they include several good case studies about the economic benefits of PA.

This book will form a basic textbook for all students of agricultural engineering, agronomy, soil science, and related disciplines at Universities and agricultural colleges around the world. It is reasonably priced, concise, and well-illustrated. At the end of each chapter, the authors give a few pages of Key Points of the chapter, which form a nice summary. The book should also be on the shelf of every agricultural extension officer, to help him advise farmers how to start with, and set up PA on their farm. It concludes with a very good index, making it very easy to look up the relevant topics covered. By reading and studying this book, one will gain a good understanding of what is involved in PA, as well as of sensing systems for measuring crop, soil, and environmental variability. It will enable the reader to critically analyze the impact of observed variation in resources on crop production and management decisions.

This book discusses only wheat as the agricultural production system. Of course, PA is also extremely valuable for other crops such as rice, sugarcane, and oil palm, to name just a few. The book only has one page of references, called ‘Further Reading’ right at the end of the book. When the authors prepare their Second Edition, which will surely come, I recommend they add a page of references at the end of each of the chapters. This will make it much more useful as a textbook for students and practitioners. The book, dealing as it does with only wheat, limits itself to optical monitoring systems. For other crops like rice, sugarcane, oil palm, one will also need to discuss the role of Synthetic Aperture Radar (SAR) imagery and image fusion techniques in PA to overcome the persistent cloud cover problem in the sub-tropical and tropical regions of the world.

This book is a ‘must have’ book! At present it serves its purpose for all those interested in an introduction to PA in general, and specifically for those working on grain production systems in countries such as Russia, China, Central Europe, and South America. I most strongly recommend it to all our readers. Besides serving as the textbook on PA for students and teachers, it will also be most useful for
agronomic advisors, extension workers, and farmers, in addition to remote sensing researchers working on crop monitoring/forecasting systems.

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