BOOK REVIEW

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by John Wibberley[1]

ADVANCES IN CONSERVATION AGRICULTURE: Two Volumes – Kassam, A. – Ed. (2020)

Kassam, A. – Ed. (2020) *Advances in Conservation Agriculture* Vol.1 Systems & Science, 575 pp.; Vol.2 Practice & Benefits, 472 pp. (Burleigh Dodds, Cambridge, UK, Series in Agricultural Science Nos. 61 & 62)

Overview

Conservation Agriculture (CA) represents an expanding and hopeful approach to sustainable agricultural management requiring full appreciation by farm managers internationally. In a total of 26 chapters, these two volumes are very ably edited by Professor Amir Kassam of the University of Reading, UK who is Moderator of the FAO-based Global CA Community of Practice. Each has a foreword, a preface and an index, with the end of each chapter having its own ample references listed. These very important and timely books collate principles that have been field-tested in research and farm practice worldwide. They attribute the foundations of thinking behind CA to three notable books: *Ploughman*'s Folly (Edward Faulkner, 1943); *An Agricultural Testament* (Sir Albert Howard, 1947) and – in Japan, *One Straw Revolution* (Masanobu Fukuoka, 1975). More reference to intercropping research than is here at present might appear in future revisions on CA.

These volumes contrast the intrusive nature of predominant agricultural systems with the agro-ecological approaches enshrined in CA. They outline many CA farming systems and the science underpinning them, together with the benefits attributable to CA, also acknowledging that some CA agronomy is contested. Their scope is global, and they reckon CA adoption so far to be approximately one-third in South America, one-third in North America and one-third in the rest of the world – with huge scope for its wider uptake, especially in Europe and Africa, but also more within China, India and elsewhere.

Within these chapters involving over 120 contributing authors, it is frequently acknowledged that farmers and farmer-to-farmer extension through farmers' groups, and farmers' associations have been keys to CA uptake so far – and are likely to be so in future. Some parts of academia and governments have not been without their resisters! Profits increase under CA systems, otherwise farmers would not adopt CA so readily. Perhaps more documented evidence of the extent of economic benefits of CA would be expected in future editions. Most CA so far is in rain-fed, annual cropping systems as the data show but there is real potential to extend adoption into a wide range of cropping systems where CA has already started in smaller ways – notably within agroforestry. Perhaps centres such as the new Wangari Maathai Agroforestry Research Centre at Nairobi University, Kenya will become key promoters? Linkage could be strengthened of CA integrated crop-livestock systems to movement towards pasture-fed livestock among farmers and consumers.

There is some variability in the use of illustrations – outstandingly good in this respect are:- chapter 3 on Soil health and landscape management; chapter 7 on Management of vegetable CA systems; chapter 9 on Integration of crop-livestock in CA systems – which notes the general disastrous decoupling of crops and livestock in intensive systems; chapter 10 on The status of mechanisation in CA systems; and in Volume 2 – chapter 9 on Biodiversity management practices and benefits in CA systems. It might have been expected that Volume 2 would have lent itself to more photographic and illustrative presentations of evidence than Volume 1. Inclusion of chapters 11 and 12 in Volume 1 on Certification and Policy matters respectively provides fruitful material for application to other issues relevant to agricultural progress, and enriches the wealth of information contained.

Clearly, the production of these two volumes has been a monumental task, and has resulted in seminal reference works of high quality on CA. Of particular value is the systematic way they combine principles and practice and have – via the Global CA Community of Practice – engaged and harnessed farm management involvement from a huge number of farmers in diverse agroecosystems within the range of research recorded.

It is to be hoped that ways can be found to make these key books available more widely in affordable form since the present cover price of £150 per volume is prohibitively high. CA benefit to SDGs and to the poor, as well as to society as a whole is noted in these texts. Among many encouraging glimpses recorded, is the benefit to Great Barrier Reef protection of CA adoption in Queensland Australia.

***Advances in Conservation Agriculture* (CA)** Vol.1 Systems & Science, 575 pp. (Burleigh Dodds, Cambridge, UK)

Noting that *Conservation Agriculture* (CA) has only been defined in internationally agreed terms since 1997[2], this volume charts its spread. Although the three principles[3] put forward in the definition of CA have been encountered within various expressions of cultivations and cropping policy, they are by no means always integrated simultaneously as in proper CA. There is a valiant attempt to chart the adoption and uptake of CA systems globally – a difficult task indeed but the reader is referred to constantly updated websites and sources of information to track changes. With such a number of authors, there is some inevitable repetition of facts

[1] Professor E John Wibberley, PhD, NSch, FRAgS, FIAgrM – University of Reading & Royal Agricultural University, Cirencester, works in international agriculture, rural development & resource management. He is Chairman of the TAA. ejwibberley@btinternet.com

[2] FAO (2020) defines CA as a farming system that promotes continuous minimum soil disturbance, maintenance of a permanent soil cover and diversification of plant species.

[3] On p.17 of Vol.1, the three integrated principles of CA are described as:- a) Continuous no or minimum mechanical soil disturbance; b) Maintaining a permanent mulch cover on the soil surface; c) Diversification of species in the cropping system.

Chapters in Volume 1. *Advances in Conservation Agriculture* (CA) - Systems & Science

1. The Need for CA
2. Development of CA systems globally
3. CA systems: soils health and landscape management
4. The role of no or minimum mechanical soil disturbance in CA systems
5. The role and management of soil mulch and cover crops in CA systems
6. The role of crop and cropping system management in CA systems
7. Management of vegetable CA systems
8. Managing perennial CA systems: orchards, plantations and agroforestry
9. Integration of crop-livestock in CA systems
10. The status of mechanisation in CA systems
11. Certification schemes for CA systems
12. Institutional and policy support for CA uptake

and data. Each chapter appears designed as almost a 'stand-alone' presentation on its particular title, though evidently and desirably overlapping with others.

Advances in Conservation Agriculture Vol.2. Practices and Benefits, 472 pp. (Burleigh Dodds, Cambridge, UK)

Volume 2 logically covers all aspects of the practical management of CA systems, and concludes with chapters covering benefits to natural resource management for the sake of all. While the weed management chapter does mention that glyphosate over-use has become controversial, and gives a couple of references, there needs to be more recognition of how very widespread is glyphosate dependence within systems currently described as CA, especially in the Americas. This arises from annually repeated use, such that glyphosate accumulation is in soils, crop residues, livestock feeds, interfering with the rumen microbiota of feedlot cattle in such farming systems, and moving on into the human food chain, adversely affecting human health via intestinal problems. More development of the use of cover cropping and knife-rollers within CA rather than using glyphosate is advocated in the text but the CA-CoP might further address this key practical issue in its future work. The need for integrated weed management, and integrated pest management is stressed, along with the need to adopt integrated, pasture-fed, less intensive livestock systems. It is made clear that genuine CA espouses these principles within its three key ones.

Arguably, the chapters in Volume 2 on Carbon might be more logically located in Volume 1 since they report experimental data and principles more than farm practice *per se*. However, that would have created a logistical problem in making Volume 1 relatively too much longer than Volume 2, unless Vol.1 chapter 7 on Management of Vegetables had been put in Vol.2 since it has much emphasis on CA practice, farm-level innovations, and benefits.

Overall, these two volumes provide an exciting collation of the science and practice of CA and its increase across the world. They are hugely valuable resources to stimulate further work for adoption of CA systems using emergent multivariate analysis - possible with digital technologies - of farming systems previously regarded as too complex to analyse. Complex mixed cropping and mixed farming systems, adopted because of their resilience by many farmers, can now be trialled. These books offer an inspiration for CA practitioners, for students of agricultural subjects, for entrepreneurs and all who are concerned for sustainable agricultural management towards Ecosystem Security.

Chapters in Volume 2. *Advances in Conservation Agriculture* (CA) - Practice and Benefits

1. Practice and benefits of CA systems
2. Crops and cropping systems management practices and benefits in CA systems
3. Soil management practices and benefits in CA systems
4. Weed management practices and benefits in CA systems
5. Insect pest and disease management practices and benefits in CA systems
6. Nutrient management practices and benefits in CA systems
7. Carbon management practices and benefits in CA systems: carbon sequestration rates
8. Carbon management practices and benefits in CA systems: soil organic carbon fraction losses and restoration
9. Biodiversity management practices and benefits in CA systems
10. CA: climate change mitigation and adaptation benefits
11. Benefits of CA to farmers and society
12. Social benefits of CA systems
13. Harnessing ecosystem services with CA
14. Rehabilitating degraded and abandoned agricultural lands with CA systems