Applied Agrometeorology

Kees Stigter
Editor

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Cover illustrations: Taking leaf and soil samples in mulching experiments in alley cropping research at the KARI Dryland Research Station, Machakos, eastern Kenya, with agriculture on sloping lands in the background (top over whole page and below that in the centre); Nomads with their animals and sedentary farmers using the same area between shelterbelts in Yambawa, northern Nigeria. Only differentiation between their needs and sustaining complementarity of their lifestyles in a changing climate will prevent resource conflicts (below top, right hand side); Adding shades to protect traditional grain storage bins from moisture influx due to solar radiation on previously wetted bin walls at the Uyole Experiment Station, Mbeya, southern Tanzania (below top, left hand side). [Photos Kees Stigter]

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I recently presented an invited paper "Rural response to climate change in poor countries: ethics, policies and scientific support systems in their agricultural environment" at an International OECD Policy Conference at the University of Wisconsin, Madison (USA), 29 June till 1 July 2009, on "Sustaining soil productivity in response to global climate change: science, policies and ethics". One of my conclusions was that (external) ethics is these days a (rare but) thoroughly accepted reason to decide to work in and for developing countries in Africa, Asia, Latin America. I took that decision more than 40 years ago. This ethical choice was based on my own suffering from the poverty that I had witnessed during early travels (in the 1960s) in these three continents.

Intuitively applying an interpretation of the Buddhist philosophy of the four Noble Truths (e.g. Brazier 1997), I learned that one can respond to such personal affliction by this rural suffering from physical and socio-economic (environmental) disasters in a practical way. Going the eightfold path of the right view (of ourselves), the right thought (of higher purpose), the right speech (of the vow of aspiration), the right action (of being part of a big story), the right livelihood (lifestyle), the right effort (intensity), the right mindfulness (remembrance and transcendence) and the right (transformative) vision. In doing so, one's private suffering may be diminished as well.

Kees Stigter

Reference

Brazier D (1997) The feeling Buddha. Robinson, London, 207pp

Preface

The contents of this book are meant to assist applied agricultural scientists in learning from case studies and other background material how to apply agrometeorology better to solve problems in the livelihood of farmers and other agricultural producers. It also wants to create a renaissance in the teaching (that is education/training/extension) of applied agrometeorology at all levels, closer to the livelihood of farmers and other agricultural producers.

Agrometeorological services are therefore the ultimate focus of this book and applied agrometeorology is shown in the service of farmers, forest and agroforestry related practitioners, and other stakeholders in using an agricultural environment to get enough and better food, fodder, fibre and other natural products.

Early in the course of 40 years of international research, teaching and consultancy, particularly in the non-industrialized world, and more than 20 years of elected international leadership (WMO, INSAM) in agrometeorology, I had become fully convinced that applied agrometeorology should actually be dealt with along different lines.

A WMO educational meeting in New Delhi early in 2007 (see Part I of this book) gave me the opportunity to test some of my ideas with some also invited colleagues from various parts of the world that would advise on new curricula in agrometeorology. They agreed with my proposal to abandon the entry towards Applied Agrometeorology through Basic Agrometeorology and to find entries for it of its own.

Once we had agreed on this basic dichotomy, that meeting designed and approved "Strategic Use of Climate Information", "Coping with Climate Variability and Climate Change", "Coping with Extreme Meteorological Events", "Tactical Decision Making Based on Weather Information" and "Developing Risk Management Strategies" as the present main entry paths to Applied Agrometeorology.

On my way back from New Delhi to Indonesia, waiting for new visa in Singapore, I finalized among others curricula contents under these headings in the form of postgraduate syllabi in an earlier agreed format. I made use of my own earlier ideas and they were later on generally approved by the other New Delhi participants in e-mail contacts. I have to note that I do not like the terminology of "risk management" for small farmers, that generally try hard to cope with their environmental difficulties more than that they manage them. These syllabi are given

in their original form in Annex I.I of Part I of this book. This shows that much historical material needed for new policies would also be collected in writing these syllabi. This is particularly also fully in line with the Sect. II.D on "Communication approaches in applied agrometeorology".

As indicated in Part I, for that part of these syllabi in which a link with basic agrometeorology is made, material has been collected in Part III of this book. It must show bedrock material for existing or new agrometeorological services. Within local agrometeorology, so on the scale of agricultural fields, this book wants to follow an approach in which actual problems in the livelihood of farmers are shown to be solvable using purely applied science. The latter should be supported by the methods, as tools and approaches, of Part IV, that belong to the basic science support systems.

It should be noted from the agrometeorological services examples collected in Part II that so far the knowledge input into these services is in many cases relatively simple but the complications are in the communications. In collecting and writing the contents of Part III, this has been taken into account. But it means that the enormous amount of material collected may be expected to be a powerful source of tools and approaches for the design of agrometeorological services in many problem fields for a long time to come, scientifically supported by the directions of the contents of Part IV. The context in which we collected the material as agrometeorologists should stimulate the design of more and better agrometeorological services.

In this Part III, the choice of the various subjects, derived from the proposed subdivision of the syllabi under the five headings mentioned above, is fully mine. Their contents are a first approach to the syllabi and determined by the various authors that have written about these subjects. In all cases these authors had been given an example of the proposed approach in the form of respectively Sects. III.2.3.(A), III.3.3.(A), III.4.3.(A), III.5.3.(A), III.6.A.(i), III.6.B.(i) and III.6.C.(i) with the title: "Problems and solutions in coping with extreme meteorological events in agricultural production and challenges remaining for the use of science to contribute to problem analyses and designing valuable solutions in this context" for the respective fields of (i) monocropping, (ii) multiple cropping, (iii) forestry, (iv) non-forest trees, (v) animal husbandry, (vi) cropping under cover and (vii) fisheries.

I am also stating in Part I that once such courses will materialize, it will appear to be information also needed in designs of further adaptation strategies and policies. Good Ph.D.-, M.Sc.- and B.Sc.-thesis research subjects can be designed for increasing the numbers and improving the contents of documented case studies, because often the available information will need extension, adaptation and updating. This is one way in which research can become more relevant to problem solving and problems related teaching and can help improve them. Local knowledge collection will also help in tying research and teaching to meteorological disaster impact experience and to improved preparedness of farmers in different land use and cropping patterns.

After all, it are these thorough links between practice, education/training/extension, policies, research and science in agricultural production that make

applied agrometeorology relevant and valuable, if and when the right ethical choices have been made.

Bruchem, The Netherlands Kees Stigter
August 2009

Acknowledgments

This book is far from a one man's exercise. There are 113 contributors to Parts II, III and IV, of which 40 in the protocols of Part II, 40 in Part II (outside the protocols) and Part III together, and 36 in Part IV, with little overlap. I consider their participation as indispensable and most valuable. I wrote Part I all alone, was editing all 30 protocol contributions to Part II and was a co-author in 10 of them. I was involved as author, co-author or advisor (as Kees Stigter or C.J. Stigter) in more than 70 of the 120 contributions to Parts II (outside the protocols), III and IV. I edited all contributions together with their (co-)authors.

As to Part II, I developed the protocol and I had the privilege to be able to use material we collected and assessed in this form in the annual INSAM contests. Although the CMA/CAU/APMP project is far from finalized, I am happy that I was able to have here a draft version of ten protocols that I could edit from an early translation by a team headed by Xiao Hongxian within the CMA. This was just sufficient to show and discuss the value of this material, even when not final. I am thankful to CMA and CAU for the support received.

In Part III there were 29 other fine authors, but two stand out in contributing to more than 10 chapters. Dr. H.P. Das and Dr. Kulasekaran Ramesh brought this way into the book an important flavor from Asia and what is important there, for which my particularly deep thanks. From four to six contributions were delivered by Drs. Emmanuel Ofori, Nicholas Kyei-Baffour and Sue Walker, from Africa, to the part on multiple cropping; by Dr. Al Riebau to the part on forest (agro)meteorology; by Drs. Luigi Mariani and Osvaldo Failla to the part on non-forest trees; and by Dr. John Gaughan to the part on animal husbandry. Without these nine multi-chapter authors, this book would also not have its present form and contents. The other 20 authors particularly also contributed to the great variation in material collected for use in the design of all kinds of agrometeorological services thinkable.

In Part IV, 15 lead authors and 21 co-authors took part in bringing scientific contributions as support systems close to applications in agrometeorology, illustrating very important methods, as tools and approaches, in exercises themselves important in the design of agrometeorological services.

I have worked for more than $3^1/_2$ years to think, get and build these contributions together in one major plan, to show the extent of applied agrometeorology when viewed from the angles of services to be established in the livelihoods of farmers

and other agricultural producers. May through our joint efforts in this book many agrometeorologists now get a better feeling for what is possible in applying agrometeorology this way.

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About the Editor

Kees Stigter is a visiting professor in Africa and Asia, these days for Agromet Vision, the Netherlands and Indonesia. His initials C.J. stand for Cornelis Johan, but Kees is his call name.

Experimental physicist by education (Phys. Drs., Amsterdam, 1966) and agrometeorologist/-climatologist by profession (Ph.D. in agriculture, Wageningen, 1974), he became member of staff (from 2001 to 2005 guest scientist) of Wageningen (Agricultural) University, the Netherlands (1966–1975, 1985–2005 (ret.); from 1974 as an Associate Professor and from 1985 in addition as a Principal Project Supervisor (TTMI-Project) and Visiting Professor in Africa and Asia.

His first mission was to Africa in May–September 1969 as an FAO expert in climatology in Madagascar. He was resident Associate Professor (1975–1978) and Full Professor (1978–1985) at the University of Dar es Salaam (Tanzania) Physics Department, in the fields of agricultural physics and agricultural meteorology.

From 1985, for the Traditional Techniques of Microclimate Improvement (TTMI) Project, he was a Visiting Professor at the University of Gezira, Wad Medani, Sudan (Department of Environmental Sciences and Natural Resources) till 2005; the University of Nairobi, Kenya (Departments of Crop Science and Meteorology) till 1999; the University of Dar es Salaam, Tanzania (Department of Physics) till 1999; and (from 1991) the Ahmadu Bello University, Zaria, Nigeria (Departments of Geography and Soil Science), till 1999. Author of the Picnic model for research education in Africa in a total of more than 40 TTMI missions. Lead author of a book on the TTMI-Project (1995).

Involved in evaluation and other missions in higher education and institutional matters, including invited lectures, in 17 African countries from 1969 till the present: Algeria, Benin, Burkina Faso, Ethiopia, the Gambia, Ghana, Kenya, Madagascar, Morocco, Niger, Nigeria, Senegal, Sudan, Tanzania and Zambia. Most recent visits: to the Sudan in 2005, to South Africa in 2006 and 2008 and Lesotho in 2008.

Subject expert (1988–1991) and project management consultant (1991–1993) for FAO/WMO/UNDP/ICAR in establishing the Centre for Advanced Studies in Agricultural Meteorology (CASAM), Pune, India. Since 1997, twelve missions (on average of more than one month) to China for the Asian Picnic Model Project (APMP), including the China Agricultural University in Beijing, trying to jointly

establish pilot projects on assessing and evaluating (institutionalization of) agrometeorological services with five provincial meteorological administrations. From 1999 onwards, for the same APMP, lectures at 10 Universities and Institutes in Indonesia, with early emphasis in Bogor and presently in Yogyakarta, three missions to Vietnam and one mission each to the Asian Disaster Preparedness Centre, Bangkok and to Fukuoka, Japan.

Three missions for Agromet Vision of respectively 1 month, 5 and 2 weeks to India (2004, 2006, 2007) in which more than twenty lectures at twelve institutes in five cities (of which several times in Hyderabad, Pune, New Delhi and once in Chennai/Madras and Coimbatore). Missions for an Asian Pacific Network Project to Hyderabad (India, 2006) and Dhaka (Bangladesh, 2008).

Former Vice-President (1986–1991) and President (1991–1999) of the World Meteorological Organization (WMO) Technical Commission for Agricultural Meteorology (CAgM). Lead author of two CAgM Reports (Nrs. 25 and 43) on Microclimate Management and Manipulation Techniques in Traditional Low External Input Agriculture. Founding president of the International Society for Agricultural Meteorology (INSAM), since 2001. Writes since 2003 the homepages of the INSAM web site (www.agrometeorology.org).

Author and co-author of more than 700 publications, of which 125 in peer reviewed journals and also close to 200 invited/selected ones in books/monographs/CD-ROMs etc. Co-author of a book on agrometeorology of multiple cropping (1993 (French); 1997 (English)). Leader of the CAgM Expert Team and Editor-in-Chief on writing the third edition of the WMO Guide to Agricultural Meteorological Practices (GAMP, WMO 134), on which he works since 1999. A draft, in which 180 scientists collaborated, was published in 2007 but after more than 2 years the final version is still under in-house editing in Geneva.

Developed from 2000 onwards in many lectures two Roving Seminars on "Agrometeorological services: theory and practice" and on "Agrometeorology and sustainable development", which he gave in Iran in 2005, in India in 2006, parts in Brazil and Venezuela in 2007 and again fully in South Africa in 2008, and one of them fully in Indonesia in 2009. This is planned to continue.

Works these days particularly on connecting agricultural sciences, environmental sciences, social sciences and extension services, proposing to use new educational commitments such as Climate Field Schools for farmers. To obtain a rural response to climate change through their own innovations and what these applied sciences have to offer through extension.

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