A contemporary history of a new approach to applied agrometeorology

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How it started

The author came to believe long ago that in developing countries, basic sciences have to be taught but very operational applied sciences have to be practiced (Stigter, 1982; 1998). When at the University of Dar es Salaam from 1975 till 1984, encouraged by L.P. Smith we already in the early stages paid attention to research needs (Stigter and Hyera, 1979). While my Amsterdam and Wageningen legacies inspired the attention for data support (e.g. Stigter, 1978; Stigter, 1983; Stigter et al., 1983; 1986) and, also motivated by John Monteith, for instrumentation suitable for the tropics (e.g. Stigter and Uiso, 1981; Stigter and Musabilha, 1982; Stigter et al., 1982).

Inspired by Gene Wilken, in the course of time emphasis in Tanzania came on identification and better understanding of traditional techniques of microclimate management and manipulation, planned from the beginning, on which our work ultimately reached the textbooks (Stigter, 1988; Wiersum, 1988; Reijntjes at al., 1992; Griffiths, 1994); and on quantification of the traditional production environment (e.g. Othieno et al., 1985; Gough et al., 1987; Stigter, 1994). This at the time already culminated in formulating the need for on-farm weather advisories in the tropics in a joint editorial after a visit of Albert Weiss to Dar es Salaam now more than 20 years ago (Stigter and Weiss, 1986).

Work the way I wanted it

Already set up long before return to the Netherlands, the Tanzanian experience inspired a follow-up with the Traditional Techniques of Microclimate Improvement Project in Africa (reviewed in Stigter et al., 1995 and Stigter and Ng'ang'a, 2001) of which many early results in the cause of time also reached the international textbooks (Griffiths, 1994; Baldy and Stigter, 1997). My work for WMO since 1979, initially on behalf of Tanzania and from 1985 onwards on behalf of the Netherlands, strengthened the international perspectives of this work. However, in Stigter et al. (1992) it had still to be concluded that there were hardly any actual attempts on operational weather advisory services, with the first exceptions reported in WMO (1990). In 1996, ten years after Stigter and Weiss (1986), I wrote in an Epilogue for the English translation of Baldy and Stigter (1993) again that "Detailed weather advisories that spring from participatory on-farm research are greatly needed", where the word "participatory" was new (Baldy and Stigter, 1997).

Only by early 1997, published in Olufayo et al. (1998), I started to talk in detail about "services to farmers". Further development of these concepts then took place in Accra, reviewing for WMO what was brought up at a Workshop on "Agrometeorology in the 21st century - needs and perspectives". Now we clearly distinguished agrometeorological services and support systems to such services (Stigter, 1999; Stigter et al., 2000). This continued in Indonesia from 1999 to 2003 during lectures at the Agricultural University in Bogor and (on their behalf and that of Wageningen University) at Universities in Bangkalan (Madura), Makassar, Manado and Kendari (Sulawesi) as well as Mataram (Lombok) (see for example Stigter, 2002a; Taba et al., 2004). I reviewed these early theories in the context of sustainable agriculture in Beijing (Stigter, 2001a) and also elaborated on them in a workshop for provincial agrometeorologists in Hanoi (Stigter, 2001b), where the most devastating conclusion was that these intermediate agrometeorologists had no training or material to assist farmers.

These theories and concepts are of course also visible in the final reporting, during the Asian Picnic Model Project since 1999, on our results in Africa and Asia (e.g. Stigter et al., 2002; Onyewotu et al., 2003; Baier, 2004; Bakheit and Stigter, 2004; Taba et al., 2004; Stigter et al., 2005d), because it is much from our own experiences that a lot of these ideas have come forward.

Use of the conceptual and diagnostic framework as a new approach to applied agrometeorology

I used these concepts on the establishment of agrometeorological services again at a training course for ADPC but tried them out as part of an "end to end" information generation and flow scheme in agricultural meteorology (Fig. 1, Stigter, 2002b). I presented this scheme for the first time at a conference in 2002 in Ljubljana (Stigter et al., 2005b) and, again for WMO, also at the end of 2002, at an expert meeting in Banjul (Stigter, 2004). I then tested these ideas on establishment of agrometeorological services also at several occasions in China, India and Indonesia, where I had lectured on the basic approach earlier. I used the framework in China for the first time in Beijing (Stigter, 2003b) and later on for an ADPC course on flood management there (Stigter et al., 2003). In between it was presented at a WMO policy meeting in Washington (Stigter, 2003a). Again, also in the reporting on the experiences from our own work it was finally used (Stigter et al., 2005a; 2006a; 2006b).

This "end to end" (from basic science to the livelihood of farmers) information generation & flow scheme in agricultural meteorology (Fig. 1) represents a new approach in applied agrometeorology. We now used it as a starting point at various occasions such as in (i) a Workshop in the Philippines

(Murthy and Stigter, 2004), (ii) the INSAM contest on collecting good examples of agrometeorological services (www.agrometeorology.org), (iii) the Pilot Projects we have with five Provincial Meteorological Administrations in China on “Reviewing agrometeorological services” (Stigter, 2005b), (iv) the FPEC Symposium in Japan (Stigter, 2005a; 2005b), (v) CAgM/WMO policy matters regarding training of intermediaries between weather and climate products and farming communities (Stigter et al., 2005c) and (vi) rewriting the WMO/CAgM Guide to Agricultural Meteorological Practices (Stigter et al., 2006/2007).

The addition compared to the Accra distinction of agrometeorological services (in the A-domain of the livelihood of farmers) and support systems to such services (forming the C-domain) is the appearance of the B-domain. This is the area where the initial conditions and the boundary conditions are studied for solving problems in the A-domain with the use of agrometeorological services and other information. Its three components are (1) the traditional knowledge pools based on local innovations that were also the basis of the new approach to research education in the TTMI-Project (Mungai et al., 1996); (2) properly selected contemporary knowledge from the ballooning C-domain and (3) understanding of appropriate policy environments that determine the feasibility of organizing agrometeorological services, guide their establishment and develop the training of extension intermediaries and farmers in field classes.

There is nowhere any doubt anymore on the importance of locally developed adaptive strategies. Nobody has ever doubted the important role that science can play if made operational in the context of farmers’ needs. But it is in this context extremely important to realize that we have come closer than ever to farmers but we are farther away than ever from policy makers (Stigter, 2005c). Although valid for many policies at many levels, this particular applies to policy matters related to extension agrometeorology and the necessity of training intermediaries and farmers (Stigter et al., 2005c). The framework has been further explained and applied at many occasions in the literature already quoted.

Further use of the new approach

The above history has been given to bring the following in an appropriate context. I have signed a contract with Springer, New York, for trying to edit a book tentatively called “Applied Agrometeorology” that will be based on the new approach outlined above (Appendix 1).

Coping with risk and disaster (e.g. Taba et al., 2004; Stigter, 2006a) is the shortest best description of farmers’ plight. Improved preparedness in the context of our new approach is part of the reply. Not only preparedness for the risks from weather and climate related disasters, pests and diseases, but also for the risks farmers take by preparing themselves in certain ways and by applying the agrometeorological services (made) available (e.g. Stigter, 2006b).

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A = Sustainable livelihood systems

B = Local adaptive strategies (knowledge pools based on traditional knowledge and indigenous technologies)
+ Contemporary knowledge pools (based on science and technology)
+ Appropriate policy environments (based on social concerns and environmental considerations, scientifically supported and operating through the market where appropriate)

C = Support systems to agrometeorological services: data + research + education/training/extension + policies

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A   ←------ |------→     B     ←------|------→    C
            |                         |
            |                         |
           E2                        E1
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E1 = Agrometeorological Action Support Systems on Mitigating Impacts of Disasters

E2 = Agrometeorological Services Supporting Actions of Producers

Figure representing Stigter's "end to end" information generation and flow scheme in agricultural meteorology with the A, B and C domains

APPENDIX 1

The following draft preliminary outline will be used to discuss, in the first half of 2006, the contents of a possible book "Applied Agrometeorology" (Kees Stigter, Editor) with members of INSAM, CAgM, the FAO/WMO Agromet-L standing e-mail conference list, CLIMLIST and other agrometeorologists and agroclimatologists not member of any of these groups. Some of the most suitable potential authors will this way also be detected.

Preface

Part I: Introductory Part [± 50 pp.]

I.1 Introduction to Part I

The book should be on how agrometeorology and agroclimatology are used (i) to prepare farmers for extreme events and (ii) to prepare farmers for the beneficial use of climate, both under the specific socio-economic conditions of different farming systems and different income groups. The latter issues make it necessary to emphasize from all points of view how farmers (can) cope with risks. Not only the risks from weather and climate related disasters, pests and diseases but also the risks they take by preparing themselves in certain ways and by applying the agrometeorological services (made) available.

I.2 Agrometeorology, a broad definition

I.3 Agrometeorology, an "end to end" information flow scheme

I.4 Agrometeorology, applications and use

I.5 Agrometeorological services

I.6 Boundary and initial conditions for solving problems with agrometeorological components

Part II: Regional operational applications of agrometeorology [100^{++} pp.]

[If we do not succeed in a substantial and balanced collection of well described case studies (earlier described or not earlier described in English,

but all in a specific protocol), this part will become Part V instead of Part II. For the geographical distribution I have followed the one of the WMO Regional Associations.]

II.1 Introduction to Part II

There is still much experience to be exchanged on applications and opportunities beyond what is pell-mell found scattered in journals, books and conference proceedings (already difficult enough to be collected) in a wide variety of fields, but there are strong regional aspects.

Earlier attempts to collect examples have not been very promising because much exists in the so called grey literature or is not specifically recognized as services (Africa, Asia, Latin America, the Caribbean, South-west Pacific and even North America and Europe). Much also was not considered publishable in other than local languages and/or local journals or could not be published in English because the people involved were not sufficiently acquainted with that language (much of north and parts of west Africa, much of Asia and Latin America, parts of the South-west Pacific).

Also there is much less value and merit attributed in our scientific system of "norms and values" to such examples of agrometeorological services compared to what is published in the support systems of data and research.

Therefore, this new attempt will not necessarily be successful and may also delay finalization because of the needs to assemble the book in a balanced way.

It is nevertheless envisaged that in this Part II we collect regional examples of actual applications of agrometeorology and agroclimatology for and by farmers. In the form of recognized services or otherwise, carried out and written up by applied scientists advising governments, companies, ngo´s and (associated) farmers, directly or through extension. This will include the relevant aspects of (the changing) means of information on and communication of such services in the livelihood of farmers.

II.2 Examples of agrometeorological services and information developed and used in Africa

II.3 Examples of agrometeorological services and information developed and used in Asia

II.4 Examples of agrometeorological services and information developed and used in South America

II.5 Examples of agrometeorological services and information developed and used in North America, Central America and the Caribbean

II.6 Examples of agrometeorological services and information developed and used in the South-West Pacific

II.7 Examples of agrometeorological services and information developed and used in Europe

Part III: Fields of application in agrometeorology [150^{++} pp.]

III.1 Introduction to Part III

There is also still much experience to be exchanged beyond what we have now collected as basic practical material in the Guide to Agricultural Meteorological Practices (GAMP). This third part should therefore become complementary to the GAMP and give background agrometeorology for which there was no place in the limited space of the Guide, following the various fields of application in agrometeorology and neighbouring disciplines.

It will be differently organized compared to the GAMP, with its remaining roots in the support systems, its historical past and its meandering emphasis on trendy subjects, which are all acceptable for such a publication but not for a book like ours. In our context, matters of action support systems, of policy support options and of capacity building policies should also get somewhat more attention than in the GAMP in this third part. Opportunities for agrometeorological services should be the guiding principle in dealing with these interdisciplinary applications.

For each of these fields the review of operational agrometeorological knowledge should include agrometeorological aspects of how to cope operationally with risks and uncertainties from and preparedness for (i) extreme events and their consequences caused by meteorological and climatological disasters on all time scales, including related aversion attempts; (ii) pests and diseases, including countervailing measures; (iii) trying to use beneficial climate and weather and (iv) applications of agrometeorological services themselves, such as offered by agroclimatological characterization, design of microclimate management

and manipulation, weather forecasting (including agrometeorological forecasting) and climate prediction, proposals of response farming, crop insurance and other advisories prepared for and by farmers in the previous three aspects.

III.2 Applied agrometeorology of monocropping in the open

III.3 Applied agrometeorology of multiple cropping in the open

III.4 Applied agrometeorology of crops under cover

III.5 Applied agrometeorology in forestry

III.6 Applied agrometeorology of non-forest trees

III.7 Applied agrometeorology in animal husbandry

III.8 Applied agrometeorology in fisheries

III.9 Applied agrometeorology in other forms of agricultural production

Part IV: Methods successfully applied in applications leading to agrometeorological services [100^{++} pp.]

IV.1 Introduction to Part IV

There are and will be no agrometeorological services and no agrometeorological actions support systems without supportive methodologies. Modern assessments of climatic resources, water resources, soil resources and biomass resources are unthinkable without such technologies. In a book like ours it is not about a theoretical approach to these methodologies but about exemplifying how these methods were supportively applied to get operational problem solving results in the agricultural environment that is the livelihood of farmers. So it should be shown how they contributed to derive the examples of Part II and made them work as well as how they guided certain fields towards the operational applications in Part III.

IV.2 Expert systems

IV.3 Field quantification

IV.4 Agricultural statistics

IV.5 Monitoring and early warning systems

IV.6 Decision support systems

IV.7 Modelling and simulation

IV.8 Remote sensing

IV.9 Geographical Information Systems

IV.10 Other approaches

Kees Stigter, Bondowoso, East Java, Indonesia, January 2006