THE BCPC CONFERENCE

Pests & Diseases 2000
Volume 1

13–16 NOVEMBER 2000 | BRIGHTON, UK

CONFERENCE PROCEEDINGS VOLUME 1

THE BCPC CONFERENCE

Pests & Diseases 2000

Proceedings of an international conference held
at the Brighton Hilton Metropole Hotel, UK
13-16 November 2000

BRITISH
CROP
PROTECTION
COUNCIL

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British Library Cataloguing in Publication Data - A catalogue record for this book is available from the British Library.

ISBN 1 901396 57 6 Set of three volumes

ISBN 1 901396 58 4 Volume 1
ISBN 1 901396 59 2 Volume 2
ISBN 1 901396 60 6 Volume 3

ISSN 0955-1506

Cover design by Major Design & Production Ltd, Nottingham
Printed in Great Britain by Page Bros, Norwich

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The British Crop Protection Council (BCPC) is a registered charity. It was founded in 1968 when the British Weed Control Council (set up in 1953) and the British Insecticide and Fungicide Council (set up in 1962) merged to form a single body. Although essentially a British organisation, its work is international in outlook.

The BCPC brings together a wide range of organisations interested in the improvement of crop protection. The members of the Board represent the interests of government departments, the agrochemical industry, farmers' organisations, the advisory services and independent consultants, distributors, the research councils, agricultural engineers, environment interests, consumer groups, training and overseas development.

Objectives

The mission of the BCPC is to promote the development, use and understanding of effective and sustainable crop protection practice.

The BCPC has four objectives:

- To examine current and developing issues in the science and practice of crop protection;
- To promote improved, environmentally-sensitive crop protection practices to produce wholesome food;
- To foster and support crop protection science and practice through conferences, symposia and publications and through the presentation of its views to government and other organisations;
- To present independent information to the general public on the place of crop protection in agriculture and horticulture and to encourage and contribute to education and training.

Further information

Further information about the BCPC, its organisation and its work can be obtained from:

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ABBREVIATIONS

Where abbreviations are necessary the following are permitted without definition

acceptable daily intake	ADI
acid equivalent	a.e.
active ingredient	a.i.
approximately	c.
body weight	b.w.
boiling point	b.p.
British Standards Institution	BSI
by the author last mentioned	*idem.*
centimetre(s)	cm
Chemical Abstracts Services Registry Number	CAS RN
compare	cf.
concentration x time product	ct
concentration required to kill 50% of test organisms	LC_{50}
correlation coefficient	*r*
cultivar	cv.
cultivars	cvs.
day(s)	d
days after treatment	DAT
degrees Celsius (centigrade)	°C
dose required to kill 50% of test organisums	LD_{50}
dry matter	d.m.
Edition	Edn
editor	ed.
editors	eds
emulsifiable concentrate	EC
freezing point	f.p.
for example	e.g.
gas chromatography-mass spectrometry	gc-ms
gas-liquid chromatography	glc
gram(s)	g
growth stage	GS
hectare(s)	ha
high performance (or pressure) liquid chromatography	hplc
hour	h
infrared	i.r.
integrated crop management	ICM
integrated pest management	IPM
International Standardisation Organisation	ISO
in the journal last mentioned	*ibid.*
Joules	J
Kelvin	K
kilogram(s)	kg
least significant difference	LSD
litre(s)	litre(s)
litres per hectare	litres/ha
mass	*m*
mass per mass	*m/m*
mass per volume	*m/V*
mass spectrometry	ms
maximum	max.
melting point	m.p.
metre(s)	m
milligram(s)	mg
milligrams per litre	mg/litre
milligrams per kg	mg/kg
millilitre(s)	ml
millimetre(s)	mm
minimum	min.
Ministry of Agriculture Fisheries and Food (England & Wales)	MAFF
minute (time unit)	min
molar concentration	M
no observed adverse effect level	NOAEL
no observed effect concentration	NOEC
no observed effect level	NOEL
nuclear magnetic resonance	nmr
number average diameter	n.a.d.
number median diameter	n.m.d.
organic matter	o.m.
page	p.
pages	pp.
parts per million	ppm
pascal	Pa
percentage	%
post-emergence	post-em.
power take off	p.t.o.
pre-emergence	pre-em.
pre-plant incorporated	ppi
probability (statistical)	*P*
relative humidity	r.h.
revolutions per minute	rev/min
second (time unit)	s
standard error	SE
standard error of means	SEM
soluble powder	SP
species (singular)	sp.
species (plural)	spp.
square metre	m^2
subspecies	ssp.
surface mean diameter	s.m.d.
suspension concentrate	SC
systemic acquired resistance	SAR
technical grade	tech.
temperature	temp.
that is	*i.e.*
thin-layer chromatography	tlc
time for 50% loss; half life	DT_{50}
tonne(s)	t
ultraviolet	u.v.
United Kingdom	UK
United States Department of Agriculture	USDA
vapour pressure	v.p.
variety (wild plant use)	var.
volume	*V*
weight	*wt*
weight by volume (mass by volume is more correct)	*wt/v* (m/V)
weight by weight (mass by mass is more correct)	*wt/wt* *(m/m)*
wettable powder	WP

less than		$<$
more than		$>$
not less than		$\nless$
not more than		$\ngtr$
Multiplying symbols-		Prefixes
mega	(x 10^{6})	M
kilo	(x 10^{3})	k
milli	(x 10^{-3})	m
micro	(x 10^{-6})	μ
nano	(x 10^{-9})	n
pico	(x 10^{-12})	p

SESSION 1

THE TWENTY-SEVENTH BAWDEN MEMORIAL LECTURE

Chairman:	Dr P J Bunyan *British Crop Protection Council, Farnham, UK*
Session Organiser:	Professor P E Russell *Aventis CropScience, Lyon, France*
Paper:	1-1

New era, new challenges, new solutions

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ABSTRACT

The recent achievements of chemistry-based crop protection will be reviewed and related to the promise of emerging technologies for the future production of food, animal feed and materials.

The arrival of the millennium finds the crop management industry in a phase of unprecedented change. The industry itself is increasingly recognising its role opposite partners in the food provision chain. This has led to wholesale changes in relationships amongst the participants.

However, it is in the technology arena that changes have been most profound and this topic provides focus for this paper. A new paradigm has emerged for the invention of new crop protection chemicals in which several novel technology platforms combine to enable breakthrough innovation. Genetic modification of crops to introduce valuable traits is now firmly established, with remarkably rapid uptake of the technology by growers who seek the commercial and agronomic advantages on offer.

In spite of sustained technical and economic progress, the industry has been less successful in several geographies in achieving the support of the general public for its activities. Compelling strategies for engagement of the public are required to ensure that progress in technology is matched by economic success.

BACKGROUND - WORLD AGRICULTURE IN CONTEXT

The turn of the millennium provides a particularly cogent opportunity to take stock of the remarkable progress made to date by the crop protection industries and to look forward to new challenges. The scope of this paper will include a retrospective view of major progress in the past decade or so, an assessment of the status quo today and a review of the prospects for the future, particularly in terms of the new solutions which science and technology promise. In this light, the scope of the paper will be limited to arable agriculture, with emphasis on both crop protection and crop management. In presenting the 15th Bawden Lecture in 1988, John Finney reminded us that "forecasting is rarely straightforward but forecasting in agriculture at a time when it is restructuring is a particularly precarious pastime" (Finney, 1988). This statement holds perfectly true today, and accordingly the prospects for the use of science and technology-based solutions which I will describe are subject to similar qualification.

At this point, it is useful to remind ourselves that those of us engaged in crop management are making an important contribution to the food provision industry. We are called upon to play a key role in feeding the world safely and sustainably. In pursuing this task, our efforts are focused upon:

- protecting yield - control of weeds, pests and diseases
- increasing yield - agronomic effects (eg. drought and salt tolerance), efficient use of light energy
- improving yield quality - enhanced composition - oils, proteins, vitamins, beneficial dietary components

The first of these endeavours has met with significant success. The organic chemistry-based industry is one half century old and its beneficial output should be a matter for great pride. Regrettably, we have not succeeded in winning public confidence in our activities - in spite of the manifest benefits.

Excellent progress has been made with projects aimed at increasing and improving yield - the promise of biotechnology in these areas suggests an acceleration of achievement in the coming years. We face a severe challenge in feeding a world with increased requirements for quality and variety, in addition to inherent population growth (Pinstrup-Anderson, 1999). Figure 1 analyses increases in population, the area given to arable and permanent crops and the food production index over the period 1985-1995 (FAO, 1996).

Figure 1.

The World 1985-1995

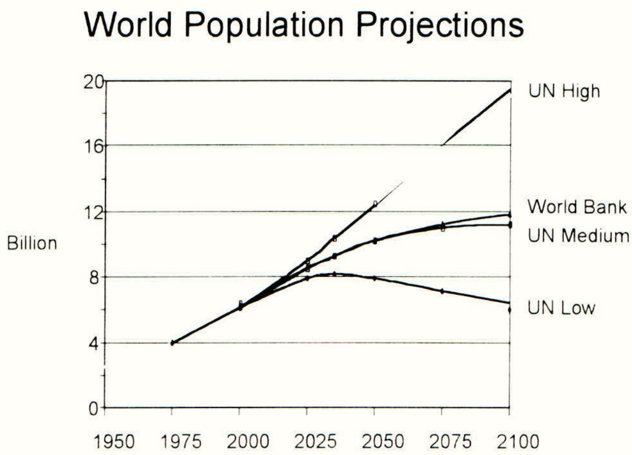
Total land area = 13.0 billion ha

	1985	1990	1995	% Change 1985-1995
Arable and permanent crops (billion ha)	1.44	1.46	1.48	2.8
Population (billion)	4.89	5.28	5.68	16.1
Food production index	90.7	100.8	110.8	22.1

Source : FAO Yearbook, Vol 50, 1996

Whereas the amount of land given to arable agriculture has increased by only 2.8% over the whole period, the population has grown by 16.1% in the same period. Furthermore, the food production index has increased by over 22% in that time. This analysis indicates that intensification of agriculture on a little changed area has met the challenge of feeding the burgeoning and increasingly demanding population. Whether or not this success can be continued will depend on many factors, perhaps the most important of which is the pattern of future world population growth. Figure 2 indicates four estimates which provide significant variation (Avery, 1995).

Figure 2.



However, all four estimates agree that the world population will increase to about eight billion over a quarter of a century. Indeed, world population passed the six billion mark in October, 1999. Thus, the imperative of enhancing food provision remains with us for yet another generation. However, the world is far from homogenous in its requirements. In the developing world, the production of calories (yield) remains the major challenge, but also with increasing requirement for variety and quality. It could be argued that in the Western world, the avoidance of calories appears to be the will of many people. The focus here will certainly be upon variety and quality, with functional foods and contributions to the dietary component of health becoming increasingly important. Notwithstanding these global differences, it is worth noting that economic growth is invariably a driver of crop protection technology usage. A comprehensive review of economic and social trends pertinent to agriculture has recently been published (FAO, 2000).

It is thus fortunate that very significant increases in crops yields have occurred world-wide in the past half century. From the production of corn in the USA through to rice in Indonesia, a relentless gain in crop yields has been evident. In his Bawden Lecture in 1997, Dennis Avery addressed the potential for stabilising world population by provision of food security. He has illustrated that increased food production, for which crop yields are a good proxy, has been a vital element in sharply reducing world birth rates (Avery, 1997). Figure 3 provides some examples of relevant data (Avery, 1995).