## Contents

	Abbreviations	ix
	Prologue	1
1.	The Fourth Resource	3
2.	Agriculture in Crisis	8
	The soil and water crisis	8
	The productivity crisis	10
	Through the looking glass	12
	The hidden harvest	14
	The problems not addressed	16
	Biotechnology, the solution?	17
3.	The Tools	20
	Cutting and pasting	21
	About language and limitations	23
	Culturing cells and tissues	26
	Controlling the process	27
	A new threshold?	28
4.	The Actors	30
	Public or private?	31
	Dominance of the transnational corporations (TNCs)	32
	The concentration within	43
5.	Providing the Inputs	51
	The biased focus: herbicide tolerance	52
	Eroding the options	61
	Artificial solutions?	65

	Transforming the Output	70
0.	Transforming the Output	73
	The circle of sugar	82
	The chocolate crop	89
	The battle for vegetable ons	94
	Interenanging products, mar new and products	~~
7.	Controlling the Profit	99
	An historical appraisal	100
	The great reversal	101
	Tightening the grip: the push for patents on life	104
	The implications	108
•	Appropriate Riotechnology?	119
0.	The LADCS and the privatization of biotechnology	120
	Third World national efforts to get involved	123
	Third world hattonial crior is to get involved	
9.	The Original Biotechnologist	135
	Diversity for production	137
	Multiple cropping, multiple benefits	138
	Biotechnology for the people	142
	Promoting people's participation	145
	Epilogue	149
	Index	152
	List of Tables	
2	1 Problems in rice and the Green Revolution response	16
2	2.2 Comparing the Green Revolution and bio-revolution	18
	3.1 Milestones in biotechnology	25
		25
4	1 1 ne true new biotechnology firms	30
4	4.2 Investments in food and agriculture-related biotech companies	3/
	4.5 Top ag-biotechnology companies R&D spending (1988)	40
	A 5 The top the phase of the top top the phase of the top top top the phase of the top	44
	4.5 The top ten pharmaceutical corporations and the urge to merge	44
	4.7 The top ten seed corporations	40
	and the top ten tool processing corporations	48
	5.1 Research on herbicide tolerance	55
	5.2 The work on artificial seeds	66
	6.1 Agricultural exports from the Third World	71

6.2	The attack on sugar: biotechnology research on the new	
	sweeteners	79
6.3	The natural super sweets	81
6.4	Cocoa production, yield, exports and dependency	83
6.5	Biotechnology research on cocoa	87
6.6	Global vegetable oil production and exports	89
8.1	The privatization of IARCS and related institutions	125
8.2	Biotechnology programmes in Asia	129
8.3	Biotechnology in Thailand	131
9.1	Ten reasons for multiple cropping	141
9.2	Sustainable agriculture: farmers and biotech approaches	144
Gra	aphs	
1.1	The state of the US Genebank	4
2 1	Changes in gronning netterns Dunish (India) 1066 86	11
2.1	The Green Revolution in the Philippines: rises in farm costs	11
<i>L</i> . <i>L</i>	1970–81	13
3.1	Time needed for the synthesis of a gene	23
4.1	The biotechnology web: co-operative agreements within the	
	industry	41
4.2	Corporate biotech R & D in the Netherlands	42
5.1	Global research on herbicide tolerance	59
5.2	Research on biological control agents	63
6.1	The decline of sugar: Philippine sugar exports to the USA	76
6.2	Biotechnology and sugar: sweetener consumption in the USA, 1965–85	77
6.3	Shares of world cocoa production, by continent, 1970–90	83
6.4	Shares of world cocoa production, by country, 1970-90	84
6.5	Global vegetable oil production	90
7.1	Third World patents: to residents and non-residents	101
7.2	The use of certified cereal seed, by EEC country	114
7.3	The use of home-grown seed in the USA, by crop	114
7.4	European plant patent applications	116

8.1	Institutions working on biotechnology, Latin America and the Caribbean	124
9.1	Annual yield of a single plot in the Philippines, by crop	140
<b>Box</b> 7.1	Twelve reasons to say no to life patents	109