AGRICULTURAL PRODUCTION IN INDIA AND ESTIMATED LOSSES DUE TO PEST DAMAGE

It is generally agreed that one of the more practical ways to solve India's food problem is to increase the yield per acre of the crops grown in the country. Fertilisers, irrigation projects and better farming practices are all helping to achieve this increase in food production. However, much of this effort would be wasted if adequate measures are not taken to ensure that what is grown is not lost or damaged by insect pests and diseases. Chemicals can provide the necessary protection.

The information presented in this study, although of necessity based on estimates, illustrates the serious losses caused by various pests to major Indian crops and which can be saved by the use of selected chemical pesticides. From the purely economic point of view, it can be seen how a relatively small investment in pesticides can give a large dividend by increasing the harvest of agricultural crops (see diagrams).

A detailed study has been made in Appendix IV of the rice crop with particular reference to one of its more serious pests — the stem borer. This study serves as an illustration of the method used in working out the data set out in Appendices I and II. Commodity prices are given in Appendix III.

CHEMICALS DEPARTMENT
BURMAH-SHELL

ESTIMATED LOSSES TO CROPS IN INDIA DUE TO DAMAGE CAUSED BY INSECTS AND THE POSSIBLE INCREASES IN YIELD RESULTING FROM THEIR CONTROL

(*Area:* Thousand acres)
(*Production:* Thousand tons unless otherwise stated)
(*Loss:* Thousand tons unless otherwise stated)

(1)	(2)	(3)	(4)	(5)			(6)
				Estimated reduction in losses (Appendix II, Col. 3)			Cost of Chemicals needed (Appendix II, Col. 4)
CROP	Total Area	Total Production	Total Estimated Loss	%	Quantity	Value Rs. Crores	Rs. Crores
Rice	78,174	28,142	2814.20	20	562.840	27.41	2.184
Other Cereals including Maize Jowar, Ragi, Small Millets, Wheat and Barley	137,468	29,109	2037.63	10	203.763	11.247	1.55
Pulses including gram ..	57,295	11,435	571.75	10	57.175	4.494	0.78
Potatoes (1954-55)	665	1,762	88.10	10	8.81	0.29	0.0269
Sugarcane (as raw sugar) ..	5,019	6,745	1079.20	50	539.60	26.49	1.905
Tobacco	1,022	306	15.30	30	4.59	0.488	0.0725
Groundnut (nuts in shell) ..	13,101	4,086	204.30	20	40.86	2.647	0.3727
Other oilseeds including Mustard, Castor, Sesamum and Linseed	16,805	1,946	97.30	10	9.73	0.7395	0.176
Jute ('000 bales of 400 lbs. each)	1,883	4,221	211.05	20	42.21	0.78	0.0567
Cotton ('000 bales of lint of 392 lbs. each	19,843	4,723	850.14	20	170.028	5.834	1.221
Tea ('000 lbs.) (1955-56) ..	791	675,000	33750.00	50	16875.00	3.138	0.318
Coffee ('000 lbs.) (1953-54) ..	232	55,616	4449.28	50	2224.64	0.516	0.0618
Cocoanut (millions of nuts) (1954-55)	1,577	3,855	192.75	10	19.275	0.482	0.0298
Rubber ('000 lbs.) (1954-55)..	172	43,266	—	—	—	—	—
Chillies (dry)	1,450	354	35.40	30	10.62	1.444	0.0873
Ginger (dry)	40	15	—	—	—	—	—
Pepper — Black	234	32	1.60	10	0.16	0.036	0.00149
Miscellaneous non-forecast crops, vegetables, fruits, etc.	125,000	25,000	1500.00	10	150	6.12	0.938

N.B.—The figures for areas and production relate to 1956-57 published figures unless otherwise stated. Although the published figures for all the miscellaneous non-forecast crops, vegetables and fruits are not available, yet they are valuable in the present context and therefore an attempt has been made to give a rough estimate of the area under such crops and their production.

APPENDIX I

(*Production:* Thousand tons unless otherwise stated)
(*Loss:* Thousand tons unless otherwise stated)

(1)	(2)	(3)		(4)		(5)
Crop and Total Production	Major Pests	Total Estimated Losses		Recommendations for Control		Estimated area economically treatable (acres)
		%	Quantity	Name	Rate of application per acre (lbs.)	
Rice	Swarming caterpillar ..	2	562.84	E	0.20	
28142	Rice stem borer ..	2	562.84	E	0.40	35,41,512
	Rice caseworm	2	562.84	E	0.40	
	Rice bug	2	562.84	A	0.30	
	Rice grasshopper ..	1	281.42	A	0.15	15,63,444
	Rice hispa	1	281.42	D	0.225	7,81,722
	Total ..	10	2814.20			58,86,678
Other Cereals including Jowar, Bajra, Ragi, Small Millets, Wheat and Barley	Grasshoppers			A	0.15	
	Termites			A	1.00	22,20,498
29109	Cutworms			A	1.00	
		7	2037.63			
	Hairy caterpillar ..			E	0.25	
	Stem borers			E	0.40	26,50,463
	Army worm			E	0.25	
	Total ..					48,70,961
Pulses including gram ..	Red hairy caterpillar ..			E	0.25	
	Pod borer ..			E	0.25	11,43,399
11435		5	571.75			
	Gram caterpillar ..			E	0.25	
	Cutworms			A	1.00	7,62,267
	Total					19,05,666
Potatoes	Jassids			E	0.20	64,410
1762	Aphids			E	0.20	
		5	88.1			
	Cutworms			A	1.00	14,411
	White grubs			A	1.00	
	Total ..					78,821
Sugarcane (as raw sugar)	Pyrilla	4	269.80	E	0.10	
6745	Borers	8	539.60	E	2.50	47,29,041
	Termites	4	269.80	A	1.00	10,21,970
	Total ..	16	1079.20			57,51,011

APPENDIX IV — TABLE II

The total infested area of 13,000,000 acres is estimated to consist of the following levels of infestation and losses:

(1)		(2)		(3)	(4)	(5)		
Fraction of the area		Loss of Production		Estimated area economically treatable ('000 acres)	Estimated reduction in losses ('000 tons)	Requirements of insecticide		
%	('000 Acres)	% of Average	('000 Tons)			Name	Quantity lbs.	Value Rs.
1	130	80	37.44	1,040	112.568	Endrin	416,000	6,772,480
2	260	60	56.16					
5	650	50	117.00					
20	2,600	20	187.20					
72	9,360	5	168.48					

N.B. In a peasant crop like Rice, we presume that only in case of severe losses control measures will generally be taken. Hence the areas suffering a loss of 20% or less have been excluded for calculation of requirements of insecticides and evaluation of yield.

APPENDIX IV — TABLE III

Major Rice Pests

(1)	(2)	(3)	(4)		
Pest	Estimated area economically treatable (acres)	Estimated reduction in losses (tons)	Requirements of Insecticide		
			Name	Quantity lbs.	Value Rs.
Stemborer	1,040,000	112,568	Endrin	416,000	6,772,480
Rice caseworm	1,250,756	112,568	Endrin	500,302	8,144,917
Swarming caterpillar	1,250,756	112,568	Endrin	250,151	4,072,458
			Total Endrin	1,166,453	
Rice bug	781,722	112,568	Aldrin	234,517	975,591
Grasshopper	781,722	56,284	Aldrin	117,258	487,793
			Total Aldrin	351,775	
Rice hispa	781,722	56,284	Dieldrin	175,887	1,389,507
Total ..	5,886,678	562,840			21,842,746
Posted in	Appendix II, Column 2, and Appendix I, Column 5.	Appendix II, Column 3.	Appendix II, Column 4.		Appendix II, Column 4.

BIBLIOGRAPHY

(1) Directorate of Economics and Statistics, Ministry of Food and Agriculture, NEW DELHI.

(i) "Abstract of Agricultural Statistics, India — 1956"

(ii) "Estimates of Area and Production of Principal Crops in India 1954-55." Vol. I — Summary Tables.

(iii) "Agricultural Situation in India" Feb. 1959.

(2) Kothari, H. C.

"Tea in National Economy" The Hindu of 21-8-1958 Madras.

(3) Tea Board, India.

"Tea Statistics, 1956."

APPENDIX III

Commodity	*Rate per unit*
Rice	Rs. 487 per ton
Other cereals including Maize, Ragi, Jowar, Bajra, Wheat, Barley	Rs. 552 per ton
Pulses including gram	Rs. 786 per ton
Potatoes	Rs. 330 per ton
Tea	Rs. 1.86 per lb.
Coffee	Rs. 2.32 per lb.
Raw Sugar (Gur)	Rs. 491 per ton
Tobacco	Rs. 1,063 per ton
Groundnut (nuts in shell)	Rs. 648 per ton
Other oilseeds including Mustard, Castor, Sesamum and Linseed	Rs. 760 per ton
Cotton	Rs. 343.16 per bale of 392 lbs.
Jute	Rs. 185 per bale of 400 lbs.
Coconut	Rs. 0.25 per nut.
Chillies	Rs. 1,360 per ton
Pepper	Rs. 2,248 per ton
Miscellaneous non-forecast crops, vegetables, fruits, etc.	Rs. 408 per ton

Chemicals	*c.i.f. cost*
Aldrin	Rs. 4.16 per lb.
Dieldrin	Rs. 7.90 per lb.
Endrin	Rs. 16.28 per lb.

APPENDIX IV — TABLE I

Crop: Rice

Pest: Stem Borer

Total acreage = 78,174,000

Total Production = 28,142,000 tons

Yield per acre = 0.36 ton

State	Total Area ('000 acres)	Infested Acreage (Estimated) %	Infested Acreage (Estimated) Area ('000 acres)
Andhra	7,104	35 — 45	2841.6
Madras	5,538	35 — 45	2215.2
West Bengal	10,060	15 — 25	2012.0
Mysore	2,030	25 — 35	609.0
Bihar	12,528	10 — 20	1879.2
Assam	4,313	10 — 20	646.9
Bombay	4,113	5 — 15	411.3
Orissa	9,825	5 — 15	932.5
Kerala	1,883	5 — 15	188.3
Uttar Pradesh	9,533	5 — 15	953.3
Madhya Pradesh	9,547	0 — 10	477.3
Jammu and Kashmir	489	—	—
Punjab	733	—	—
Rajasthan	228	—	—
Delhi	1	—	—
Himachal Pradesh	111	—	—
Manipur	222	—	—
Tripura	406	—	—
Andaman and Nicobar Islands	10	—	—
All-India	78,174		13166.6

It is also seen that the overall infestation can be safely taken as 15 to 20% of the total acreage.

APPENDIX II

(*Loss:* Thousand tons unless otherwise stated)

(1)	(2)	(3)			(4)		
Crop	Estimated area economically treatable (acres)	Estimated reduction in losses			Chemicals required		
		% of Total losses	Quantity	Value Rs. Crores		Quantity (lbs.)	Value Rs.
Rice	5,886,678	20	562.840	27.41	E	1,166,453	18,989,855
					A	351,775	1,463,384
					D	175,887	1,389,507
					Total ..		21,842,746
					= Rs. 2.184 crores		
Other Cereals including Jawar, Bajra, Ragi, Small Millets, Wheat and Barley	4,870,961	10	203.763	11.247	A	768,634	3,197,517
					E	757,275	12,328,437
					Total ..		15,525,954
					= Rs. 1.55 crores		
Pulses including gram	1,905,666	10	57.175	4.494	A	762,267	3,171,031
					E	285,850	4,653,638
					Total ..		7,824,669
					= Rs. 0.78 crores		
Potatoes	78,821	10	8.81	0.29	E	12,882	209,719
					A	14,411	59,950
					Total ..		269,669
					= Rs. 0.0269 crores		
Sugarcane (as raw sugar) ..	5,751,011	50	539.60	26.49	A	1,021,970	4,251,395
					E	909,431	14,805,537
					Total ..		19,056,932
					= Rs. 1.905 crores		
Tobacco	159,120	30	4.59	0.488	E	36,720	597,802
					A	30,600	127,296
					Total ..		725,098
					= Rs. 0.0725 crores		
Groundnut (nuts in shell) ..	913,043	20	40.86	2.647	E	195,652	3,185,215
					A	130,435	542,610
					Total ..		3,727,825
					= Rs. 0.3727 crores		

APPENDIX II—(Contd.)

(1)	(2)	(3)			(4)		
Crop	Estimated area economically treatable (acres)	Estimated reduction in losses			Chemicals required		
		% of Total losses	Quantity	Value Rs. Crores		Quantity (lbs.)	Value Rs.
Other oilseeds including Mustard, Castor, Sesamum and Linseed	454,067	10	9.73	0.79395	E	108,111	1,760,047
						= Rs. 0.176 crores	
Jute ('000 bales of 400 lbs. each)	150,749	20	42.21	0.78	E	28,265	460,154
					D	13,568	107,187
					Total ..		567,341
					= Rs. 0.0567 crores		
Cotton ('000 bales of lint of 392 lbs. each)	2,333,338	20	170.028	5.834	E	750,000	12,210,000
					= Rs. 1.221 crores		
Tea ('000 lbs.)	1,003,192	50	16,875	3.138	A	155,000	644,800
					D	121,094	956,642
					E	96,874	1,577,108
					Total ..		3,178,550
					= Rs. 0.318 crores		
Coffee ('000 lbs.)	92,291	50	2224.54	0.556	D	58,465	461,874
					A	37,584	156,349
					Total ..		618,223
					= Rs. 0.0618 crores		
Cocoanut (millions of nuts) ..	51,617	10	19.275	0.482	A	25,808	107,361
					E	8,603	140,057
					D	6,482	51,208
					Total ..		298,626
					= Rs. 0.0298 crores		
Chillies (dry)	491,667	30	10.62	1.444	D	110,625	873,938
					= Rs. 0.0873 crores		
Pepper (Black)	6,317	10	0.16	0.036	D	1,895	14,971
					= Rs. 0.00149 crores		
Miscellaneous non-forecast crops, vegetables, fruits, etc. ..	2,544,444	10	150	6.12	A	500,000	2,080,000
					E	400,000	6,512,000
					D	100,000	790,000
					Total ..		9,382,000
					= Rs. 0.938 crores		

A = Aldrin
D = Dieldrin
E = Endrin

APPENDIX I—(Contd.)

(1)	(2)	(3)		(4)		(5)
Crop and Total Production	Major Pest	Total Estimated Losses		Recommendations for Control		Estimated area economically treatable (acres)
		%	Quantity	Name	Rate of application per acre (lbs.)	
Tobacco 306	Tobacco caterpillar ..	5	15.30	E	0.25	1,28,520
	Stem borer			E	0.40	
	Aphids			E	0.25	
	Cutworms			A	1.00	30,600
	Total ..	..	..	..	..	1,59,120
Groundnut (nuts in shell). 4086	Hairy caterpillar ..	5	204.30	E	0.25	7,82,608
	Termites			A	1.00	1,30,435
	Total ..	..	..	..	..	9,13,043
Other Oilseeds including Mustard, Castor, Sesamum and Linseed 1946	Mustard aphids ..	5	97.3	E	0.25	4,54,057
	Hairy caterpillar ..			E	0.25	
	Semi-looper			E	0.20	
	Capsule borer ..			E	0.25	
	Leaf and Pod caterpillar			E	0.25	
Jute ('000 bales of 400 lbs. each) 4221	Semi-looper	5	211.05	E	0.25	1,13,060
	Hairy caterpillar ..			E	0.25	
	Jute apion			D	0.36	37,689
	Total ..	..	..	..	..	1,50,749
Cotton ('000 bales of lint of 392 lbs. each, .. 4723	Bollworms	10	472.3	E	0.75	23,33,338
	Jassids	4	188.92	E	0.25	
	Cotton leafroller ..	4	188.92	E	0.75	
	,, stem borer ..			E	0.25	
	Aphids			E	0.25	
	Whitefly			E	0.25	
	Total ..	18	850.14			
Tea ('000 lbs.) 675000	Tea Mosquito	5	33750	D	0.3	5,38,196
	Looper caterpillar ..			D	0.2	
	Thrips			D	0.2	
	Leaf eaters			E	0.25	3,87,496
	Aphids			E	0.25	
	Termites			A	2.0	77,500
	Total ..	..	..	..	..	10,03,192
Coffee ('000 lbs.) .. 55616	Green bug	8	4449.28	D	0.7	65,147
	Borers			D	1.25	
	Mealy bug			A	2.25	27,144
	Cutworm			A	1.0	
	Total ..	..	..	..	..	92,291

APPENDIX I—(Contd.)

(1)	(2)	(3)		(4)		(5)
Crop and Total Production	Major Pests	Total Estimated Losses		Recommendations for Control		Estimated area economically treatable (acres)
		%	Quantity	Name	Rate of application per acre (lbs.)	
Cocoanut (millions of nuts) 3,855	Black headed caterpillar	5	192.75	E	0.25	25,809
	Red palm weevil ..			E	0.50	
	Rhinoceros beetle ..			A	1.00	25,808
	Total					51,617
Chillies (dry) 354.. ..	Chilli thrips	10	35.4	D	0.225	4,91,667
Pepper — Black 32	Mealy bug	5	1.6	D	0.225	6,317
	Flea beetle			D	0.45	
Miscellaneous non-forecast crops, vegetables, fruits, etc. 25,0000	Aphids, Caterpillars, Borers	6	1500	E	0.25	1,600,000
	Grasshoppers, Termites, Cutworms			A	1.00	5,00,000
	Bugs, Fruit flies, Thrips.			D	0.225	4,44,444
	Total					2,544,444

N.B. A = Aldrin
D = Dieldrin
E = Endrin.

RICE

PRODUCTION — 28 MILLION TONS

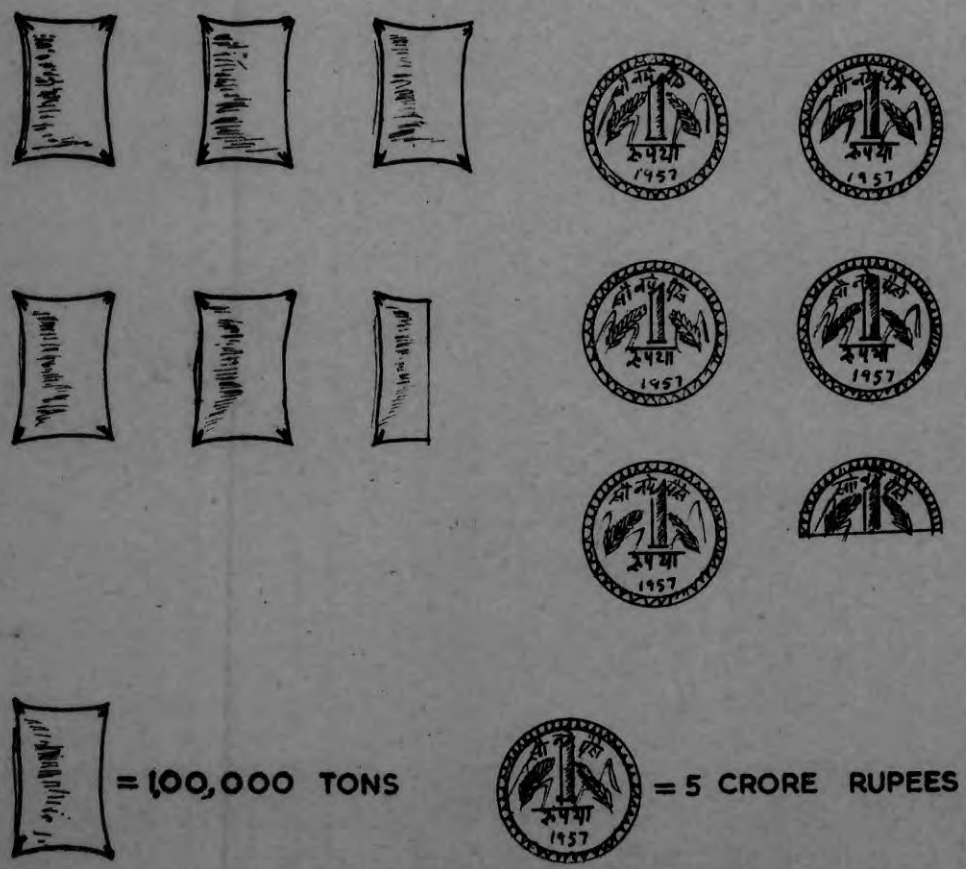
ESTIMATED LOSS — 2·8 MILLION TONS

USING

ALDRIN
DIELDRIN
ENDRIN
} at a cost of Rs.2·2 CRORES

ESTIMATED SAVING

5,60,000 TONS ≡ Rs.27.4 CRORES



= 100,000 TONS

= 5 CRORE RUPEES

SUGARCANE

(GUR)

PRODUCTION 6·7 MILLION TONS

ESTIMATED LOSS – 1·1 MILLION TONS

USING

ALDRIN, ENDRIN } at a cost of Rs. 1·9 CRORES

ESTIMATED SAVING

5,40,000 TONS ≡ Rs. 26·5 CRORES

GUR = 1 00 000 TONS

= 5 CRORE RUPEES

COTTON

PRODUCTION 4·72 MILLION BALES

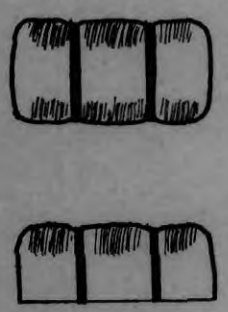
ESTIMATED LOSS 0·85 MILLION BALES

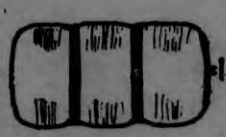
USING -

ENDRIN: at a cost of Rs.1·2 CRORES

ESTIMATED SAVING

1,70,000 BALES = Rs.5·8 CRORES





1,00,000 BALES
(1 BALE = 392 lbs)

= 1 CRORE RUPEES

TEA

PRODUCTION — 675 MILLION POUNDS

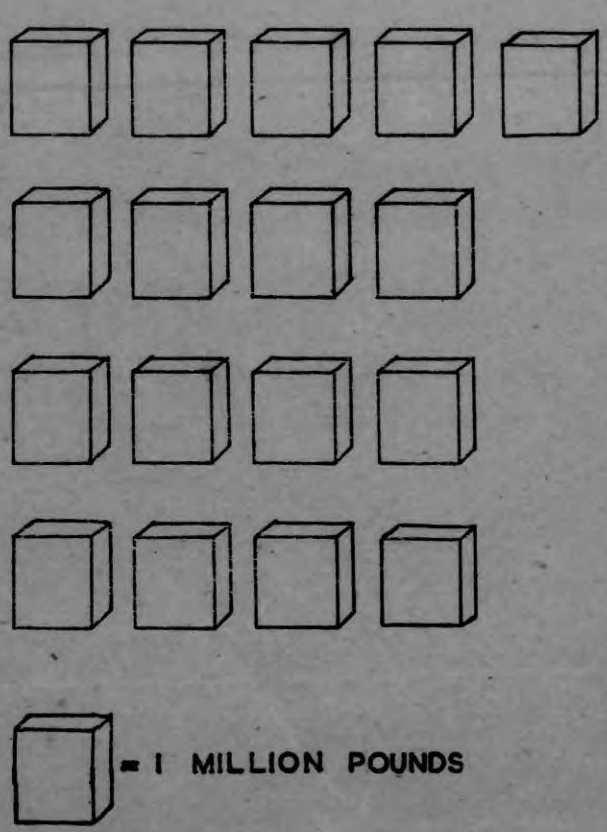
ESTIMATED LOSS — 34 MILLION POUNDS

USING

ALDRIN
DIELDRIN
ENDRIN
} At a cost of Rs.0·3 CRORES

ESTIMATED SAVING

17·0 MILLION POUNDS = Rs. 3·1 CRORES



= 1 MILLION POUNDS

= 1 CRORE RUPEES

PULSES INCLUDING GRAMS

PRODUCTION – 11·4 MILLION TONS

ESTIMATED LOSS – 0·6 MILLION TONS

USING

ALDRIN, ENDRIN } at a cost of Rs. 0·8 CRORES

ESTIMATED SAVING

57,000 TONS ≡ Rs. 4·5 CRORES

= 10,000 Tons

= 1 Crore

CEREALS

JOWAR, RAGI, SMALL MILLETS,
WHEAT & BARLEY

PRODUCTION — 29 MILLION TONS
ESTIMATED LOSS — 2 MILLION TONS

USING

ALDRIN, ENDRIN — at a cost of Rs. 1·6 CRORES

ESTIMATED SAVING

200,000 TONS = Rs. 11·2 CRORES

= 100,000 TONS

= 5 CRORE RUPEES