have only theoretical and physically-scientific value. Under a variety of broad assumptions, they calculated theoretical maximum production at 30 times present world production. The authors hasten to say that, while such large increases are possible, they "...can never be obtained in practice because of economic, social, or political limitations."

In a sense we *are* running out of land. But man, the biological, economic and social animal, has *always* been running out of land; spatially, economically, and politically. In the economic sense I want to emphasize that there is a supply price (a rent) required to bring additional land into production. Much discussion (including that surrounding the "idle" acres in the U.S. of the late 1960s) implies that, since there is more land out there somewhere that is potentially cultivatable, it will automatically, and at zero, or low cost, come into production. This thinking is dangerously misleading, even though there is lots of land in the world that can be brought into cultivation. Clearly, sizable investments may be required in many instances and much of the land brought in will not be initially as productive as land now in production.

Considering the above caution, I ask you to remember my optimism built around the proposition that the relative economic importance of farmland declines while human capital (skills and knowledge) rises with economic growth and the modernization of agriculture. The point is that technical progress produces contrary results because the forces that lead to the results are each other's opposite. Good economics is capable of explaining even contrary results. Theory is for explaining what happens. But predicting certain matters, for example income shares, is presently beyond our capabilities.

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The Nectar Of the Moths...

NECTARILESS COTTON

...Is a Thing Of the Past

by Richard L. Wilson and F. Douglas Wilson*

Arizona's pink bollworm community is all a-buzz—or, perhaps, all a-flutter would be more accurate—over news that a change in their diet can reduce their numbers by as much as 50 per cent.

Normal cotton plants contain nectaries, organs that secrete a liquid high in sugar, organs that supply nutrient to the pink bollworm moth, organs that provide 9-10 million feeding sites per acre in the average cotton field for adult pink bollworms and other insects.

The nectaries are found on the undersides of leaves and at the base of bracts that surround the fruiting parts of the cotton, including the squares, flowers, and bolls.

What's happened is this: Plant geneticists have found a way to eliminate those nectaries—every last one—and thus have removed the sugars needed for maximum egg production by the pink bollworm moth. Eggs do get laid of course, but without the sugar the moths just aren't up for big production numbers.

You could say, with some justification, that they're off their feed.

Field tests in 1974, 1975, and 1976 on nectariless versus nectaried cotton proves the point. In 1974, we compared 40 acres of an experimental strain of Deltapine 16 nectariless cotton with an equal area of nectaried Deltapine 16 at Bruce Church Farms near Parker, and both plots were sprayed for pink bollworm control according to the grower's schedule.

In 1975 and 1976 we grew five acres each of nectaried and nectariless Deltapine and Stoneville types at Tempe. No insecticides were applied.

The results of the testing showed the number of pink bollworms found in green bolls on nectariless cotton de-

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clined by 58 per cent at the Parker location and by 46 per cent and 48 per cent respectively in 1975 and 1976 at Tempe (see Table 1).

Seed x-rayed from the tests showed damage reduced at Parker by 39 per cent in the nectariless cottons, by 39 per cent at Tempe in 1975, and by 44 per cent in the Deltapine strain and 23 per cent in the Stoneville in 1976.

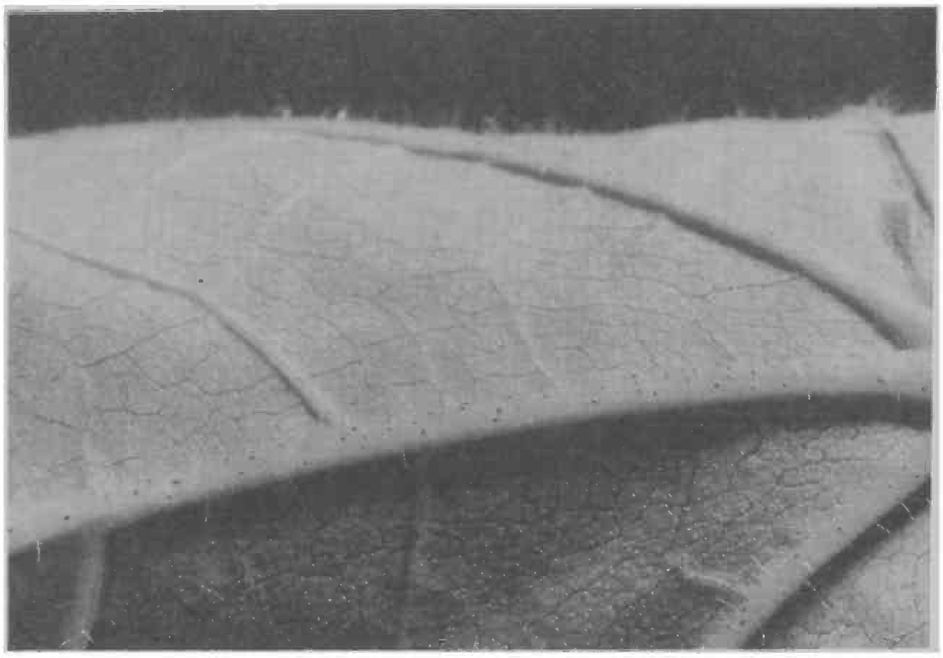
Also encouraging is the yield of the nectariless strains, which usually exceeded that of the nectaried plants.

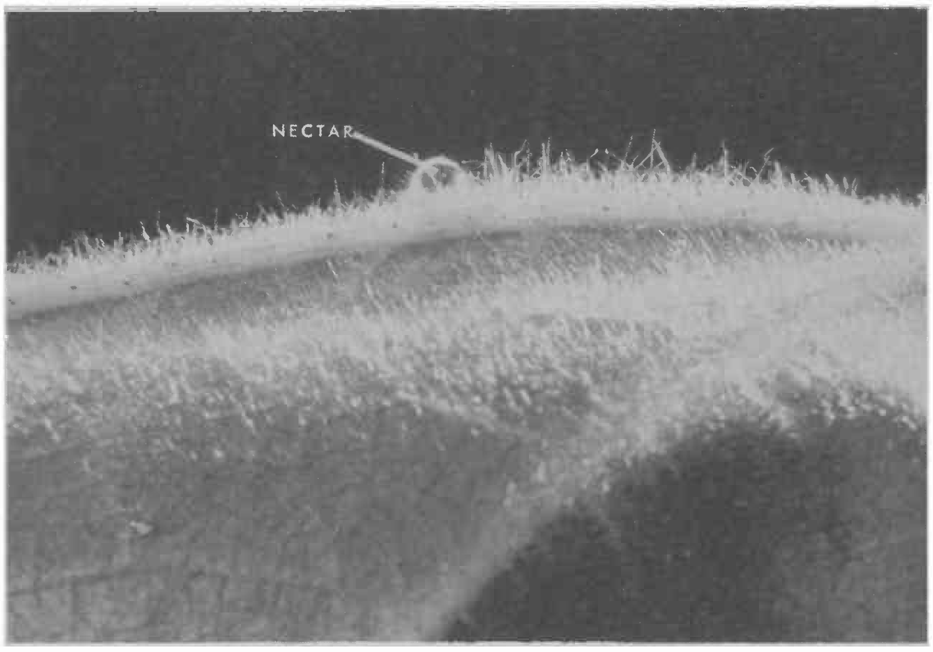
At Parker, the nectaried did exceed the nectariless strain for yield, but this was probably because the nectariless strain we used didn't have the yield potential of which Deltapine 16 is capable.

At Tempe, the 1975 results were not appreciably different between nectaried and nectariless strains, but in 1976 the nectariless plots of Stoneville and Deltapine outyielded the nectaried plot.

In short: bolls of nectariless cotton contained fewer pink bollworms; seeds sustained less damage; improved strains of nectariless cotton yielded as well or better than their nectaried counterparts.

Nectariless cotton will probably not eliminate the need for insecticidal control of pink bollworms, but it should reduce the amount needed. Large-scale use of such strains would not only diminish pink bollworm and other insect-pest populations during the growing season, but would also reduce the overwintering populations and thus the overall populations the following year. Conceivably a grower could use less insecticide on his cotton because he could start treating later and treat less frequently during the season. Nectariless cotton could also be an important component of an integrated control system in which several methods rather than a single one are used to reduce or eliminate populations of unwanted pests.





NECTAR GLISTENS at the base of bracts on a young boll of nectaried cotton (below), while the relative hairlessness of the nectariless leaf (top right) contrasts with the hairy and nectar-bearing leaf of the standard variety (middle right).

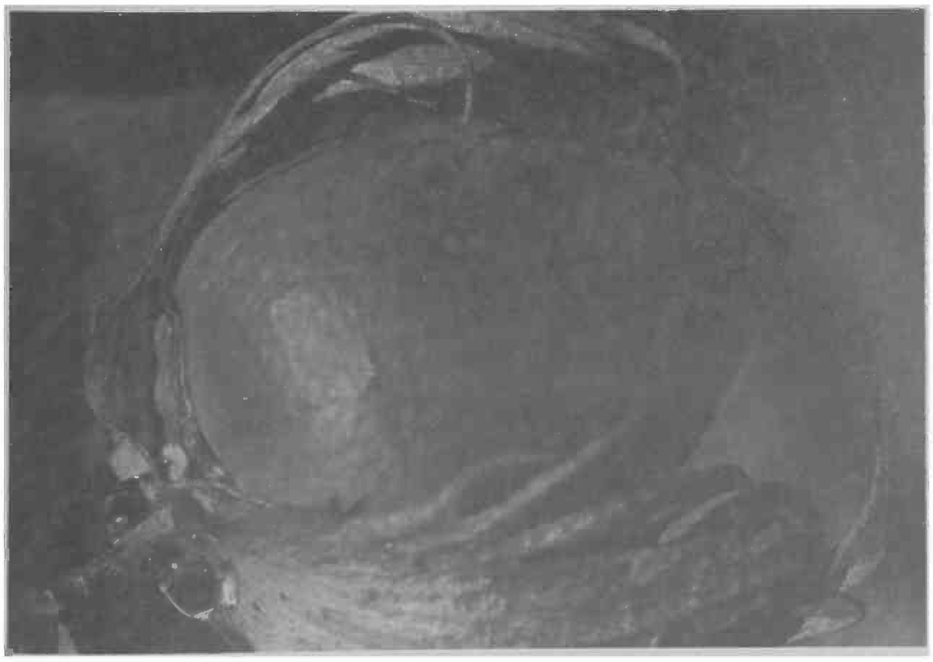


Table 1.
Response of 3 nectariless cotton types to pink bollworms in Arizona from 1974 to 1976.

Strain or cultivar	Nectaries	PBW/100 bolls	Damaged seed (%)	Lint yield (lb/A)
		1974 (Parker, AZ)		
DPL–16	+	9.9	2.3	2716
DPL–16 N	–	4.1	1.4	2300
		1975 (Tempe, AZ)		
Stv 7A	+	79.4	30.4	945
Stv 731 N	–	43.2	18.6	933
		1976 (Tempe, AZ)		
DPL–16	+	102.6	35.9	853
DPL–7146 N	–	42.8	20.2	1174
Stv 213	+	–	36.8	873
Stv 731 N	–	–	28.3	1021