Risk & Diversify

(From page 7)

sugar beets and cotton at .30 acres each. Given the corresponding average net income, $103, and variability coefficient, 17%, the expected net income varies by $19 over the 60 to 90% probability range — as explained previously in part 1, a 60 (90)% probability level should be interpreted to mean that at least 6 (9) years out of ten net income can be expected to be as high or higher than the amount shown. In contrast at the same .30 crop mix the net income spread over the 60 to 90% range for cotton and fall lettuce is $92. However, with the more stable sugar beets the $19 range is from $80 to $99 while with fall lettuce the $92 range is from $166 to $74. Thus, based on both net income and risk considerations fall lettuce at .30 appears far superior to sugar beets at .30 for even if the farmer undertaking such a diversification scheme had a very bad year (net income should be as low or lower than the 90% figure only one year out of ten) the lettuce diversion net income can be expected to be nearly as good as the sugarbeet diversion net income, $74 versus $80. Moreover, under a reasonably good year (6 out of 10) the net income from the lettuce diversion is far superior to the corresponding sugar beet diversion net income, $166 versus $99.

A comparison of the results reveals quite a different picture if the diversion of cotton is carried to the extreme where all .60 acres are put in fall lettuce. Under a reasonably good year, the expected net income for the .60 acre lettuce rotation would be a whopping $197/acre or greater. However, the comparable return at the 90% level is only $25. Clearly a farmer who has a fixed debt amounting to $75/acre/year might logically choose not to risk the $50/acre cash loss and potential bankruptcy associated with the $239 average net income from a .60 acre lettuce mix when a .30 acre sugar beet mix results in a reasonable and secure $103 average net income. Appropriately, in Part III, "Allowing for Risk in Arizona Crop Farm Planning," (forthcoming in the January-February issue), we will complete the process of developing the procedure for the practical application of the "Principle of Increasing Risk" by introducing debt retirement and farm fixed cost considerations.

Cutting Alfalfa for Hay Timed to Reduce Buildup of Lygus Bug Populations

*by G. D. Butler, Jr., M. H. Schonhorst and F. Watson**

Populations of lygus bugs, particularly *Lygus hesperus* Knight in Arizona, build up in alfalfa fields in the summer months and migrate to cotton and other nearby crops when the alfalfa is cut for hay. Results of recent studies of the growth of alfalfa and analyses of biological data of lygus bugs indicated that the number of lygus bugs migrating from alfalfa fields may be greatly reduced by shortening the interval between cuttings of alfalfa in the early summer months when lygus bugs are important pests of cotton.

Populations of lygus bug adults in alfalfa may increase 3.6-fold every 10 days in May and June, as indicated in Table 1. This rapid increase, if permitted to develop by delays in the cutting of the alfalfa for hay or by the withholding of irrigation because of greater need of water for cotton or other crops, can result in development of high populations of lygus bugs in alfalfa. The study field in Table 1 and several other alfalfa fields were adjacent to cotton fields. An insecticide was applied to the alfalfa just before it was cut to prevent mass migration of lygus bugs from the alfalfa fields to the cotton. In addition to the expense of the insecticide and its application, beneficial insects, parasites and predators, were killed. Many lygus bug adults moved into the cotton before the alfalfa was treated necessitating insecticidal application which reduced predator and parasite popu-

Table 1. Populations of lygus bug adults in alfalfa in May-June 1969. Eloy, Arizona.

No. days after alfalfa cut for hay	*No. adult lygus bugs per 100 net sweeps*
20	58
25	110
30	209
35	396
40	752
45	1426

**Research Entomologist, Cotton Insects Biological Control Investigations, Agricultural Research Service, U. S. Department of Agriculture; Professor, Department of Agronomy; and Research Assistant, Department of Agricultural Engineering, University of Arizona, respectively.*

lations that were holding harmful cotton insects in check.

The rate of development of eggs and nymphs of lygus bugs, as influenced by temperature, was determined in the laboratory. This information was programmed in a computer and the duration of the cycle from egg to adult at the temperatures at Casa Grande, Arizona, in 1969 is shown in Figure 1. It took 22 to 23 days for lygus bug adults to develop from eggs laid in the last part of May to 18 to 19 days for eggs laid in July.

Mature lygus bugs generally leave an alfalfa field within a day or two after it is cut, depending on the rate of curing. Then they return to the field as regrowth of alfalfa progresses. Immature lygus bugs probably die since they cannot leave the field and are subjected to high soil-surface temperatures after the removal of the alfalfa. Certain practices such as delayed raking and baling of the alfalfa, cloudy weather, and other factors, may permit some of the nymphs to survive.

Results of studies on the growth of alfalfa over a period of several years at the Mesa Experimental Farm of the University of Arizona indicated that the time from cutting to when 25 to 35% of the plants in the field are in bloom, criteria used to indicate when

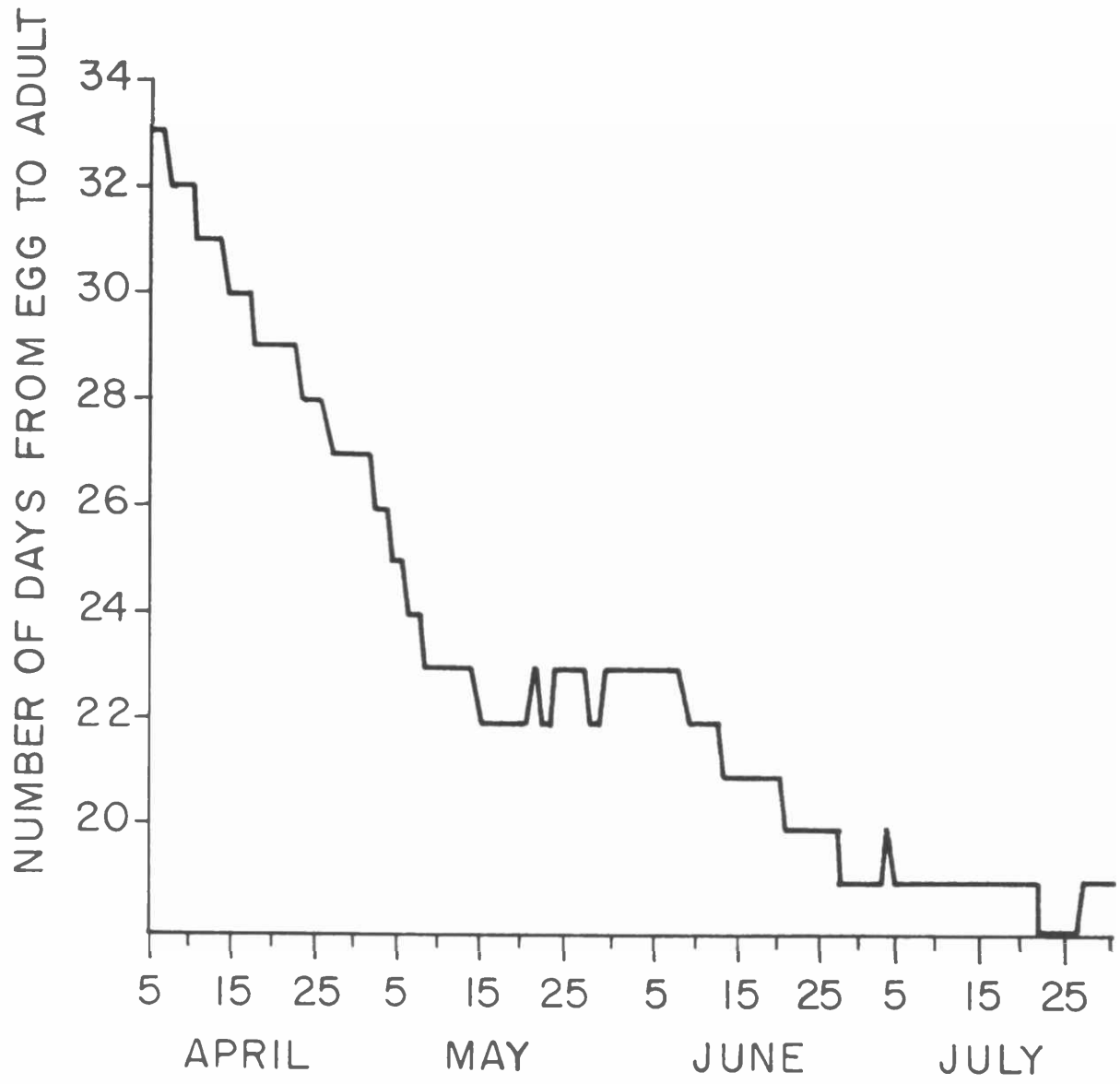

Fig. 1.—Number of days from egg to adult of lygus bugs on various dates at Eloy, Ariz. 1969.

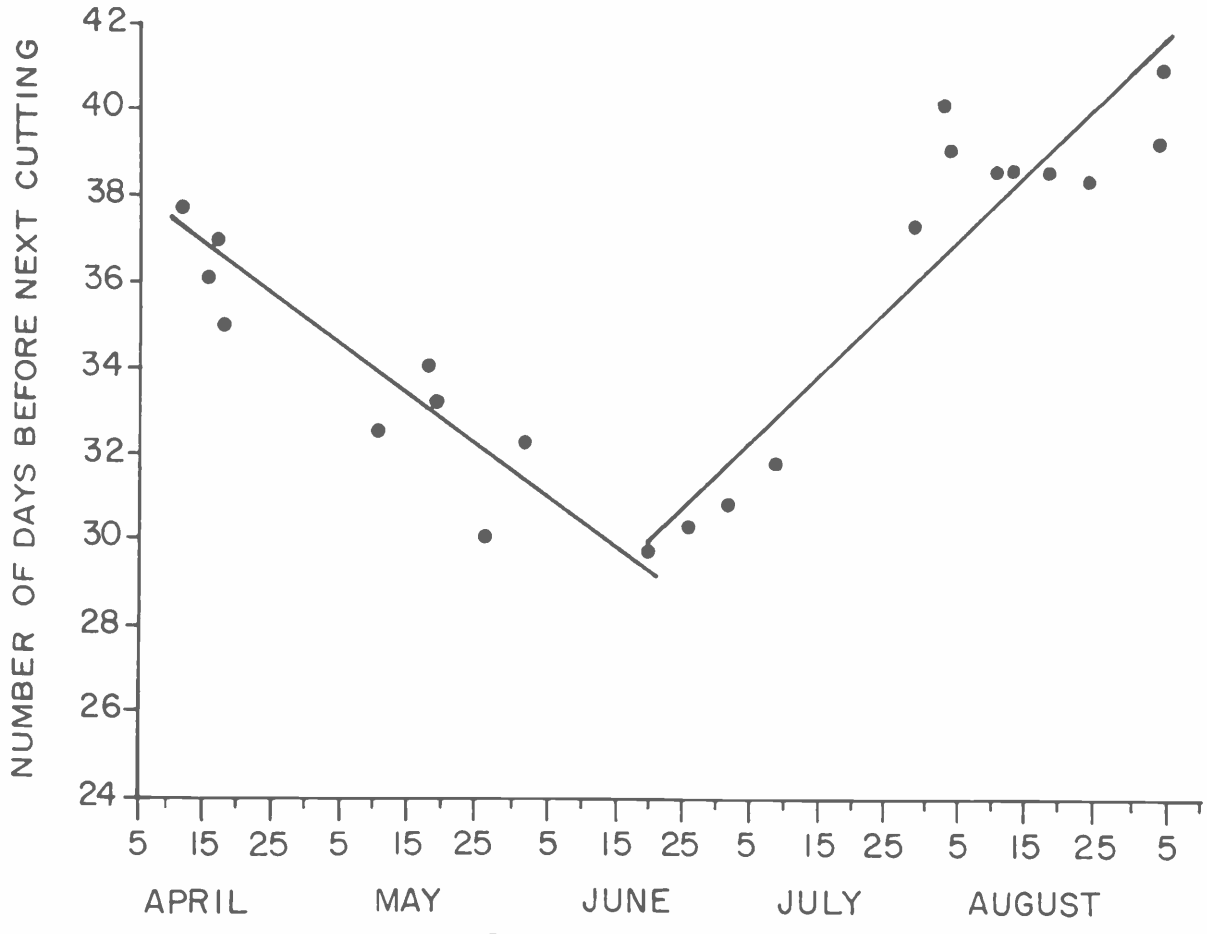

Fig. 2.—Number of days required from one hay cutting to next (25 to 35% bloom) at Mesa, Ariz.

alfalfa should be cut for hay, shortens from April to June and increases thereafter (Figure 2). For fields cut about May 20, approximately 32 days were required before the plants were ready for the next cutting. At this time it takes approximately 22 to 23 days for lygus bugs to develop into adults from eggs laid on the new growth. From 5 to 7 days may elapse after the alfalfa is cut before adults come back into the field in any number and start laying eggs. Thus only eggs laid early in the period have time to produce adults. Therefore, care must be exercised to avoid lengthening the period of plant growth at this time. The timing of cutting the alfalfa based on flowering in the summer months may not be as clear-cut as is desired because lygus bug adults and nymphs injure flower buds and may prevent normal flowering. Timing of cutting alfalfa from May to August should be based on the data in Figure 1. If growers follow the above procedure in producing alfalfa hay, the lygus migration to cotton will be reduced.