replacement following chemotherapy[5], and *per se* in the treatment of malignant disease[6].

We thank Dr. G. H. Tovey for generous supplies of human serum, and Mr. J. Wegrzyn for his assistance.

This work was supported by a Medical Research Council research grant to one of us (M. O. S.).

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AGRICULTURE

Significance of Differences between Variety Yields under Experimental and Farm Conditions

Previous work has shown that if farm yields are plotted against experimental yields they lie along a curve which has a slope of 45 degrees at low values and is almost horizontal at high values[1]. This occurs because, in years favourable to the crop, farm yields do not increase by the same proportion as experimental yields.

This result suggests that it may be erroneous to assume that significant differences between yields of plants obtained under experimental conditions will also be significant on farms. This becomes obvious when the differences between two points on the curve are measured on the abscissae and the ordinate of Fig. 1. In unfavourable years the difference between the yield of two crop varieties in an experiment is A B. On farms it would be the smaller but still substantial differences A_1B_1. Although a much larger difference in the yield of the two varieties A_2B_2 may be obtained in favourable years in an experiment, the difference in yield on farms A_3B_3 will actually be smaller than in unfavourable years. If farm yields fail to reflect the large differences between the yields obtained under experimental conditions in favourable years, it is possible that significant differences due to varieties, fertilizers, insecticides and other cultural practices obtained on an experimental scale would not be significant on a farm scale.

It is possible to examine the differences in the yields of varieties of sugar cane in experimental plots and on farms. In Queensland (Australia) the Bureau of Sugar Experimental Stations has carried out variety trials of commercial strains of sugar cane in all major sugar areas using the latin square or randomized block techniques over a period of years. Differences in the yields of varieties are not published unless they are significant at the 5 per cent level. The cultural and manurial practices used in the experiment are similar to those used on farms in the mill area in which the trial is conducted; the concurrent yields of individual varieties of sugar cane produced on farms are collected for each mill area by the Bureau of Sugar Experimental Stations (N. J. King, personal communication).

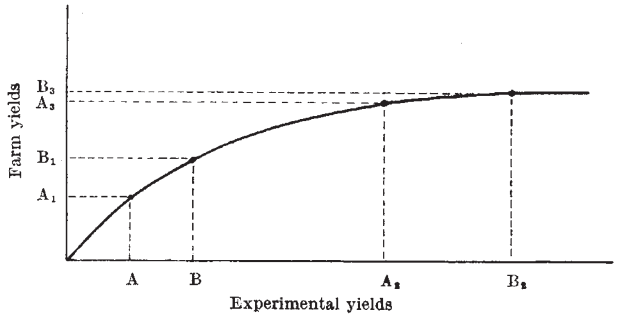

Fig. 1. Differences between yields on farms and in experiments in favourable and unfavourable years

Table 1. Comparison of High- and Low-yielding Varieties of Sugar Cane in Experimental Trials and on Farms

Variety pair	Yields (tons cane per acre)				Total area of farm crops in mill area acres	
	Experimental plots		District average			
	High-yielding variety	Low-yielding variety	High-yielding variety	Low-yielding variety	High-yielding variety	Low-yielding variety
A	22·36	20·97	17·6	15·7	6698	1011
B	38·34	35·12	23·2	23·5	5335	2295
C	16·65	13·99	16·9	17·3	2085	5886
D	40·26	32·28	19·8	16·6	3373	1607
E	40·26	26·28	19·8	24·4	3373	808
F	43·28	33·65	29·0	31·8	1573	6965
G	43·28	22·45	29·0	26·2	1573	309
H	46·35	39·90	29·0	29·6	1386	8729
I	35·22	27·81	23·4	23·3	4648	1201
J	33·65	22·43	31·8	26·2	6965	309
K	32·28	26·28	16·6	24·4	1607	808
L	41·37	39·05	29·6	32·5	1400	4122
Mean	36·11	28·35	23·8	24·3	3328	2838
Mean difference	+7·8		−0·5			

Using this information, a comparison can be made between any two varieties of different yield in a particular trial in a particular year. Similarly the average yields of the same high-yielding variety can be compared with the average yield of the same lower-yielding variety in the mill area in which the trial is located. Unfortunately mill areas are restricted to a few varieties and, if areas where trials and farm crops are partially or fully irrigated are excluded, only twelve pairs of varieties can be compared with farm data. This comparison is made in Table 1.

In the experiments the mean yield of the high-yielding varieties was 7·8 tons (27 per cent) higher than that of the lower-yielding varieties and this difference was significant at the 1 per cent level. On farms there was no significant difference between the yield of the high- and low-yielding varieties. The lack of difference on farms between high- and low-yielding varieties cannot be explained by the total acreages of each variety grown on farms. Substantial acreages of all the varieties studied were produced, and there was no correlation between acreage of crop grown in the mill area and difference between the yield of high- and low-yielding varieties on the farms.

This investigation was restricted to a comparison between experimental yields and average farm yields of high- and lower-yielding varieties of sugar cane, but it does suggest that, although a variety may give significantly higher yields than other varieties under experimental conditions, this difference may not exist on farms even when climate, soil and cultural practices are similar to those in the experiment. It is possible that this failure of farm yields to reflect experimental trends may also be true of comparisons between different levels of fertilizer or different cultural practices. Further comparisons between differences in yields in experiments and on farms would be necessary to establish the magnitude and significance of differences which exist on farms for a given difference established in an experimental trial at a particular level of significance. For the data presented here a difference in the average yield of 27 per cent, which is significant at the 1 per cent level in experiments, is not reflected in average farm yields. It is possible that the reduction in the difference in yield, which occurs when a practice is translated from experiment to farm, changes with the variable or the type of crop being examined, and that the actual degree of reduction in yield for particular variables and different crops must be found before the results of experiments can be applied to farming.

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