(4) WATER USE IN AGRICULTURE

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Table I has columns headed "Present" and "Future", showing the part that agriculture takes—or might take—in the national water economy. By "nation" is meant England and Wales, because not all the facts needed are readily available for Scotland or for Northern Ireland, but qualifying signs show the kind of change that would be produced if these areas were included. If there is a problem, it is exposed at its most acute by considering only England and Wales.

TABLE I

Mean Annual Water Balance and Outlets
(cm. depth over England and Wales)

	Present	Future	Very remote future
Rain	90 (+)	90	
Evaporation	45 (−)	45	
River flow, etc.	45 (++)	45	
Use	5·5 (−)	11?	
Farm: non-irrigation	0·25 (−)	0·3?	
Irrigation	0·04 (−)	0·08	0·20
		(0·16)	(0·40)

Within the year—and depending on geology—part of the 45 cm. of "river flow" may be temporarily stored as ground-water; "use" in many areas involves drawing on this storage. Elsewhere it is done by tapping or trapping river flow.

Within this, the agricultural part is very small. The estimate is made in the same way as by Prickett**, but using later agricultural statistics of animal populations. The allocations are: for cows in milk, 30 g.p.d.; for other cattle and horses, 10 g.p.d.; for pigs, 3 g.p.d.; for sheep, 1½ g.p.d.; for poultry, 1/20 g.p.d., plus an allowance for miscellaneous uses of water, small in individual amounts but very important. Prickett's total, for 1960, was 73,000 m.g.: the new value, for 1962, is 76,000 m.g. An increase of about 20 per cent in the next 15 years or so is probably fair. In the field the animals get about half

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** Prickett, C. N. 1962 Proc. Institution of Civil Engineers Symposium on Conservation of Water Resources in the United Kingdom, p. 15.

wooden model were suspended, one at a time and in random order, by their nylon threads from a line strung horizontally about 8 m. above the ground between two masts 15 m. apart. Each specimen was exposed three times for five minutes, and the number of times it was approached by a drone and the number of drones that mounted it were recorded.

their water from the grass they eat so, in terms of demand, or possible demand, on public supplies, the "non-irrigation" farm requirement might well be halved.

The average use for irrigation has two sources of uncertainty: (i) the area irrigated; (ii) the amount applied per unit area. It is known that the amount of equipment now on farms is sufficient for simultaneous irrigation of about 170,000 acres; on average, it increases by the equivalent of about 15,000 acres per year. As the equipment can be moved round the farm the area that could be irrigated now may be nearer 300,000 acres. This, though uncertain, is independent of weather. The use of water varies with season; as a guess, the average might be close to 5 cm. per year. Combining these figures gives the value of 0·04 cm. as equivalent rainfall over England and Wales.

For the future there are two ways of estimating the area. First, extrapolation of the current rate of expansion suggests that in 15 or 20 years there will be double the present equipment area. So, assuming the same average rate, the first future average irrigation requirement is 0·08 cm. Second, by examination of the crop distribution, and of regional weather and known responses to irrigation, an upper limit can be set to the possible area to be reached at some epoch several decades ahead, when water is very cheap, or increased food production is more important than economic orthodoxy. The technical working party of the National Resources Committee (Technical) on Agriculture*, which surveyed the present and future of irrigation in Great Britain assessed this area as 1,500,000 acres, not all in England and Wales; but to ascribe it all to England and Wales again leads to an overestimate of an extreme figure, at five times the present average.

Once or twice in ten years the irrigation need will be twice the average: hence the doubled figured in brackets. Less frequently, there will be severe drought years in which more water could be used with profit—very great profit—but it is fairly certain that the farming community would be happy to know that in such years they could depend on getting the bracketed figure. Even so, it is still less than the non-irrigation need for water, and the two together make up no more than 5 per cent of the probable total national use of water.

Deserting science for politics, it seems that agriculture might well be allowed first dip in the national pool: the other users would never miss what was taken. The link between the politics and the science is the nature of the return; for non-irrigation farm use there is no need for special pleading to justify home-produced supplies of meat and milk. Irrigation helps this, too, by increasing yields of grass and other fodder crops, and adds increased supplies of vegetables and fruit. Some months ago the station was asked to assess the current return to British farming of the use of irrigation. The answer, subject to the same kind of uncertainties referred to earlier, was, on average, between £4,000,000 and £5,000,000 per annum, gross, and near

* National Resources Committee (Technical) on Agriculture, 1962. Report on Irrigation in Great Britain (H.M. Stationery Office).

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£2,500,000 net profit. For the interest of the engineers, the energy return from increased yield in a dry summer is about 40 times that of a hydro-electric generator, using the same amount of water over a fall of 100 metres at 100 per cent efficiency.

There the main task is complete. In relation to current water use, and even more so in relation to water income, the part used by agriculture is trifling. If it doubles during the next generation, as other use may double, the fractional load it imposes will remain unchanged, but its relative social value will increase. Already industry and the domestic consumer use too much high-quality water extravagantly, and it is fairly certain that when more is provided the fraction wasted will increase. For farm irrigation the fraction wasted should decrease for at least two reasons. First, technical advice—already very good—on when to irrigate and how much to apply will get better: much of current agricultural research is directed to that end. Second, but certainly more remotely, improved medium-range weather forecasting will eliminate many of the occasions on which an irrigation operation is quickly followed by a large amount of rain.

What is written here seemingly gives equal weight to Cumberland and Essex, to winter and to summer. Extension to regional and seasonal problems, and to variations from year to year, would need a symposium to itself, but much of it is in the technical report of National Resources Committee on Agriculture.

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Proc. R. ent. Soc. Lond. (A). **42** (4–6). Pp. 71–76. 1967.