Daniel Hillel held up two glasses of water. Into one he tipped an ordinary clod of earth, which at once began disintegrating and muddying the water. Into the other he dropped a clod which had been coated with a thin layer of silicones. This clod lay like a stone in the bottom of the glass while it was passed round the group, but it crumbled easily between his fingers when he lifted it out of the water and pressed it.

A little bit of entertaining magic? Dr Hillel likes dramatic moments, but he also exercises a scientist’s caution. So he merely says it is “an innovation which we believe can be important in the semi-arid regions”.

He has been developing this technique of “rainproofing” clods of earth during his year as an IDRC Research Fellow. He is Professor of Soil Physics at the Hebrew University of Jerusalem, and the fellowship allowed him to take 1974 as a sabbatical year away from his position as head of the university’s Department of Soil and Water Science.

He began the year by following up on some experiments which had not been entirely successful some years before, when he was in charge of agricultural research in a Negev settlement. There they had tried to coat the slopes of the desert with a waterproofing compound, so that there could be maximum use of whatever rain did fall by increasing its run-off onto more arable land below. They found, however, that in many cases cracks formed in the surface of the soil, and the rain simply penetrated the ground more effectively through these cracks.

So he decided to apply the lesson of this failure to another region, where infiltration rather than run-off was what was wanted. In Israel only one-quarter of the land can at present be cultivated, and half of that area is under irrigation. In the other, rain-fed half, more than 50 percent of the rainwater goes to waste in run-off, evaporation or weed growth.

By rainproofing clods of earth, he reasoned, he might greatly reduce this wastage. For, instead of the normal process in which the rainfall breaks down the clods (just as in the glass of water) and produces a muddy crust on the surface, the protective coat would hold the clods together during rainfall and far more water would seep steadily down to nourish the roots of crops. Weeds, which germinate near the surface, would get much less water and their reduced growth would cut the need for herbicides and field labor.

With some of his students he tried using a modified potato-digger to lift the clods and spray them thoroughly before dropping them back. The trials were encouraging. So he turned to computers, working first at Wageningen University in the Netherlands and then at Texas A and M University, to do (in the words of the title of the paper he and two other professors in Texas have published) a “dynamic simulation of water storage in fallow soil as affected by mulch of hydrophobic aggregates.”

They designed a mechanistic numerical model, and put it through a four-day simulation run in which they simulated two rainstorms lasting six hours each, as well as four evaporation cycles. They tested it for different soil conditions and for varying thicknesses of mulch, ranging up to 10 cm thick.

Again, the results were encouraging. To take the extreme cases in the simulation run: the crusted and unmulched soil lost 4 cm of the 14.4 cm of precipitation to run-off and another 4.8 cm to evaporation; the soil covered with the 10 cm mulch lost only 0.3 cm to run-off and evaporation. It gained two-and-a-half times as much moisture in water storage down to a depth of about 70 cm as did the untreated soil.

Obviously many questions remain. What is the optimum size of the clods? Big enough to act like a layer of gravel and let the water penetrate; but not so large that there are large cavities between them which would allow vapor transmission and evaporation. How deep a layer of soil needs to be treated? Professor Hillel thinks about four inches is enough.

What is the best material? How long will it last? And what would it cost? He used silicones, and found that by this means a clod mulch can be developed that will last a full season. At a retail cost of $5 a gallon and using up to 15 gallons an acre, it would cost a farmer up to $75 a year to rainproof an acre of land.

Too expensive for a small farmer? Professor Hillel thinks the outlay could make the difference between success and failure of a crop in semi-arid regions, and a small farmer could use the technique with hand tools. In 1975 he is planning bigger field tests in Texas and Israel, doing a cost-benefit analysis and writing two monographs on the subject. We’ll clearly be hearing more from Daniel Hillel.

CLYDE SANGER