

Using DSSAT to simulate the effects of a plastic mulch cover

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The effects of a plastic mulch row cover can be simulated by DSSAT-CSM 4.7.8 and later versions. The use of a plastic mulch will impact simulated infiltration, runoff, and soil evaporation, but has no influence on the irrigation amount applied (i.e., the irrigation is assumed to be applied below the plastic cover). The model assumes that all rainfall on a plastic mulch cover will be added to runoff. Rainfall on the bare ground will be partitioned to infiltration and runoff using the SCS CN method. The model assumes no soil evaporation from areas covered by the plastic mulch.

To enable this feature, you must add a 3rd tier of input in the field section as shown in Box 1. This allows a user to define the width and albedo of the plastic mulch cover. In this example, the first treatment has no plastic mulch. For the 2nd treatment, the plastic mulch covers half of the 150 cm row width, and for the 3rd treatment, the entire row is covered with plastic with an albedo of 0.03.

Box 1. Plastic mulch inputs using a third tier of data in FileX field section

```
*TREATMENTS
@N R O C TNAME..... CU FL SA IC MP MI MF MR MC MT ME MH SM
1 1 0 0 No PM coverage 1 1 0 1 1 1 0 0 0 0 0 0 1 1
2 1 0 0 50% PM coverage 1 2 0 1 1 1 0 0 0 0 0 0 1 1
3 1 0 0 100% PM coverage 1 3 0 1 1 1 0 0 0 0 0 0 1 1

*FIELDS
@L ID_FIELD WSTA.... FLSA FLOB FLDT FLDD FLDS FLST SLTX SLDP ID_SOIL FLNAME
1 UFBR0001 UFBR9101 0 0 000 0 0 0000 SA 180 UFBR950001 -99
2 UFBR0001 UFBR9101 0 0 000 0 0 0000 SA 180 UFBR950001 -99
3 UFBR0001 UFBR9101 0 0 000 0 0 0000 SA 180 UFBR950001 -99
@L .....XCRD .....YCRD .....ELEV .....AREA .SLEN .FLWR .SLAS FLHST FHDUR
1 0 0 0 0 0 0 0 -99 -99
2 0 0 0 0 0 0 0 -99 -99
3 0 0 0 0 0 0 0 -99 -99
@L PMALB PMWD
1 -99 -99
2 0.03 75
3 0.03 150

*PLANTING DETAILS
@P PDATE EDATE PPOP PPOE PLME PLDS PLRS PLRD PLDP PLWT PAGE PENV PLPH SPRL
1 91077 -99 1 1 T R 150 90 1 3 24 25 1 0
```

The 3rd tier of the field section provides the following parameters to the plastic mulch model.

1. **PMALB**: the albedo of plastic mulch, fraction. It will replace the original soil surface albedo for the portion of soil covered by the plastic mulch.
2. **PMWD**: the width of plastic mulch in cm. It will be used with row spacing (PLRS) to calculate the ratio of plastic mulch coverage.

If the third tier is missing, or values are “-99”, the model will assume no plastic mulch cover.

NOTE: XBuild does not recognize the third tier of field data! If you open your file with XBuild then save it, your third tier of data will not be saved!