# DSSAT User Guide to managing harvest residues in crop rotations

2022-09-19

DSSAT CSM allows a user to control the amount of yield product and by-products that are harvested, i.e., removed from the field. This is an important consideration for crop rotations where carry-over of crop residues from one season to the next can be an important factor in soil N and C dynamics and long-term sustainability of the cropping system.

There are two ways to set these amounts of harvested material in DSSAT, depending on the type of harvest that is specified. The table below lists the specification method for each harvest management method.

Harvest		
management code		
(HARVS)	Type of harvest	Specification of crop residue carryover
М	At maturity	Harvest Section
R	On reported date	Harvest Section
D	Days after planting	Harvest Section
Α	Automatic	Simulation Options, Automatic Harvest section

In either case, the amount of crop removed from the field is specified separately for the yield product and for the crop by-product (i.e., the remaining above-ground biomass). Default values are 100% of yield product is removed and zero percent of by-product is removed.

This document describes how to specify crop residue management in the Harvest Section of FileX and in the Simulations Options using XBuild.

#### **Method 1: Harvest Section**

In most cases, the residue management options are specified in the Harvest Section of FileX. In XBuild, select Management  $\rightarrow$  Harvest and set the date of harvest and the grain harvest percentage and the byproduct takeoff percentage. These last two values describe the amount of the crop that is removed from the field for the yield product (grain harvest) and the remaining above-ground plant parts (byproduct takeoff). (Note: for "Harvest at Maturity", no date should be specified.) This harvest level must then be specified in the treatment table for the applicable crop rotations.

Figure 1 illustrates the selection in XBuild of the harvested amounts in the Harvest Section of FileX. In this example, 100% of the yield product is removed from the field and all of the byproduct is left in the field.

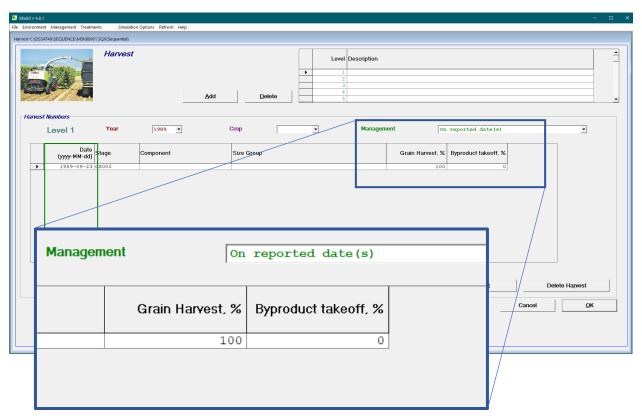


Figure 1. Specification of the harvested percentages in the Harvest Section using XBuild

### **Method 2: Simulation Options**

For Automatic Harvest, the amounts of crop yield and byproduct harvested are specified in Simulation Options. The amounts of harvested material are specified as the "Percentage of product harvested" and the "Percentage of residue harvested". As with the harvest section, these two values describe the amount of crop material removed from the field for the yield product (product harvested) and for the remaining above-ground plant parts (residue harvested).

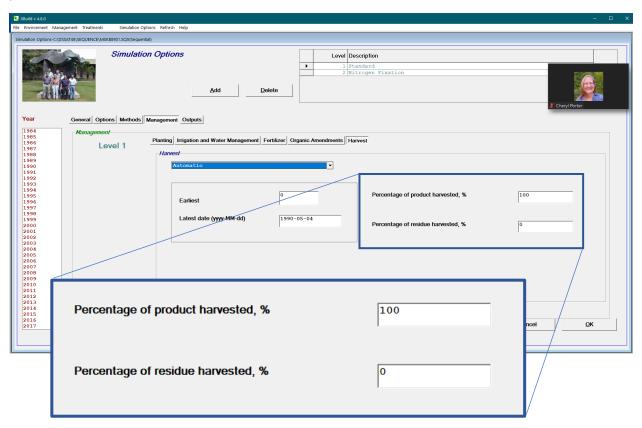


Figure 2. Specification of the harvested percentages in the Simulation Options, Automatic Harvest Section using XBuild

For Automatic Harvest, the earliest harvest date is specified as days after maturity and the latest date is specified as a date. For the automatic harvest option, the acceptable soil conditions for a harvest to occur are specified in the automatic planting section. The simulated harvest will occur on the first day within the harvest window where soil conditions are within the acceptable range.

## **Sample Crop Rotation FileX**

Box 1 presents a portion of a sequence FileX showing both methods of harvest residue specification. Rotation 2 (maize rotation) uses Method 1: Harvest Section. From the treatment table, this rotation uses harvest level 2, which specifies that 95% of the yield is removed from the field and 75% of the by-product is removed from the field. Rotation 4 (soybean) uses Method 2: Simulation Options. From the treatment table, simulation options level 2 is used, which specifies the Automatic harvest method. In this case, 100% of the yield and 50% of the byproduct is removed from the field.

#### Box 1. Sample FileX

```
*EXP.DETAILS: SMPL8901SQ based on MSKB8901SQ
*TREATMENTS
                              -----FACTOR LEVELS----
@N R O C TNAME...... CU FL SA IC MP MI MF MR MC MT MA MH SM
1 1 1 0 Fallow before maize 1 1 0 1 0 0 0 0 0 0 1 1
                              2 1 0
1 1 0
                                      0
                                         2 0 0
                                                0 0 0 0 2 1
0 0 0 0 3 1
1 2 1 0 Maize
1 3 1 0 Fallow before soybean
                                              0
                               3 1 0 0 4 0
1 4 1 0 Soybean
                       HPC HBPC HNAME
*HARVEST DETAILS
@H HDATE HSTG HCOM HSIZE
             -99 -99
-99 -99
                             -99 FA before MZ
1 89123 GS000
2 89266 GS000
                               75 MZ
                         -99 -99 FA before SB
3 90148 GS000 -99 -99
*SIMULATION CONTROLS
           NYERS NREPS START SDATE RSEED SNAME...... SMODEL
              4 1 S 89001 2150 Maize harvest @ maturity
1 GE
            WATER NITRO SYMBI PHOSP POTAS DISES CHEM TILL CO2
@N OPTIONS
                                                  N M
1 OP
             Y Y N N N N
            WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO NSWIT MESOM MESEV MESOL
@N METHODS
                                        C R 1 P S
1 ME
              M M E R
@N MANAGEMENT PLANT IRRIG FERTI RESID HARVS
1 MA R N R N R
                                    R
            FNAME OVVEW SUMRY FROPT GASUT CAOUT WAOUT NIOUT MIOUT DIOUT VBOSE CHOUT OPOUT Y Y Y Y Y Y Y N Y N Y
an OUTPUTS
1 OU
@ AUTOMATIC MANAGEMENT
            PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
@N PLANTING
1 PT.
            89117 89131 40 100 30 40 10
@N IRRIGATION IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
1 IR
             30 50 100 GS000 IR001
@N NITROGEN
            NMDEP NMTHR NAMNT NCODE NAOFF
             30 50 25 FE001 GS000
1 NT
@N RESIDUES
            RIPCN RTIME RIDEP
1 RE
             100 1 20
@N HARVEST
            HFRST HLAST HPCNP HPCNR
               0 90124 100
1 HA
@N GENERAL
            NYERS NREPS START SDATE RSEED SNAME...... SMODEL
             4 1 S 89060 2150 Soybean auto harvest
2. GE
@N OPTIONS
            WATER NITRO SYMBI PHOSP POTAS DISES CHEM TILL CO2
2 OP
               Y Y Y N N N
                                             N
                                                  N
                                                         Μ
@N METHODS
            WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO NSWIT MESOM MESEV MESOL
              M M E R
                                         C R 1 P
@N MANAGEMENT PLANT IRRIG FERTI RESID HARVS
2 MA
               R N R
                              N
            FNAME OVVEW SUMRY FROPT GASUT CAOUT WAOUT NIOUT MIOUT DIOUT VBOSE CHOUT OPOUT
Y Y Y 1 Y Y Y Y Y N Y N Y
an OUTPUTS
2 OU
@ AUTOMATIC MANAGEMENT
           PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
@N PLANTING
2 PL
            89117 89131 40 100 30 40 10
@N IRRIGATION IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
             30 50 100 GS000 TR001
2 TR
                                        1.0
@N NITROGEN
            NMDEP NMTHR NAMNT NCODE NAOFF
             30 50 25 FE001 GS000
2 NI
@N RESIDUES
            RIPCN RTIME RIDEP
2 RE
             100 1
@N HARVEST HFRST HLAST HPCNP HPCNR
              0 90320
                        100
```

# Viewing residue carryover amounts in MgmtEvent.OUT file

The MgmtEvent.OUT file is very helpful when determining if the user's selection of harvest options are correctly simulated. This is especially important for crop rotation simulations where multiple management options might be specified for different crops. To activate this file, go to Simulation Options → Outputs and set "Operations output" to "Yes". (In FileX, set "OPOUT" to "Y"). This file provides a chronological listing of all management operations. This file also shows the crop residue that is carried over in the field to the next season. Box 2 shows a listing of a portion of the MgmtEvent.OUT file which resulted from the sample crop rotation FileX in Box 1.

Box 2. MgmtEvent.OUT file showing carry-over of residues in a crop rotation simulation

		TIONS	EVENT SU	MARY		
2 MAY 4, 1989 124 1 0 MZ Planting 2 MAY 4, 1989 124 1 0 MZ 14 Start Sim 2 MAY 5, 1989 125 2 1 MZ 08 Germinate 2 MAY 20, 1989 140 17 16 MZ 09 Emergence 2 JUN 6, 1989 157 34 33 MZ 01 End Juveni 2 JUN 13, 1989 164 41 40 MZ 02 Floral Ini 2 JUL 20, 1989 201 78 77 MZ 03 75% Silkin 2 AUG 1, 1989 213 90 89 MZ 04 Beg Gr Fil 2 SEP 16, 1989 259 136 135 MZ 05 End Gr Fil 2 SEP 20, 1989 263 140 139 MZ 06 Maturity 2 SEP 23, 1989 266 143 142 MZ 16 Harvest  Surface residue carryover 4100. kg/ha Root residue carryover 2204. kg/ha	@RUN Date	DOY	DAS	DAP	CR	Stage Operation Quantities
2 MAY 4, 1989 124	*					
2 MAY 5, 1989 125 2 1 MZ 08 Germinate 2 MAY 20, 1989 140 17 16 MZ 09 Emergence 2 JUN 6, 1989 157 34 33 MZ 01 End Juveni 2 JUN 13, 1989 164 41 40 MZ 02 Floral Ini 2 JUL 20, 1989 201 78 77 MZ 03 75% Silkin 2 AUG 1, 1989 213 90 89 MZ 04 Beg Gr Fil 2 SEP 16, 1989 259 136 135 MZ 05 End Gr Fil 2 SEP 20, 1989 263 140 139 MZ 06 Maturity 2 SEP 23, 1989 266 143 142 MZ 16 Harvest  2 SEP 23, 1989 266 143 142 MZ 16 Harvest  SUMPLIFY OF A SUMPLIF						
2 JUN 6, 1989 157 34 33 MZ 01 End Juveni 2 JUN 13, 1989 164 41 40 MZ 02 Floral Ini 2 JUL 20, 1989 201 78 77 MZ 03 75% Silkin 2 AUG 1, 1989 213 90 89 MZ 04 Beg Gr Fil 2 SEP 16, 1989 259 136 135 MZ 05 End Gr Fil 2 SEP 20, 1989 263 140 139 MZ 06 Maturity 2 SEP 23, 1989 266 143 142 MZ 16 Harvest	2 MAY 4, 1989	124	7	1	ME	14 Start Still
2 JUN 6, 1989 157 34 33 MZ 01 End Juveni 2 JUN 13, 1989 164 41 40 MZ 02 Floral Ini 2 JUL 20, 1989 201 78 77 MZ 03 75% Silkin 2 AUG 1, 1989 213 90 89 MZ 04 Beg Gr Fil 2 SEP 16, 1989 259 136 135 MZ 05 End Gr Fil 2 SEP 20, 1989 263 140 139 MZ 06 Maturity 2 SEP 23, 1989 266 143 142 MZ 16 Harvest	2 MAI J, 1909	140	17	16	MIZ	00 Germanaa
2 JUL 20, 1989 201 78 77 MZ 03 75% Silkin 2 AUG 1, 1989 213 90 89 MZ 04 Beg Gr Fil 2 SEP 16, 1989 259 136 135 MZ 05 End Gr Fil 2 SEP 20, 1989 263 140 139 MZ 06 Maturity 2 SEP 23, 1989 266 143 142 MZ 16 Harvest	2 MAI 20, 1909	157	7 /	2.0	MIZ	01 End Turent
2 JUL 20, 1989 201 78 77 MZ 03 75% Silkin 2 AUG 1, 1989 213 90 89 MZ 04 Beg Gr Fil 2 SEP 16, 1989 259 136 135 MZ 05 End Gr Fil 2 SEP 20, 1989 263 140 139 MZ 06 Maturity 2 SEP 23, 1989 266 143 142 MZ 16 Harvest	•		J4 // 1	33	M7	02 Floral Ini
2 AUG 1, 1989 213 90 89 MZ 04 Beg Gr Fil 2 SEP 16, 1989 259 136 135 MZ 05 End Gr Fil 2 SEP 20, 1989 263 140 139 MZ 06 Maturity 2 SEP 23, 1989 266 143 142 MZ 16 Harvest	· · · · · · · · · · · · · · · · · · ·		7.0	77	M7	02 FIOLAT III
2 SEP 16, 1989 259 136 135 MZ 05 End Gr Fil 2 SEP 20, 1989 263 140 139 MZ 06 Maturity 2 SEP 23, 1989 266 143 142 MZ 16 Harvest  95.0 % yield harvested 2805. kg/ha 75.0 % by-product harv 376. kg/ha Surface residue carryover 1400. kg/ha Root residue carryover 2204. kg/ha   9RUN Date DOY DAS DAP CR Stage Operation Quantities						
2 SEP 20, 1989 263 140 139 MZ 06 Maturity 2 SEP 23, 1989 266 143 142 MZ 16 Harvest  95.0 % yield harvested 75.0 % by-product harv 376. kg/ha 75.0 % by-product harv 376. kg/ha 75.0 % by-product harv 376. kg/ha 2204. kg/ha   PLOW DAS DAP CR Stage Operation Quantities  4 MAY 29, 1990 149 1 0 SB Planting  4 MAY 29, 1990 149 1 0 SB Planting  4 MAY 29, 1990 158 10 9 SB 03 End Juven.  4 JUN 7, 1990 158 10 9 SB 03 End Juven.  4 JUN 20, 1990 167 19 18 SB 02 Unifoliate  4 JUN 20, 1990 171 23 22 SB 04 Flower Ind  4 JUL 27, 1990 208 60 59 SB 05 First Flwr  4 AUG 15, 1990 227 79 78 SB 06 First Pod  4 AUG 26, 1990 238 90 89 SB 08 First Seed  4 SEP 5, 1990 248 100 99 SB 09 End Pod  4 SEP 11, 1990 254 106 105 SB 12 End Msnode  4 SEP 25, 1990 268 120 119 SB 13 End Leaf  4 SEP 28, 1990 271 123 122 SB 10 Phys. Mat  4 NOV 1, 1990 305 157 156 SB 16 Harvest						
2 SEP 23, 1989 266 143 142 MZ 16 Harvest  95.0 % yield harvested 2805. kg/ha 75.0 % by-product harv 376. kg/ha Surface residue carryover 1400. kg/ha Root residue carryover 2204. kg/ha   1						
95.0 % yield harvested 75.0 % by-product harv 376. kg/ha 376. kg/h						
Surface residue carryover 2204. kg/ha 2204. kg/ha   Provided the state of the s	2 001 20, 1909	200	140	172	114	
Surface residue carryover 2204. kg/ha 2204. kg/ha   Provided the state of the s						75.0 % by-product harv 376. kg/ha
Root residue carryover 2204. kg/ha   Provided the state of the sta						Surface residue carryover 1400. kg/ha
Planting  4 MAY 29, 1990 149 1 0 SB Planting  4 MAY 29, 1990 149 1 0 SB SB 03 End Juven.  4 JUN 7, 1990 158 10 9 SB 03 End Juven.  4 JUN 16, 1990 167 19 18 SB 02 Unifoliate  4 JUN 20, 1990 171 23 22 SB 04 Flower Ind  4 JUL 27, 1990 208 60 59 SB 05 First Flwr  4 AUG 15, 1990 227 79 78 SB 06 First Pod  4 AUG 26, 1990 238 90 89 SB 08 First Seed  4 SEP 5, 1990 248 100 99 SB 09 End Pod  4 SEP 11, 1990 254 106 105 SB 12 End Msnode  4 SEP 28, 1990 271 123 122 SB 10 Phys. Mat  4 OCT 10, 1990 283 135 134 SB 11 Harv. Mat  4 NOV 1, 1990 305 157 156 SB 16 Harvest						
RUN Date DOY DAS DAP CR Stage Operation Quantities						
RUN Date DOY DAS DAP CR Stage Operation Quantities						
4 MAY 29, 1990 149	·					
4 MAY 29, 1990 149 1 0 SB Planting 4 MAY 29, 1990 149 1 0 SB 15 Sowing 4 JUN 7, 1990 158 10 9 SB 03 End Juven. 4 JUN 16, 1990 167 19 18 SB 02 Unifoliate 4 JUN 20, 1990 171 23 22 SB 04 Flower Ind 4 JUL 27, 1990 208 60 59 SB 05 First Flwr 4 AUG 15, 1990 227 79 78 SB 06 First Pod 4 AUG 26, 1990 238 90 89 SB 08 First Seed 4 SEP 5, 1990 248 100 99 SB 09 End Pod 4 SEP 11, 1990 254 106 105 SB 12 End Msnode 4 SEP 25, 1990 268 120 119 SB 13 End Leaf 4 SEP 28, 1990 271 123 122 SB 10 Phys. Mat 4 NOV 1, 1990 305 157 156 SB 16 Harvest	@RUN Date	DOY	DAS	DAP	CR	Stage Operation Quantities
4 JUN 16, 1990 167 19 18 SB 02 Unifoliate 4 JUN 20, 1990 171 23 22 SB 04 Flower Ind 4 JUL 27, 1990 208 60 59 SB 05 First Flwr 4 AUG 15, 1990 227 79 78 SB 06 First Pod 4 AUG 26, 1990 238 90 89 SB 08 First Seed 4 SEP 5, 1990 248 100 99 SB 09 End Pod 4 SEP 11, 1990 254 106 105 SB 12 End Msnode 4 SEP 25, 1990 268 120 119 SB 13 End Leaf 4 SEP 28, 1990 271 123 122 SB 10 Phys. Mat 4 OCT 10, 1990 283 135 134 SB 11 Harv. Mat 4 NOV 1, 1990 305 157 156 SB 16 Harvest	4 MAY 29. 1990	149	1	n	SB	Plantinα
4 JUN 16, 1990 167 19 18 SB 02 Unifoliate 4 JUN 20, 1990 171 23 22 SB 04 Flower Ind 4 JUL 27, 1990 208 60 59 SB 05 First Flwr 4 AUG 15, 1990 227 79 78 SB 06 First Pod 4 AUG 26, 1990 238 90 89 SB 08 First Seed 4 SEP 5, 1990 248 100 99 SB 09 End Pod 4 SEP 11, 1990 254 106 105 SB 12 End Msnode 4 SEP 25, 1990 268 120 119 SB 13 End Leaf 4 SEP 28, 1990 271 123 122 SB 10 Phys. Mat 4 OCT 10, 1990 283 135 134 SB 11 Harv. Mat 4 NOV 1, 1990 305 157 156 SB 16 Harvest	4 MAY 29, 1990	149	1	0	SB	15 Sowing
4 JUN 16, 1990 167 19 18 SB 02 Unifoliate 4 JUN 20, 1990 171 23 22 SB 04 Flower Ind 4 JUL 27, 1990 208 60 59 SB 05 First Flwr 4 AUG 15, 1990 227 79 78 SB 06 First Pod 4 AUG 26, 1990 238 90 89 SB 08 First Seed 4 SEP 5, 1990 248 100 99 SB 09 End Pod 4 SEP 11, 1990 254 106 105 SB 12 End Msnode 4 SEP 25, 1990 268 120 119 SB 13 End Leaf 4 SEP 28, 1990 271 123 122 SB 10 Phys. Mat 4 OCT 10, 1990 283 135 134 SB 11 Harv. Mat 4 NOV 1, 1990 305 157 156 SB 16 Harvest	4 JUN 7, 1990	158	10	0	CD	
4 JUL 27, 1990 208 60 59 SB 05 First Flwr 4 AUG 15, 1990 227 79 78 SB 06 First Pod 4 AUG 26, 1990 238 90 89 SB 08 First Seed 4 SEP 5, 1990 248 100 99 SB 09 End Pod 4 SEP 11, 1990 254 106 105 SB 12 End Msnode 4 SEP 25, 1990 268 120 119 SB 13 End Leaf 4 SEP 28, 1990 271 123 122 SB 10 Phys. Mat 4 OCT 10, 1990 283 135 134 SB 11 Harv. Mat 4 NOV 1, 1990 305 157 156 SB 16 Harvest				9	SB	U.S Find Juven.
4 JUL 27, 1990 208 60 59 SB 05 First Flwr 4 AUG 15, 1990 227 79 78 SB 06 First Pod 4 AUG 26, 1990 238 90 89 SB 08 First Seed 4 SEP 5, 1990 248 100 99 SB 09 End Pod 4 SEP 11, 1990 254 106 105 SB 12 End Msnode 4 SEP 25, 1990 268 120 119 SB 13 End Leaf 4 SEP 28, 1990 271 123 122 SB 10 Phys. Mat 4 OCT 10, 1990 283 135 134 SB 11 Harv. Mat 4 NOV 1, 1990 305 157 156 SB 16 Harvest	4 JUN 16, 1990	167	19	9 18	SB SB	03 End Juven. 02 Unifoliate
4 AUG 26, 1990 238 90 89 SB 08 First Seed 4 SEP 5, 1990 248 100 99 SB 09 End Pod 4 SEP 11, 1990 254 106 105 SB 12 End Msnode 4 SEP 25, 1990 268 120 119 SB 13 End Leaf 4 SEP 28, 1990 271 123 122 SB 10 Phys. Mat 4 OCT 10, 1990 283 135 134 SB 11 Harv. Mat 4 NOV 1, 1990 305 157 156 SB 16 Harvest	4 JUN 16, 1990	16/	19 23	18 22	SB SB SB	02 Unifoliate 04 Flower Ind
4 AUG 26, 1990 238 90 89 SB 08 First Seed 4 SEP 5, 1990 248 100 99 SB 09 End Pod 4 SEP 11, 1990 254 106 105 SB 12 End Msnode 4 SEP 25, 1990 268 120 119 SB 13 End Leaf 4 SEP 28, 1990 271 123 122 SB 10 Phys. Mat 4 OCT 10, 1990 283 135 134 SB 11 Harv. Mat 4 NOV 1, 1990 305 157 156 SB 16 Harvest	4 JUN 16, 1990 4 JUN 20, 1990	171	23	22	SB	02 Unifoliate 04 Flower Ind
4 SEP 5, 1990 248 100 99 SB 09 End Pod 4 SEP 11, 1990 254 106 105 SB 12 End Msnode 4 SEP 25, 1990 268 120 119 SB 13 End Leaf 4 SEP 28, 1990 271 123 122 SB 10 Phys. Mat 4 OCT 10, 1990 283 135 134 SB 11 Harv. Mat 4 NOV 1, 1990 305 157 156 SB 16 Harvest	4 JUN 16, 1990 4 JUN 20, 1990 4 JUL 27, 1990	171 208	23	22	SB	02 Unifoliate 04 Flower Ind
4 SEP 11, 1990 254 106 105 SB 12 End Msnode 4 SEP 25, 1990 268 120 119 SB 13 End Leaf 4 SEP 28, 1990 271 123 122 SB 10 Phys. Mat 4 OCT 10, 1990 283 135 134 SB 11 Harv. Mat 4 NOV 1, 1990 305 157 156 SB 16 Harvest	4 JUN 16, 1990 4 JUN 20, 1990 4 JUL 27, 1990 4 AUG 15, 1990	167 171 208 227	23 60 79	18 22 59 78	SB SB SB SB	02 Unifoliate 04 Flower Ind 05 First Flwr 06 First Pod
4 SEP 25, 1990 268 120 119 SB 13 End Leaf 4 SEP 28, 1990 271 123 122 SB 10 Phys. Mat 4 OCT 10, 1990 283 135 134 SB 11 Harv. Mat 4 NOV 1, 1990 305 157 156 SB 16 Harvest	4 JUN 16, 1990 4 JUN 20, 1990 4 JUL 27, 1990 4 AUG 15, 1990 4 AUG 26, 1990	167 171 208 227 238	23 60 79 90	18 22 59 78 89	SB SB SB SB	02 Unitoliate 04 Flower Ind 05 First Flwr 06 First Pod 08 First Seed
4 SEP 28, 1990 271 123 122 SB 10 Phys. Mat 4 OCT 10, 1990 283 135 134 SB 11 Harv. Mat 4 NOV 1, 1990 305 157 156 SB 16 Harvest	4 JUN 16, 1990 4 JUN 20, 1990 4 JUL 27, 1990 4 AUG 15, 1990 4 AUG 26, 1990 4 SEP 5, 1990	167 171 208 227 238 248	23 60 79 90 100	18 22 59 78 89 99	SB SB SB SB SB	02 Unifoliate 04 Flower Ind 05 First Flwr 06 First Pod 08 First Seed 09 End Pod
4 OCT 10, 1990 283 135 134 SB 11 Harv. Mat 4 NOV 1, 1990 305 157 156 SB 16 Harvest	4 JUN 16, 1990 4 JUN 20, 1990 4 JUL 27, 1990 4 AUG 15, 1990 4 AUG 26, 1990 4 SEP 5, 1990 4 SEP 11, 1990	167 171 208 227 238 248 254	23 60 79 90 100	18 22 59 78 89 99	SB SB SB SB SB SB	02 Unifoliate 04 Flower Ind 05 First Flwr 06 First Pod 08 First Seed 09 End Pod 12 End Msnode
4 NOV 1, 1990 305 157 156 SB 16 Harvest	4 JUN 16, 1990 4 JUN 20, 1990 4 JUL 27, 1990 4 AUG 15, 1990 4 AUG 26, 1990 4 SEP 5, 1990 4 SEP 11, 1990 4 SEP 25, 1990	167 171 208 227 238 248 254 268	23 60 79 90 100 106 120	18 22 59 78 89 99 105 119	SB SB SB SB SB SB SB	02 Unifoliate 04 Flower Ind 05 First Flwr 06 First Pod 08 First Seed 09 End Pod 12 End Msnode 13 End Leaf
100 0 % yield harvested 2887 kg/ha	4 JUN 16, 1990 4 JUN 20, 1990 4 JUL 27, 1990 4 AUG 15, 1990 4 AUG 26, 1990 4 SEP 5, 1990 4 SEP 11, 1990 4 SEP 25, 1990 4 SEP 28, 1990	167 171 208 227 238 248 254 268 271	19 23 60 79 90 100 106 120 123	18 22 59 78 89 99 105 119 122	SB SB SB SB SB SB SB SB	02 Unifoliate 04 Flower Ind 05 First Flwr 06 First Pod 08 First Seed 09 End Pod 12 End Msnode 13 End Leaf 10 Phys. Mat
100.0 0 yicia naivebeca 2007. kg/na	4 JUN 16, 1990 4 JUN 20, 1990 4 JUL 27, 1990 4 AUG 15, 1990 4 AUG 26, 1990 4 SEP 5, 1990 4 SEP 11, 1990 4 SEP 25, 1990 4 SEP 28, 1990 4 OCT 10, 1990	167 171 208 227 238 248 254 268 271 283	23 60 79 90 100 106 120 123 135	18 22 59 78 89 99 105 119 122 134	SB SB SB SB SB SB SB SB SB	02 Unifoliate 04 Flower Ind 05 First Flwr 06 First Pod 08 First Seed 09 End Pod 12 End Msnode 13 End Leaf 10 Phys. Mat 11 Harv. Mat
50.0 % by-product harv 103. kg/ha	4 JUN 16, 1990 4 JUN 20, 1990 4 JUL 27, 1990 4 AUG 15, 1990 4 AUG 26, 1990 4 SEP 5, 1990 4 SEP 11, 1990 4 SEP 25, 1990 4 SEP 28, 1990 4 OCT 10, 1990	167 171 208 227 238 248 254 268 271 283	23 60 79 90 100 106 120 123 135	18 22 59 78 89 99 105 119 122 134	SB SB SB SB SB SB SB SB SB	02 Unifoliate 04 Flower Ind 05 First Flwr 06 First Pod 08 First Seed 09 End Pod 12 End Msnode 13 End Leaf 10 Phys. Mat 11 Harv. Mat 16 Harvest
Surface residue carryover 1910. kg/ha	4 JUN 16, 1990 4 JUN 20, 1990 4 JUL 27, 1990 4 AUG 15, 1990 4 AUG 26, 1990 4 SEP 5, 1990 4 SEP 11, 1990 4 SEP 25, 1990 4 SEP 28, 1990 4 OCT 10, 1990	167 171 208 227 238 248 254 268 271 283	23 60 79 90 100 106 120 123 135	18 22 59 78 89 99 105 119 122 134	SB SB SB SB SB SB SB SB SB	02 Unifoliate 04 Flower Ind 05 First Flwr 06 First Pod 08 First Seed 09 End Pod 12 End Msnode 13 End Leaf 10 Phys. Mat 11 Harv. Mat 16 Harvest 100.0 % yield harvested 2887. kg/ha
Root residue carryover 784. kg/ha	4 JUN 16, 1990 4 JUN 20, 1990 4 JUL 27, 1990 4 AUG 15, 1990 4 AUG 26, 1990 4 SEP 5, 1990 4 SEP 11, 1990 4 SEP 25, 1990 4 SEP 28, 1990 4 OCT 10, 1990	167 171 208 227 238 248 254 268 271 283	23 60 79 90 100 106 120 123 135	18 22 59 78 89 99 105 119 122 134	SB SB SB SB SB SB SB SB SB	04 Flower Ind 05 First Flwr 06 First Pod 08 First Seed 09 End Pod 12 End Msnode 13 End Leaf 10 Phys. Mat 11 Harv. Mat 16 Harvest 100.0 % yield harvested 2887. kg/ha 50.0 % by-product harv 103. kg/ha

For some crops, e.g., maize, the surface residue carryover includes not only the unharvested by-product (stover) but also unharvested grain, unharvested cob (assumed to be 100%), and any plant tissue which was senesced over the season and not previously dropped from the plant. All of these are added to the surface organic matter on the day of harvest. Root residues are added to subsurface organic matter.