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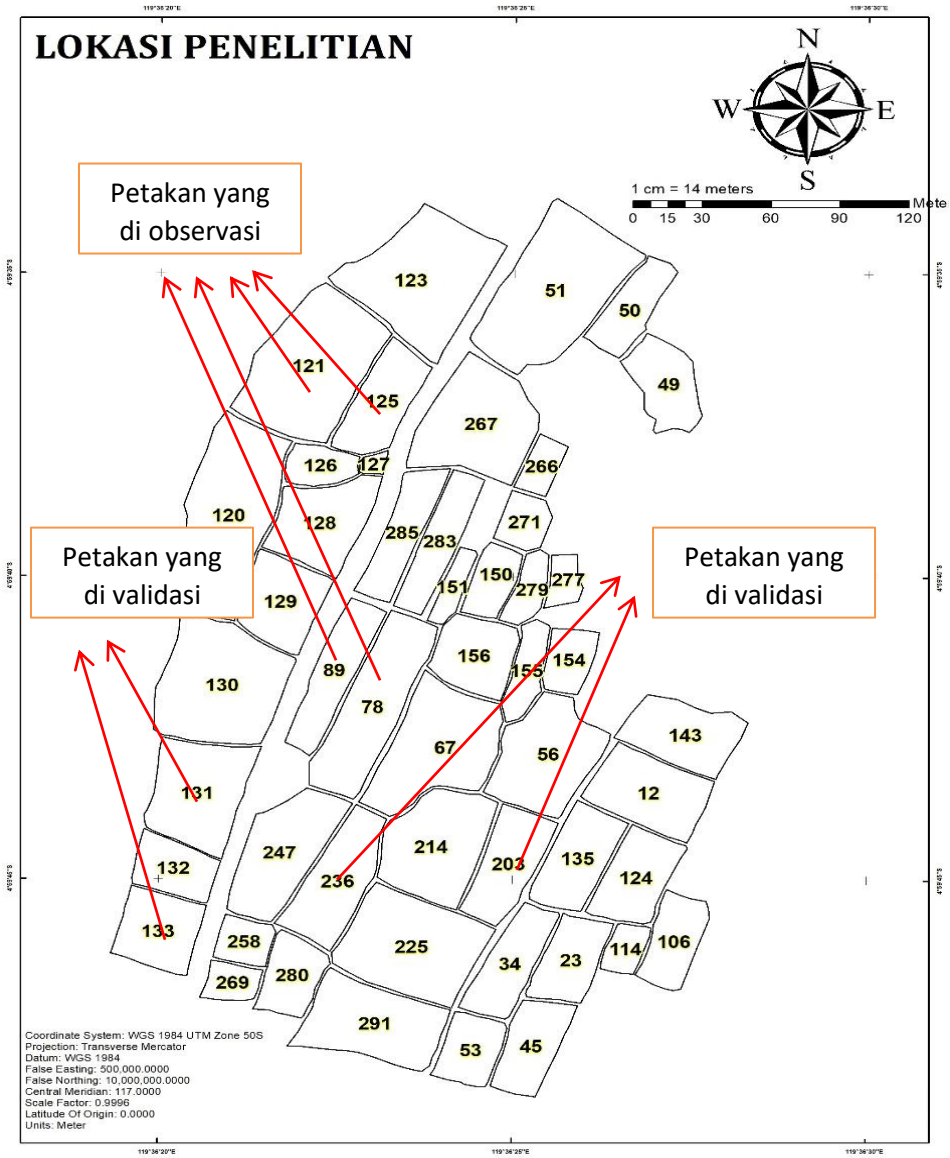
LAMPIRAN

Lampiran 1 Peta dasar Petakan Sawah



Lampiran 2 Tabel Nilai LAI

Nilai LAI pada petakan varietas CL220

Tanggal	HST	LAI_Obs	LAI_Sim
26/01/2020	18	0,6	0,9
8/2/2020	31	2	4,9
24/02/2020	47	3,4	8,09
05.03.2020	57	5,6	7,85
08.03.2020	60	6,5	7,6
22.03.2020	74	3,7	6,09
28.03.2020	80	1,9	5,49

Nilai LAI pada petakan varietas MR219

Tanggal	HST	LAI_Obs	LAI_Sim
26/01/2020	18	0,88	0,8
8/2/2020	31	4,41	2,1
24/02/2020	47	10,2	4,6
05.03.2020	57	9,1	6,4
08.03.2020	60	8,2	4,9
22.03.2020	74	7,3	3,4
28.03.2020	80	5,45	3

Lampiran 3. Tabel Nilai Biomassa Kering

Nilai biomassa kering pada petakan varietas CL220

Tanggal	HST	Biomassa Kering (Kg/Ha)			
		Batang	Daun	Malai	Utuh
26/01/2020	18	966	152,2	-	998
8/2/2020	31	3982,2	1061	-	3051,1
24/02/2020	47	5809,2	1907,7	-	7335,9
05.03.2020	57	8906,8	2865,9	-	11614
08.03.2020	60	11339	5090,9	2683,33	16176
22.03.2020	74	9472	2891,1	4856,25	22336
28.03.2020	80	6077,8	2147,5	7738,6	26140

Nilai biomassa kering pada petakan varietas MR219

Tanggal	HST	Biomassa Kering (Kg/Ha)			
		Batang	Daun	Malai	Utuh
26/01/2020	22	821,6	466,2	-	886,4
8/2/2020	35	2551,9	1554,1	-	3350,9
24/02/2020	51	5426,1	2090,7	-	7334,4
08.03.2020	64	8327	4412,6	-	12604
16.03.2020	72	14933	3977,2	952,33	15948
22.03.2020	78	12317	3099,8	5173,8	24558
03.04.2020	90	11783	2533,1	7055,9	28328

Lampiran 4. Bahasa Program Crop Model ORYZA v3

1. File Kontrol

```
CONTROLFILE = 'control.dat'
STRUN  = 0
ENDRUN = 72
FILEON = 'E:\oryzatrain\res.dat'       ! Output file
FILEOL = 'E:\oryzatrain\model.log'     ! Log file
FILEIR = 'E:\oryzatrain\reruns.rer'    ! Rerun file
FILEIT = 'E:\oryzatrain\standard.exp'  ! Experiment file
FILEI1 = 'E:\oryzatrain\standard.crp'  ! Crop file
FILEI2 = 'E:\oryzatrain\standard.sol'  ! Soil file

*-------------------------------------------------------*
* Optionally, Weather Station information can be provided*
* here. It is useful for large amount of simulations     *
* under same management                                  *
*-------------------------------------------------------*
*WTRDIR = 'E:\oryzatrain '     !* Folder name of weather
files
*CNTR   = 'INA'  !* Weather station name
*ISTN   = 2       !* Weather station number
*MULTIY = 'NO'    !* Whether multiple year weather file
                   !*  is used, default is 'NO' or if the
                   !*  variable do not appear.
*-------------------------------------------------------*
* Rice monoculture cropping system                       *
* the default for SOILKILL is "YES", soil will be        *
* reinitiated every crop season, and all processes in    *
* soil will also stop as growth stop. if "NO", soil will *
* only be initiated at the starting date of simulation   *
* and all processes in soil will continue after growth   *
* stop.                                                  *
*-------------------------------------------------------*
*SOILKILL = 'NO'   !* Whether the soil processes continue
*                   !* after crop maturity.
*-------------------------------------------------------*
* Set output/print options                               *
*-------------------------------------------------------*
PRDEL  = 1.   ! Output time step (day), too much reruns,
               !  omit detail outputs
IPFORM = 5    ! Code for output table format:
COPINF = 'N'  ! Switch variable whether to copy the input
               !  files to the output file
               !  ('N' = do not copy, 'Y' = copy)
DELTMP = 'N'  ! Switch variable what should be done with
               !  the temporary output file
               !  ('N' = do not delete, 'Y' = delete)
```

```
IFLAG  = 1100 ! Indicates where weather error and
              !  warnings go (1101 means errors and
              !  warnings to log file, errors to screen
              !  see FSE manual)
*PRSEL = 'WAGT','WRR14','WSO' !* For output variables
*        'LAI', 'LAI_OBS'      !*  in res.dat
OPSTRING = 'DAE, WRR14, WAGT' !* For output variables
                              !*  in op.dat
*IOBSD = 2020,161  !* List of observation data for which
                   !*  output is required. The list should
                   !*  consist of pairs <year>,<day>
                   !*  combination
```

2. File Eksperimental

```
*-----------------------------------------------------*
* EXPERIMENTAL DATA FILE
* File name        : EXPERIMENT.DAT
*
* Crop             : ORYZA SATIVA Cv. CL220 (78)
*
* Year/Season      : 2020/rainy season
*
* Experimental st. : Bantimurung, -4.99 S, 119.60 E, 13 m
*
* Fertilizer       : 9 sak/Ha
*
* Researchers      : Daniel Useng/Muh. Tahir Sapsal/Eka
Sartika      *
*-----------------------------------------------------*

*-----------------------------------------------------*
* 1. Selection of modes of running
*
*-----------------------------------------------------*
*--  RUNMODE: mode of running ORYZA
RUNMODE = 'EXPERIMENT'      ! ORYZA simulates particular
experiment
*RUNMODE ='EXPLORATION'     ! ORYZA used for exploration

*--  PRODENV is Water production situation setting
*PRODENV = 'POTENTIAL'      ! Potential production
PRODENV = 'WATER BALANCE'   ! Production may be water-
limited

*-- WATBAL is choice of water balance
*   needs only be given when PRODENV = 'WATER BALANCE'
WATBAL = 'PADDY'  ! PADDY water balance (for lowland soils)
*WATBAL = 'SAHEL'  ! SAHEL water balance (for freely
draining upland soils)
```

```
*WATBAL = 'SAWAH'  ! SAWAH water balance (for lowland or
upland soils)
*WATBAL = 'LOWBAL' ! LOWBAL water balance (for lowland
soils)
*WATBAL = 'SOILPF' ! SOILPF water balance (Soil water
tension read from file)

*--  NITROENV is Nitrogen production situation setting
NITROENV = 'POTENTIAL'         ! Potential production
*NITROENV = 'NITROGEN BALANCE' ! Production may be nitrogen-
limited


*--  ETMOD is method for evapotranspiration calculation:
ETMOD = 'PENMAN'           ! Penman-based (Van Kraalingen&
Stol,1996)
*ETMOD = 'PRIESTLY TAYLOR'  ! Priestly-Taylor (")
*ETMOD = 'MAKKINK'          ! Makkink (Van Kraalingen&Stol,
1996)

*-----------------------------------------------------*
* 2. Timer data for simulation
*
*-----------------------------------------------------*
IYEAR  = 2020 ! Start year of simulation (year)
STTIME = 1.           ! Start time  (day number)
FINTIM = 1000.          ! Finish time (days after start)
DELT   = 1.             ! Time step   (day)


*-----------------------------------------------------* 3.
Weather station and climatic data for simulation
*
*-----------------------------------------------------*
WTRDIR = ' E:\oryzatrain'   ! Directory of weather data
CNTR   = 'INA'              ! Country code
ISTN   = 1                   ! Station code
MULTIY  = 'NO'               !* Whether multiple year
weather file is used,
                             !* default is 'NO' or if the
variable do not appear.
ANGA = 0.29                  ! Angstrom A parameter
ANGB = 0.45                  ! Angstrom B parameter

*TMCTB =  0., 0.,            !* Table for temperature
increase
*       366., 0.             !* Climatic Change studies

TMINCTB = 0., 0.   !* Table for temperature increase for
minimum temperature
```

```
        366., 0.   !* It has been used with TMAXCTB

TMAXCTB = 0., 0., !* Table of temperature increase for
maximum temperature
        366., 0.  !* use TMINCTB & TMAXCTB, must disable
TMCTB

*CO2A = 0., 0.,  !* Table for daily CO2 concentration AFTER
EMERGENCE


FAOF  = 1.       ! Multiplying factor for potential
evapotranspiration (FAO)
                 ! Value Murty & Tuong

TMPSB = 0.       ! Temperature increase in seed-bed due to
cover:
                 ! Zero when no cover over seed-bed; 9.5
with seed-bed

*TMCTB = 0.0, 0.0,   !* Daily average temperature increment
table (oC)
*      366.0, 0.0    !* Column 1: Julian day, Column 2:
change value

*TMAXCTB = 0.0, 0.0, !* Daily maximum temperature change,
*        366.0, 0.0  !* either TMCTB or TMAXCTB
                     !* Column 1: Julian; Column 2:
Increment value (oC)

*TMINCTB = 0.0, 0.0, !* Daily minimum temperature change,
use with TMAXCTB
*        366.0, 0.0  !* Column 1: Julian day; Column 2:
Increment (oC)

*RADCTB = 0.0, 0.0,  !* Total daily radiation change
*       366.0, 0.0,  !* Column 1: Julian day; Column 2:
change percentage (%)


*XFRDIF = 0.0        !* How you count diffusive radiation
change?
*                    !* 0: No change
*                    !* 1: Change in percentage based
theoretical fraction
*                    !* 2: Change with given diffusive
radiation fraction

*FRDIFCTB = 0.0,0.0, !* Diffusive radiation change table if
XFRDIF > 0
```

```
*         366.0,0.0  !* Column 1: Julian day; Column 2:
change value (% or-)

*CCYEAR = 2020 !* The start year for climate change
computation
                     !* It must be not later than simulation
starting year

*RAINCTB = 0.0,0.0,  !* Rainfall change table
*        366.0,0.0   !* Column 1: Julian day; Column 2:
change value (%)

*VAPPCTB = 0.0,0.0,  !* Vapor pressure change table
*        366.0,0.0   !* Column 1: Julian day; Column 2:
change value (% or-)

*WINDCTB = 0.0,0.0,  !* Wind speed change table
*        366.0,0.0   !* Column 1: Julian day; Column 2:
change value (% or-)

*-------------------------------------------------* * 4.
Establishment data
*-------------------------------------------------* *--
ESTAB is method of establishment: 'TRANSPLANT' or 'DIRECT-
SEED'
ESTAB='TRANSPLANT'
*ESTAB='DIRECT-SEED'

* Transplanting date May 25 (145), 2001; sowing date April
15;
* 50% emergence April 29 (119)
EMD    = 1   ! Day of emergence (either direct, or in seed-
bed)
EMYR   = 2020! Year of emergence
SBDUR  = 15    ! Seed-bed duration (days between emerging
and transplanting)

*-------------------------------------------------* * 5.
Management parameters
*
*-------------------------------------------------* NPLH
= 31.0        ! Number of plants per hill
NH     = 14.0       ! Number of hills/m2 (13 x 27 cm)
NPLSB  = 1000.      ! Number of plants in seed-bed (???)
NPLDS  = 165.       ! Number of plants/m2 direct-seeded

*-- Initial data at emergence, for either direct-seeding or
seed-bed
*   Standard data used.
LAPE   = 0.0001     ! Initial leaf area per plant
```

```
DVSI   = 0.0        ! Initial development stage
WLVGI  = 0.0        ! Initial leaf weight
WSTI   = 0.0        ! Initial stem weight
WRTI   = 0.0        ! Initial stem weight
WSOI   = 0.0        ! Initial weight storage organs
ZRTI   = 0.0001     ! Initial root depth (m)

*-- Re-initialization at transplanting (standard data used)
ZRTTR  = 0.05       ! Root depth at transplanting (m)

*-----------------------------------------------------* * 6.
Irrigation parameters
* Need only to be filled-in when PRODENV = 'WATER BALANCe'
*-----------------------------------------------------* *
NEW, SEPT 2006:
DVSIMAX = 2.0 ! Development stage after which no more
irrigation is applied

* NEW SETTING, 21 MAY 2023
* The determination for switch critical
ICOMBA = 1 ! 1: Use Julian day;
           ! 2: Use DVS;
           ! 3: Use mixture of DVS and Julian day,
           !    but the Julian day is not allowed to be
smaller than 2;
           ! 4: Use DAE;

* Combining irrigation management methods table IRMTAB, it
must have at least
* two lines, X (Julian day or DVS or DVS+Julian, present the
switching day),
*            Y (methods in real number)
IRMTAB = 0.,0.0,
         202.,1.0

AUTODEPT = -10.0   ! The surface water depth (mm) for
determining irrigation
                   ! amount automatically
                   ! Function is disabled when it did not
appear or with
                   ! negative number

** FSelect from the following options are available for
setting IRMTAB:
*SWITIR = 0 !!* No irrigation; rainfed
SWITIR = 1 !!* Irrigation supplied as input data
*SWITIR = 2 !!* Irrigation at minimum standing soil water
depth
*SWITIR = 3 !!* Irrigation at minimum soil water potential
*SWITIR = 4 !!* Irrigation at minimum soil water content
```

```
*SWITIR = 5 !!* Irrigation at x days after disappearance of
standing water
*SWITIR = 6 !!* Irrigation at minimum soil water potential
in defined periods
            !!* only

** If SWITIR = 1, supply irrigation table, amount of
irrigation
** (y in mm) for a given calendar * day (x),
RIRRIT = 1.0, 0.00,
      365.00, 0.00

** If SWITIR = 2:
***1) supply amount of irrigation IRRI2 (mm)
***2) supply minimum standing water depth WL0MIN (mm) below
which irrigation
***   water is applied
IRRI2 = 75.  ! Irrigation gift (mm)              ! IT MUST
BE REAL DATA
WL0MIN = 10. ! Minimum standing water depth (mm) ! IT MUST
BE REAL DATA

** IF SWITIR =3:
***1) supply amount of irrigation IRRI3 (mm)
***2) supply minimum soil water potential KPAMIN (KPa)
***3) supply soil layer for which KPAMIN applied, SLMIN3
IRRI3 = 50.            ! IT MUST BE REAL DATA
KPAMIN = 70.           ! IT MUST BE REAL DATA
SLMIN3 = 3             ! IT MUST BE INTEGER DATA

** IF SWITIR = 4:
***1) supply amount of irrigation IRRI4 (mm)
***2) supply minimum soil water content WCAMIN (-)
***3) Supply soil layer for which KPAMIN applied, SLMIN4
IRRI4 = 50.       ! IT MUST BE REAL DATA
WCMIN = 0.30      ! IT MUST BE REAL DATA
SLMIN4 = 3        ! IT MUST BE INTEGER DATA

** IF SWITIR = 5:
***1) supply amount of irrigation IRRI5 (mm)
***2) supply number of days after disappearance of standing
water (WL0DAY) at
***   which irrigation water is applied
IRRI5 = 50.     ! IT MUST BE REAL DATA
WL0DAY = 5      ! IT MUST BE INTEGER DATA

** IF SWITIR = 6:
***1) supply amount of irrigation IRRI6 (mm)
***2) Supply soil layer for which KPAMIN applied, SLMIN6
```

```
***3) period table as "start DVS' 'finish DVS' 'KPAMIN
during period'
* Irrigation will be applied in the periods between 'start
DVs' to 'end DVS'
* and only when the soil water tension in layer SLMIN is
above KPAMIN in that
* period
* Note: at maximum 5 stages can de defined (no more than 15
data in table)
IRRI6 = 50.     ! IT MUST BE REAL DATA
SLMIN6 = 3      ! IT MUST BE INTEGER DATA
ISTAGET = 0.00, 0.20,  5.,
          0.65, 0.80, 50.,
          1.00, 1.20,  5.,
          1.50, 1.60, 50.,
          1.70, 1.80,  5.

*-----------------------------------------------------* * 7.
Nitrogen parameters
*
*-----------------------------------------------------* *TWO
SOIL C AND N DYNAMICS
NUTRIENT = 'GENERAL SOM'  ! USE GENERAL SOIL ORGANIC C AND N
MODULE TO HANDLE
                          ! THE NUTRIENT CHANGES
*NUTRIENT = 'FIXED SUPPLY' ! Use fixed mineralization rate
with fertilizer
                           ! recovery rate

* Table of recovery fraction of Nitrogen in the soil (-)
second column
* versus development stage (DVS) (first column) STANDARD
VALUE
*RECNIT =*
*0.0, 0.30,*
*0.2, 0.35,*
*0.4, 0.50,*
*0.8, 0.75,*
*1.0, 0.75,*
*2.5, 0.75*

* NO DATA ON SOILSP: THIS 0.8 IS FOR IRRI CONDITIONS IN THE
DS......
SOILSP = 0.8  ! Soil N mineralization rate (kg N/ha/d)

* Table of fertilizer rate (kg N/ha) (second column) versus
days after sowing
* in the seed-bed (!) (first column)
FERTIL =
 0.,   0.,
```

```
25.,   0.,
26.,  60.,
27.,   0.,
32.,   0.,
33.,  90.,
34.,   0.,
86.,   0.,
87.,  38.,
88.,   0.,
366.,  0.

*Fresh organic residue input at land surface if it is
applicable
*SORGANC = 1000.0   !* Surface residue carbon input at kg
C/ha
*SORGANN = 20.0     !* Surface residue nitrogen input at kg
N/ha
*-----------------------------------------------------* * 8.
Measured data for model calibration and comparison
*
*    And option to force measured LAI during simulation
*
*    (instead of using simulated values)
*
*-----------------------------------------------------* *
Observed phenology: only required if program DRATES is run!!
IDOYTR = 8    !* Day of transplanting (give 0 if direct-
seeded)
IYRTR  = 2020   !* Year of transplanting (give 0 if direct-
seeded)
IDOYPI = 54    !* Day of panicle initiation (estimated as
same day as
                !* jointing)
IYRPI  = 2020   !* Year of panicle initiation
IDOYFL = 68   !* Day of flowering
IYRFL  = 2020   !* Year of flowering
IDOYM  = 81   !* Day of maturity (estimated as 7 d before
harvest)
IYRM   = 2020   !* Year of maturity

*!* Leaf Area Index (m2 leaf / m2 ground):
LAI_OBS =
2020.00,   26.00,   0.6,
2020.00,   39.00,   2.0,
2020.00,   55.00,   3.4,
2020.00,   65.00,   5.6,
2020.00,   68.00,   6.5,
2020.00,   82.00,   3.7,
2020.00,   88.00,   1.9
```

```
*-- Parameter to set forcing of observed LAI during
simulation
LAI_FRC = 0      ! No forcing
*LAI_FRC = 2      ! Forcing

*!* Green leaf dry wt (kg/ha)
WLVG_OBS =
2020.00,   26.00,   152.2,
2020.00,   39.00,  1061.01,
2020.00,   55.00,  1907.69,
2020.00,   65.00,  2865.85,
2020.00,   68.00,  5090.94,
2020.00,   82.00,  2891.13,
2020.00,   88.00,  1147.51

*!* Dead leaf dry wt (kg/ha)
WLVD_OBS =
2020.00,   26.00,    0.00,
2020.00,   39.00,    0.00,
2020.00,   55.00,    0.00,
2020.00,   65.00,   126.00,
2020.00,   68.00,   414.4,
2020.00,   82.00,   971.04,
2020.00,   88.00,   1264.2

*!* Stem dry wt (kg/ha)
WST_OBS =
2020.00,   26.00,   966.00,
2020.00,   39.00,  3982.22,
2020.00,   55.00,  5809.22,
2020.00,   65.00,  8906.76,
2020.00,   68.00,  11339.0,
2020.00,   82.00,  9472.3,
2020.00,   88.00,  6077.76

*!* Panicle dry wt (kg/ha)
WSO_OBS =
2020.00,   26.00,      0.00,
2020.00,   39.00,      0.00,
2020.00,   55.00,      0.00,
2020.00,   65.00,      0.00,
2020.00,   68.00,   2683.44,
2020.00,   82.00,   4856.16,
2020.00,   88.00,   7737.55

*!* Total dry wt (kg/ha)
WAGT_OBS =
2020.00,   26.00,    998.00,
2020.00,   39.00,    3051.11,
2020.00,   55.00,   7335.89,
```

```
2020.00,   65.00,   11613.87,
2020.00,   68.00,   16175.89,
2020.00,   82.00,   22335.69,
2020.00,   88.00,   26139.71


*!* Leaf N (g N/g leaf):
*FNLV_OBS =

*!* Leaf N (g N/m2 leaf):
*NFLV_OBS =

*-- Parameter to set forcing of observed NFLV values during
simulation
*NFLV_FRC = 0      !* No forcing
*NFLV_FRC = 2      !* Forcing

*!* Root biomass observation in a layers
*ROOTM1_OBS =

*!* Root biomass observed in a year
*TOORM3_OBS =

*-------------------------------------------------------* *
Additional input for night temperature control experiment,
if you have
* temperature control
*-------------------------------------------------------*
ISTEMC = 0   ! WHETHER USE TEMPERATURE CONTROL 0 = NO,
*            ! 1= NIGHT CONTROL, 2=DAY CONTROL, 3=Both
Control

SHOUR  = 19.   ! Start time for temperature control
EHOUR  = 5.    ! End time for temperature control
*The SHOUR and EHOUR define the night time period, it should
be SHOUR>EHOUR

SDAY   = 0.  ! Julian day temperature control starts
TSYEAR = 2020.
EDAY   = 111.  ! Julian day temperature control ends
TEYEAR = 2020.
TTEMPD = 28.   ! Target, -999 means net change is used
TTEMPN = 21.   ! Target temperature for nighttime,
               ! -999 means net change is used
TCHANG = -999. ! Net change of temperature,
               ! -999 means target temperature is used
CONTRM = 2     ! 1 = Control the temperature exceeding the
defined range,
               ! 2 = Constant temperature
```

3. File Crop

```
************************************************************
**********
* Crop data file for ORYZA rice growth model
*
* Variety   : CL220 N0. 78
*
* File name : STANDARD.CRP
*
* Researchers : Daniel Useng/Muh. Tahir Sapsal/Eka Sartika
*
************************************************************
**********
*-----------------------------------------------------------
* 1. Phenological development parameters
*-----------------------------------------------------------
TBD    = 8.      ! Base temperature for development (oC)
TBLV   = 8.      ! Base temperature for juvenile leaf area
growth (oC)
TMD    = 42.     ! Maximum temperature for development (oC)
TOD    = 30.     ! Optimum temperature for development (oC)
DVRJ = 0.0008570 ! Development rate in juvenile phase (oCd-
1)
DVRI = 0.0003570  ! Development rate in photoperiod-
sensitive phase (oCd-1)
DVRP = 0.0008810  ! Development rate in panicle development
(oCd-1)
DVRR = 0.0022510  ! Development rate in reproductive phase
(oCd-1)
MOPP   = 11.50   ! Maximum optimum photoperiod (h)
PPSE   = 0.0     ! Photoperiod sensitivity (h-1)
SHCKD  = 0.4     ! Relation between seedling age and delay
in phenological
                 ! development (oCd oCd-1)

*-----------------------------------------------------------
* 2. Leaf and stem growth parameters
*-----------------------------------------------------------
RGRLMX = 0.0085  ! Maximum relative growth rate of leaf area
(oCd-1)
RGRLMN = 0.0040  ! Minimum relative growth rate of leaf area
(oCd-1)
SHCKL  = 0.25    ! Relation between seedling age and delay
in leaf area
                 ! development (oCd oCd-1)
SHADET = 0.90    !* Tolerance index to shading with value
0.1 to 0.99
                 !* from susceptible to high tolerance,
default
                 !* is 0.5 to indicate fair tolerance.
```

```
* Switch to use SLA as table (give values below) or as fixed
function
*SWISLA = 'FUNCTION' ! Give function parameters ASLA, BSLA,
CSLA, DSLA,
                     ! SLAMAX
SWISLA = 'TABLE'    ! Give SLA as a function of DVS in the
table SLATB

* If SWISLA='FUNCTION', supply SLA function parameters:
* SLA = ASLA + BSLA*EXP(CSLA*(DVS-DSLA)), and SLAMAX
ASLA = 0.0024   ! (-)
BSLA = 0.0025   ! (-)
CSLA = -4.5     ! (-)
DSLA = 0.14     ! (-)
SLAMAX = 0.0045 ! Maximum value of SLA (ha/kg)

* If SWISLA='TABLE', supply table of specific leaf area (ha
kg-1; Y value)
* as a function of development stage (-; X value):
SLATB = 0.00, 0.0045,
        0.16, 0.0045,
        0.33, 0.0033,
        0.65, 0.0028,
        0.79, 0.0024,
        2.10, 0.0023,
        2.50, 0.0023

* Table of specific green stem area (ha kg-1; Y value) as a
function of
* development stage (-; X value):
SSGATB = 0.0, 0.0003,
         0.9, 0.0003,
         2.1, 0.0000,
         2.5, 0.0000

*---------------------------------------------------------
* 3. Photosynthesis parameters
*---------------------------------------------------------
FRPAR  = 0.5  ! Fraction of sunlight energy that is
              ! photosynthetically active (-)
SCP    = 0.2  ! Scattering coefficient of leaves for PAR (-)
CO2REF = 340. ! Reference level of atmospheric CO2 (ppm)
CO2    = 385. ! Ambient CO2 concentration (ppm)

* Table of light extinction coefficient for leaves (-; Y-
value) as a function
* of development stage (-; X value):
KDFTB = 0.00, 0.4,
        0.65, 0.4,
        1.00, 0.6,
```

```
        2.50, 0.6

* Table of extinction coefficient of N profile in the canopy
(-; Y-value)
* as a function of development stage (-; X value):
KNFTB = 0.0,  0.4,
        0.65, 0.4,
        1.00, 0.4,
        2.5,  0.4


* Table of light use efficiency (-; Y-value) as a function
of
* temperature (oC; X value):
EFFTB  =   0., 0.54,
          10., 0.54,
          25., 0.54,
          40., 0.36,
          60., 0.24

* Table of effect of temperature on AMAX (-; Y-value) as a
function of
* temperature (oC; X value):
REDFTT = -10., 0.,
10., 0.,
20., 1.,
37., 1.,
43., 0.,
60., 0.

* Table of N fraction in leaves on leaf area basis (g N m-2
leaf; Y-value)
* as a function of development stage (-; X value):
NFLVTB = 0.00, 0.54,
         0.16, 0.54,
         0.33, 1.53,
         0.65, 1.22,
         0.79, 1.56,
         1.00, 1.29,
         1.46, 1.37,
         2.02, 0.83,
         2.50, 0.83

AMAXSLN0 = 22.0 !* Leaf nitrogen content corresponding
                !* coefficient to AMax (g N/m-2 leaf))

MINSLN = 0.2    !* * Minimum leaf nitrogen content for that
                !* Am (maximum rate CO2 assimilation) is 0.0
(g N/m2 leaf)
```

```
*-----------------------------------------------------------
* 4. Maintenance parameters
*-----------------------------------------------------------
* Maintenance respiration coefficient (kg CH2O kg-1 DM d-1)
of:
MAINLV = 0.02   ! Leaves
MAINST = 0.015  ! Stems
MAINSO = 0.003  ! Storage organs (panicles)
MAINRT = 0.01   ! Roots

TREF   = 25.    ! Reference temperature (oC)
Q10    = 2.     ! Factor accounting for increase in
maintenance
                ! respiration with a 10 oC rise in
temperature (-)

*-----------------------------------------------------------
* 5. Growth respiration parameters
*-----------------------------------------------------------
* Carbohydrate requirement for dry matter production (kg
CH2O kg-1 DM leaf)of:
CRGLV  = 1.326  ! Leaves
CRGST  = 1.326  ! Stems
CRGSO  = 1.462  ! Storage organs (panicles)
CRGRT  = 1.326  ! Roots
CRGSTR = 1.11   ! Stem reserves

LRSTR  = 0.947  ! Fraction of allocated stem reserves that
is
                ! available for growth (-)

*-----------------------------------------------------------
* 6. Growth parameters
*-----------------------------------------------------------
FSTR   = 0.20      ! Fraction of carbohydrates allocated to
stems that
                   ! is stored as reserves (-)
TCLSTR = 10.       ! Time coefficient for loss of stem
reserves (1 d-1)
SPGF   = 64900.    ! Spikelet growth factor (no kg-1)
WGRMX  = 0.0000249 ! Maximum individual grain weight (kg
grain-1)

* Partitioning tables
* Table of fraction total dry matter partitioned to the
shoot (-; Y-value)
* as a function of development stage (-; X value):
FSHTB  = 0.00,  0.50,
         0.43,  0.75,
         1.00,  1.00,
```

```
         2.50,  1.00

* Table of fraction shoot dry matter partitioned to the
leaves (-; Y-value)
* as a function of development stage (-; X value):
FLVTB  = 0.000, 0.60,
         0.500, 0.60,
         0.750, 0.30,
         1.000, 0.00,
         1.200, 0.00,
         2.5  , 0.

* Table of fraction shoot dry matter partitioned to the
stems (-; Y-value)
* as a function of development stage (-; X value):
FSTTB  = 0.000, 0.40,
         0.500, 0.40,
         0.750, 0.60,
         1.000, 0.10,
         1.200, 0.00,
         2.5  , 0.

* Table of fraction shoot dry matter partitioned to the
panicles (-; Y-value)
* as a function of development stage (-; X value):
FSOTB  = 0.000, 0.000,
         0.500, 0.000,
         0.750, 0.100,
         1.000, 0.900,
         1.200, 1.000,
         2.5  , 1.

* Table of leaf death coefficient (d-1; Y-value) as a
function of development
* stage (-; X value):
DRLVT  = 0.00, 0.000,
         0.60, 0.000,
         1.00, 0.015,
         1.60, 0.025,
         2.10, 0.050,
         2.50, 0.050

*---------------------------------------------------------
* 7. Carbon balance parameters
*---------------------------------------------------------
* Mass fraction carbon (kg C kg-1 DM) in the:
FCLV   = 0.419  ! Leaves
FCST   = 0.431  ! Stems
FCSO   = 0.487  ! Storage organs (panicles)
FCRT   = 0.431  ! Roots
```

```
FCSTR  = 0.444  ! Stem reserves

*-----------------------------------------------------------
* 8. Root parameters
*-----------------------------------------------------------
GZRT   = 0.01   ! Growth rate of roots (m d-1)
ZRTMCW = 0.25   ! Maximum depth of roots if no drought
stress (m)
ZRTMCD = 0.40   ! Maximum depth of roots if drought (m)

*ADDITIONAL INFORMATION since JUNE 2009
*SROOTL = 90.0  ! Special root length cm/g DM
RMINT  = 5.0    ! Minimum temperature for root growth
ROPTT  = 25.0   ! Optimum temperature of root growth
RTBS   = 2.0    ! Minimum temperature for root to survive
RCNL   = 0.012  ! Lowest root nitrogen content (residue root
N content,
                ! kg N kg-1 ROOT DM)
SODT   = 0.9    ! The tolerance index of oxygen deficiency

*-----------------------------------------------------------
* 9. Temperature and drought stress parameters
*-----------------------------------------------------------
COLDMIN = 12.    ! Lower air temperature threshold for
growth (oC)
COLDEAD = 3.     ! Consecutive number of days below COLDMIN
that crop dies (-)
COLDREP = 21.    !* The threshold temperature for cold
caused sterility (oC)
CTSTER = 36.5    !* The threshold temperature for heat
caused sterility (oC)

* Upper and lower limits for drought stress effects
ULLS =   74.13    ! Upper limit leaf rolling (kPa)
LLLS =  794.33    ! Lower limit leaf rolling (kPa)
ULDL =  630.95    ! Upper limit death of leaves (kPa)
LLDL = 1584.89    ! Lower limit death of leaves (kPa)
ULLE =    1.45    ! Upper limit leaf expansion (kPa)
LLLE = 1404.      ! Lower limit leaf expansion (kPa)

* Switch to use ULTR and LLTR as given above or function
built in ORYZA
* for the reduction in relative transpiration:
* SWIRTR = 1, Use ULRT AND LLRT for transpiration; SWIRTR =
2, Use SWIRTRF
* for transpiration; SWIRTR = 3, Use FSWTD for transpiration
SWIRTR = 3 ! Use function

* Give value of ULRT and LLRT for SWIRTR = 1
```

```
ULRT =   74.13    ! Upper limit relative transpiration
reduction (kPa)
LLRT = 1584.89    ! Lower limit relative transpiration
reduction (kPa)

* Give value for SWIRTRF if SWIRTR= 2, default value
SWIRTRF=0.003297
SWIRTRF = 0.020597

* Give value for FSWTD if SWIRTR= 3, default value
SWIRTRF=0.003297
* The upper limit factor while transpiration declines which
is the ratio of
* remaining available water to total water supply capability
FSWTD = 0.40

*-----------------------------------------------------------
* 10. Nitrogen parameters
*-----------------------------------------------------------
NMAXUP  = 8.      ! Maximum daily N uptake (kg N ha-1 d-1)
RFNLV   = 0.004   ! Residual N fraction of leaves (kg N kg-1
leaves)
FNTRT   = 0.15    ! Fraction N translocation from roots, as
(additonal)
                  ! Fraction of total N translocation from
stems and leaves
                  ! (-)
RFNST   = 0.0015  ! Residual N fraction of stems (kg N kg-1
stems)
TCNTRF  = 10.     ! Time coefficient for N translocation to
grains (d)
NFLVI   = 0.5     ! Initial leaf N fraction (on area basis:
g N m-2 leaf)
FNLVI   = 0.025   ! Initial leaf N fraction (on weight
basis: kg N kg-1 leaf)
NDSENS = 0.95     !* Nitrogen deficiency sensitivity,
0.5=fair as default,
                  !* >0.5 tolerance, <0.5 sensitive, Value
range 0.0 to 1.0
NMAXSO  = 0.0175  ! Maximum N concentration in storage
organs (kg N kg-1)

* Table of minimum N concentration in storage organs (kg N
kg-1 DM; Y value)
* as a function of the amount of N in the crop till
flowering (kg N ha-1; X
* value):
NMINSOT =  0., .006,
          50., .0008,
         150., .0125,
```

```
         250., .015,
         400., .017,
        1000., .017

* Table of maximum leaf N fraction on weight basis (kg N kg-
1 leaves; Y value)
* as a function of development stage (-; X value):
NMAXLT = 0.0, .053,
         0.4, .053,
        0.75, .040,
         1.0, .028,
         2.0, .022,
         2.5, .015

* Table of minimum leaf N fraction on weight basis (kg N kg-
1 leaves; Y value)
* as a function of development stage (-; X value):
NMINLT = 0.0, 0.025,
         1.0, 0.012,
         2.1, 0.007,
         2.5, 0.007

*--- Table of effect of N stress on leaf death rate (-; Y
value)
* as a function of N stress level (-; X value):
NSLLVT = 0., 1.0,
        1.1, 1.0,
        1.5, 1.4,
        2.0, 1.5,
        2.5, 1.5
```

4. Wheater.log

```
*-------------------------------------------------------------
*  Station Name: MAROS 0.20
*  Author: Climate Unit, MAROS             nil value: -99.
*  Source:
*  Comments: This file is extracted from CLICOM database.
*  Longitude: 118 34 E  Latitude: -5 39 N  Altitude: 13.0 m
*
*  Date: January-April 2020
*
*  Column    Daily Value
*     1      Station number
*     2      Year
*     3      Day
*     4      irradiance         KJ m-2 d-1
*     5      min temperature            oC
*     6      max temperature            oC
*     7      vapor pressure            kPa
*     8      mean wind speed         m s-1
*     9      precipitation          mm d-1
*-------------------------------------------------------------
118.57, -5.65, 13.00, 0.000, 0.000
    1,2020,  1, 19440.00, 24.80, 30.60,  3.16,  2.10,  0.00
    1,2020,  2, 19836.00, 24.80, 28.40,  3.10,  1.50,  13.00
    1,2020,  3, 20016.00, 23.60, 26.00,  3.00,  1.50,  36.00
    1,2020,  4, 19800.00, 24.40, 30.70,  3.09,  2.10,  25.00
    1,2020,  5, 19800.00, 23.40, 30.80,  2.93,  2.10,  5.00
    1,2020,  6, 19800.00, 23.20, 28.60,  3.00,  1.50,  50.00
    1,2020,  7, 19800.00, 24.80, 28.00,  3.06,  1.50,  10.00
    1,2020,  8, 19404.00, 24.40, 30.80,  3.24,  2.10,  39.00
    1,2020,  9, 20052.00, 25.60, 30.10,  3.16,  1.50,  0.00
    1,2020, 10, 20196.00, 24.40, 31.00,  3.06,  1.50,  4.00
    1,2020, 11, 20880.00, 24.20, 30.60,  3.09,  2.60,  0.00
    1,2020, 12, 20340.00, 23.20, 25.60,  2.91,  2.10,  82.00
    1,2020, 13, 19692.00, 23.60, 30.80,  3.08,  2.10, 111.00
    1,2020, 14, 19476.00, 24.90, 32.50,  3.03,  1.50,  0.00
    1,2020, 15, 20232.00, 25.30, 31.00,  3.06,  1.50,  0.00
    1,2020, 16, 20124.00, 24.80, 31.50,  3.04,  1.50,  7.00
    1,2020, 17, 19944.00, 24.90, 31.60,  2.91,  2.10,  0.00
    1,2020, 18, 19980.00, 25.60, 31.80,  3.14,  1.50,  0.00
    1,2020, 19, 19728.00, 25.40, 32.00,  3.06,  1.50,  0.00
    1,2020, 20, 20448.00, 26.00, 31.80,  3.14,  1.50,  2.00
    1,2020, 21, 21528.00, 25.20, 32.30,  3.06,  1.50,  3.00
    1,2020, 22, 21420.00, 25.60, 32.20,  3.07,  2.10,  0.00
    1,2020, 23, 21780.00, 25.40, 31.80,  3.04,  2.10,  0.00
    1,2020, 24, 20448.00, 25.00, 32.00,  3.08,  1.50,  21.00
    1,2020, 25, 20664.00, 24.90, 32.40,  3.09,  2.10,  1.00
```

```
1,2020, 26, 20664.00, 25.00, 31.60,  3.16,  1.00,  0.00
1,2020, 27, 21456.00, 26.20, 32.00,  3.26,  1.50,  0.00
1,2020, 28, 21528.00, 26.00, 32.00,  3.22,  1.50,  0.00
1,2020, 29, 21492.00, 26.00, 32.00,  3.30,  2.10,  0.00
1,2020, 30, 21348.00, 26.40, 32.00,  3.18,  3.60,  0.00
1,2020, 31, 21168.00, 24.40, 30.70,  3.07,  1.50, 126.00
1,2020, 32, 21168.00, 24.20, 27.90,  2.96,  1.00,  30.00
1,2020, 33, 21348.00, 24.10, 31.60,  3.02,  1.50,  10.00
1,2020, 34, 22500.00, 24.60, 32.00,  3.13,  1.50,  0.00
1,2020, 35, 22356.00, 25.20, 30.80,  3.20,  1.50,  9.00
1,2020, 36, 22140.00, 25.00, 31.00,  3.15,  1.50,  0.00
1,2020, 37, 21708.00, 25.80, 31.50,  3.24,  1.60,  28.00
1,2020, 38, 21852.00, 24.40, 29.40,  3.13,  1.50,  30.00
1,2020, 39, 21636.00, 24.00, 29.80,  3.11,  1.00,  80.00
1,2020, 40, 21636.00, 24.20, 29.60,  2.94,  2.10,  0.00
1,2020, 41, 21924.00, 24.00, 29.60,  3.04,  1.50,  10.00
1,2020, 42, 22644.00, 24.80, 31.00,  3.15,  1.50,  15.00
1,2020, 43, 23544.00, 24.60, 29.50,  3.02,  1.00,  0.00
1,2020, 44, 22644.00, 24.20, 32.00,  3.08,  1.00,  0.00
1,2020, 45, 22932.00, 25.20, 31.80,  3.24,  1.50,  0.00
1,2020, 46, 23472.00, 25.00, 32.00,  3.17,  1.50,  0.00
1,2020, 47, 23544.00, 25.50, 30.80,  3.22,  2.10,  0.00
1,2020, 48, 23436.00, 24.00, 30.80,  3.05,  2.10,  39.00
1,2020, 49, 23040.00, 24.00, 28.10,  3.03,  1.50,  63.00
1,2020, 50, 23616.00, 23.80, 29.20,  2.98,  1.50,  38.00
1,2020, 51, 23580.00, 24.00, 30.40,  3.01,  1.50,  13.00
1,2020, 52, 23832.00, 24.00, 31.20,  3.11,  1.50,  34.00
1,2020, 53, 24228.00, 24.80, 29.20,  3.18,  1.00,  16.00
1,2020, 54, 24120.00, 24.40, 30.20,  3.20,  1.00,  6.00
1,2020, 55, 23868.00, 25.40, 32.20,  3.38,  1.50,  0.00
1,2020, 56, 24084.00, 25.80, 31.70,  3.34,  1.50,  0.00
1,2020, 57, 23724.00, 25.60, 31.40,  3.45,  1.50,  0.00
1,2020, 58, 24300.00, 25.30, 29.80,  3.20,  1.00,  15.00
1,2020, 59, 24336.00, 25.00, 30.60,  3.19,  1.50,  2.00
1,2020, 60, 24084.00, 25.20, 30.60,  3.26,  1.50,  16.00
1,2020, 61, 25020.00, 25.00, 30.40,  2.99,  1.50,  0.00
1,2020, 62, 24876.00, 25.40, 31.80,  2.88,  1.00,  3.00
1,2020, 63, 25056.00, 25.40, 31.20,  3.11,  2.10,  1.00
1,2020, 64, 25020.00, 25.00, 29.70,  2.96,  1.50,  36.00
1,2020, 65, 24732.00, 24.40, 29.40,  3.01,  1.50,  17.00
1,2020, 66, 24300.00, 23.80, 29.60,  2.77,  1.50, 117.00
1,2020, 67, 24228.00, 24.40, 30.50,  2.85,  1.50,  2.00
1,2020, 68, 24588.00, 24.20, 30.20,  3.00,  1.00,  9.00
1,2020, 69, 24516.00, 24.00, 31.20,  2.70,  1.50,  11.00
1,2020, 70, 24732.00, 24.60, 31.60,  2.88,  1.50,  0.00
1,2020, 71, 24588.00, 25.00, 32.50,  2.92,  1.50,  0.00
1,2020, 72, 24516.00, 25.00, 31.80,  2.93,  1.00,  0.00
1,2020, 73, 24732.00, 24.40, 32.20,  2.88,  1.50,  0.00
1,2020, 74, 25020.00, 24.60, 29.50,  3.07,  1.00,  3.00
1,2020, 75, 25848.00, 24.20, 31.20,  3.09,  1.50,  0.00
```

```
1,2020, 76, 26100.00, 25.20, 31.80,  3.18,  1.50,  0.00
1,2020, 77, 25884.00, 25.00, 32.40,  3.09,  1.50,  0.00
1,2020, 78, 25452.00, 24.00, 31.90,  2.95,  1.50,  0.00
1,2020, 79, 24156.00, 24.80, 31.60,  3.08,  1.50, 0.00
1,2020, 80, 25272.00, 24.40, 30.80,  3.04,  1.50,  2.00
1,2020, 81, 25848.00, 24.00, 30.80,  3.06,  2.10,  30.00
1,2020, 82, 25848.00, 23.80, 31.00,  3.04,  1.00,  40.00
1,2020, 83, 26064.00, 24.60, 31.20,  2.99,  1.50,  0.00
1,2020, 84, 26244.00, 24.40, 31.00,  3.13,  2.10,  0.00
1,2020, 85, 26280.00, 24.80, 32.00,  2.91,  1.50,  0.00
1,2020, 86, 26604.00, 24.80, 31.80,  3.07,  1.50,  0.00
1,2020, 87, 26712.00, 26.20, 33.00,  3.22,  1.00,  0.00
1,2020, 88, 26784.00, 25.30, 31.20,  3.18,  1.50,  0.00
1,2020, 89, 26856.00, 24.60, 31.20,  3.11,  1.00,  18.00
1,2020, 90, 25956.00, 25.40, 30.80,  3.17,  1.50,  0.00
1,2020, 91, 26280.00, 24.00, 29.60,  3.02,  1.50,  0.00
1,2020, 92, 26388.00, 24.90, 32.60,  3.15,  1.00,  19.00
1,2020, 93, 26532.00, 24.20, 32.00,  3.06,  1.50,  0.00
1,2020, 94, 27396.00, 25.00, 32.00,  3.24,  1.50,  0.00
1,2020, 95, 26964.00, 25.00, 32.40,  3.17,  1.50,  0.00
1,2020, 96, 27036.00, 24.60, 32.40,  3.10,  1.50,  0.00
1,2020, 97, 26640.00, 26.00, 32.10,  3.22,  2.10,  0.00
1,2020, 98, 26568.00, 24.40, 27.10,  3.08,  1.50,  10.00
1,2020, 99, 27396.00, 25.00, 31.30,  3.15,  1.00,  9.00
1,2020,100, 26604.00, 23.40, 32.40,  3.08,  1.50,  0.00
1,2020,101, 26856.00, 24.60, 31.20,  3.11,  1.50,  0.00
1,2020,102, 26812.00, 25.00, 31.20,  3.20,  1.50,  0.00
1,2020,103, 26208.00, 24.80, 32.30,  3.30,  1.50,  7.00
1,2020,104, 26208.00, 25.20, 32.30,  3.28,  1.50,  3.00
1,2020,105, 26136.00, 24.80, 31.60,  3.34,  1.50, 0.00
1,2020,106, 25092.00, 25.70, 31.80,  3.28,  1.00,  0.00
1,2020,107, 24876.00, 25.90, 31.80,  3.28,  1.50,  0.00
1,2020,108, 24876.00, 25.20, 31.80,  3.20,  1.50,  22.00
1,2020,109, 26352.00, 25.20, 31.40,  3.15,  1.50,  3.00
1,2020,110, 26172.00, 25.20, 31.20,  3.15,  1.50,  0.00
1,2020,111, 26388.00, 23.80, 31.70,  3.06,  1.50,  33.00
1,2020,112, 20158.00,s 25.50, 34.10,  2.99,  1.70,  0.00
```

Lampiran 5. Dokumentasi

Gambar 1. Dokumentasi pengambilan data biomassa padi.

Gambar 2. Dokumentasi *Survey* lokasi penelitian.