

Minutes from the meeting with the StanForD-group 2004-03-30

Place:	Skogforsk, Uppsala, Sweden
Present:	Jörgen Eriksson, ESE-Technique Jonas Thorsson, ESE-Technique Thom Stenfelt, ESE-Technique Perttu Isosaari, Mitron Tapio Räsanen, Metsäteho Samuli Hujo, Metsäteho Ruediger Dehn, Komatsu Per Lindberg, Komatsu Ola Söderlund, Komatsu Stefan Falk, Rottne Roland Karlsson, Rottne Markus Wallmyr, CC Systems Niklas Götz, CC Systems Jari Korhonen, Ponsse Anders Emmoth, Ponsse Leif Orth, Södra Erik Kindlund, Timberjack Ilari T Virtanen, Timberjack Joakim Nygren, Haglöf Mats Holknekt, MHT Virkesanalys Tor Marntell, SDC
From Skogforsk:	John Arlinger, Secretary Jan Sondell, Chairman Johan J Möller

§1 Opening of the meeting

Jan Sondell opened the meeting. The proposed agenda was accepted.

§2 Clarifications of variables

The following updates of variable descriptions were decided (new text is underlined):

Var	Name	Type	Data type	Description
503	NUM-STEMDB	2		The number of stems <u>that have produced one (or more) logs of an assortment /DBH class/price matrix/tree species: 1...var501/1...var116/1...var111</u> <u>As one stem can contain logs of many assortments, the total number of stems in var503_t2 can not be compared with the total number of stems registered in i.e. var503_t1 or var222_t1. The sum of var503_t2 will in most cases be larger than the sum of var503_t1.</u>
508	LEN-LOGDB	1 & 2	<u>Long</u> integer	
290	NUM-LOGS	1		Number of logs (saw logs and pulpwood). <u>All logs registered in the current file are to be included.</u>
290	NUM-LOGS	2	integer	Total number of logs harvested on a site after the start date (STARTDATE, var16_t4). Never reset during harvesting at a specific site. Used for checking that all files have been included when calculating the total production of a site. <u>All logs from the site and registered in any file are to be included.</u>

FILE NAME SIZE

The secretary informed the meeting about the fact that the Main document was not completely updated in accordance with the last minutes. The following text will be updated in the “Main document” (new text is underlined):

Page 1, section 1:

The ~~extension~~ base name shall be three ~~may be up to eight~~ characters long while there is no limit concerning the length of the base name of StanForD-files. ~~and the extension three characters long.~~

§3 New variables

BUTT END DIAMETERS

Based on a suggestion from Metsäteho (complete proposal in appendix 1).

Different calculation methods are used in harvesters for extrapolating butt end diameter values from the first measured values. Butt end profiles are today created using either linear or non-linear functions or diameter coefficient tables. Tests in Finland have shown that the neiloid-shape profile of the butt end is not predicted well enough with these methods, this is especially true for large trees. Very often the diameters are also underestimated. Different harvester head models start diameter measuring at different heights. Falsely extrapolated diameter values lead to incorrect volumes of the butt end. Control volume measurements in the tests showed that most of the total stem volume error, 35 - 65 %, originates from the 0 – 1 meter part of the first log.

Metsäteho has therefore proposed standardized extrapolation methods for all harvesters, including new coefficient tables for butt end diameter extrapolations as well as special coefficient functions.

Tables and functions give the extrapolation coefficient of a certain point as a result of measured diameter at breast height (also referred to as the “reference height”) and distance (height) of the extrapolation point from the point of the felling cut. The output from the tables or functions is a coefficient, e.g. 113,2 % (or 1132 in per mille format). The measured diameter at reference height multiplied with the given coefficient will give the extrapolated diameter. Observe that it is suggested that it should be possible to change the width of the DBH and distance classes as well as the reference height.

There has been an agreement, based on discussions with the Finnish machine manufacturers, to implement the new extrapolation method, preferably as quickly as possible. Machines could use either tables or functions depending on their present method or processing capacity. The change in extrapolation method shall not affect the volume calculation method (in 10 cm steps with conical function) of the butt end.

Normally, there should not be any need to change the tables and functions after they have been accepted to be used. Still there is a possibility that they need to be updated some time, for instance if new data for checking the coefficients will be collected. Similar kinds of extrapolation tables can also be prepared for new tree species or they could be used in other countries than Finland as well. It would therefore be wise not to hardcode them. It is suggested that it should be possible to load and update them into bucking computers. It was therefore suggested with the minutes that a new file type is implemented with the name *.spp (stem prediction parameters). Other types of data that could be included in this kind of file are bark-thickness & top extrapolation.

It was decided to introduce the following new variables:

Var	Name	Type	Data type	Unit	Description	Files and priorities
170	BUTT-DIAM	1	Integer	Code	Type of butt end profile extrapolation method. Used in the extrapolation of butt end diameter values. Volume calculation of butt end is done according the extrapolated diameters. Method can be chosen separately for each tree species: 1...var111_t1. 0 or no code = machine specific system for extrapolation, 1 = coefficient tables, 2 = functions	SPP / 1 PRD / 2 PRI / 2 STM / 2 STI / 2 KTR / 2
		2	Integer	Cm	Reference height / tree species: 1...var111_t1. Diameter measurement height from the felling cut point. Normally breast height (130 cm in Finland, 120 cm in Sweden) is used for extrapolation of diameter values.	SPP / 2
		3	Integer	Integer	Number of diameter classes / tree species in extrapolation coefficient table: 1...var111_t1. Measured and classified (rounded to the nearest cm) diameter of the tree at reference height.	SPP / 2
		4	Integer	Integer	Number of distance classes / tree species in extrapolation coefficient table: 1...var111_t1. Distance is the classified distance of the diameter to be extrapolated from the felling cut point.	SPP / 2
		5	Integer	Cm	Diameter class values of the reference height in extrapolation coefficient table / tree species. Values can be e.g. 8 – 50 cm in 1 cm intervals.: 1 ... var170_t3 / 1...var111_t1. If the measured diameter at reference height is greater than the greatest diameter class, the greatest class is used.	SPP / 2
		6	Integer	Cm	Distance class values (distance from the felling cut) in extrapolation coefficient table / tree species: 1 ... var170_t4 / 1...var111_t1. First value is 0 cm and last is the value of the actual reference height in	SPP / 2

					var170_t1 (e.g. 130 cm). Intervals normally 10 cm.	
		7	Integer	%	Extrapolation coefficient tables: coefficient values (multiplying values) per mille / distance class / diameter class / tree species.: 1...var170_t4 / 1 ... var170_t3 / 1...var111_t1. Example: Measured diameter at reference height (normally dbh) of stem = 23,3 cm. Distance to extrapolation point = 90 cm. Coefficient value in table at (23, 90) = 1042. Diameter value at 90 cm = 23,3 cm * 1,042 = 24,3 cm (243 mm).	SPP / 2

Comment from Metsäteho: An important issue is that the functions and tables must give equal (or close too equal) values and if so it is up to the machine manufacturers and users to together decide which way is recommended. Some authorized organization (like Metla in Finland) should perhaps confirm the tables and the functions. However, that is not a StanForD question. StanForD should only make it possible to implement either tables or functions.

Comment from Skogforsk: If we need new types of functions we will have to know for certain whether or not a certain bucking computer can use it or not, while if we only use a table we will know that the butt end extrapolation will always work once it has been implemented. We can always calculate a table based on a function but we may not be able to developed or describe a function using data in the form of a table. The main problem with the tables is that they need some kind of rounding. If we only use tables we get a more stable situation while we do loose a little bit in precision partly depending on how many diameter classes are used. Tables (var170 type 1-7) need only to be implemented once and for all in the machines while we may very well need to add and update the functions for example based on regional demands.

It was therefore decided to postpone the introduction of the following new variables used for the functions:

Var	Name	Type	Data type	Unit	Description	Files and priorities
		8	Integer	Code	Code for type of diameter extrapolation function / tree species. Used only if var170_t1 = 2. 1 = function described above or see appendix X 2 = other (description): 1...var111_t1.	SPP / 2
		9	Integer	Integer	Number of parameters of the diameter extrapolation function / tree species: 1...var111_t1.	SPP / 2
		10	String	Text	Names of the parameters of the diameter extrapolation function (e.g. a ₀₀ , a ₀₁ ...): 1... var170_t9 / 1...var111_t1.	SPP / 3
		11	Integer	Integer	Integer part of the parameter value, negative values are possible: 1... var170_t9 / 1...var111_t1.	SPP / 2
		12	Long integer	1/10000 00000	Decimal part of the parameter value in 1/1000000000ths (maximum 9 decimals): 1... var170_t9 / 1...var111_t1.	SPP / 2

The following variables are to be included in the spp-file:

var1_t2, FILETYPE, priority 1
var1_t3, FILETYPE, priority 1
var5_t2, VARIANT, priority 2
var12_t4, DATESAVED, Priority 1

SITE VARIABLE (VAR23)

Based on a suggestion from Metsäteho.

Variables are needed to describe the logging unit (site or block). These are needed in Finland mainly for entrepreneurs' follow-up and cost calculation applications. Forest companies have them in their own applications, but this information is not included in StanForD today.

The proposals were based on the discussions of a working group, which is working on the information needs of the Finnish machine entrepreneurs. There are also some other needs than those discussed at the meeting, but they will be discussed more in the working group before handling in StanForD meetings.

Harvesting method as text

A new variable var23_t1 (SITEINFO) for harvesting method code was accepted at the meeting 2003-04-08. The codes can not be standardized and therefore the information about the harvesting method in a text format is also needed. A new type 2 of var23 should be used in the prd file.

The following list of harvesting methods that might be used was accepted in the working group and in the Finnish StanForD meeting:

1=removal of seed trees, 2=first thinning, 3=other thinnings, 4=clearcut (retention trees can be left), 5=clearcut for natural regeneration (seed trees are left), 6=logging of storm damaged trees, 7=opening of a line (road, ditch, electric line etc.), 8=logging of trees from a building site, 9=other special logging, 10=thinning of a young stand (seedlings)

However, it is normally better to use the codes of the forest company if they are available. Information about the harvesting method could be transformed from the company to the machine in an oai-file with var23_t1 and var23_t2. Then it would be available for prd file. The list of harvesting methods (above) was created mainly as an aid when building the user interfaces of the machines, but it could be used if no other coding exists.

Area of the site

There is no variable in the standard for expressing the area of the logging unit using the unit hectares. Var670 was primarily intended for inventory data with the unit m². It would be more logical, as suggested by Metästeho, to implement this site information within the existing variable SITEINFO (var23). It should be possible to send this information about the area from the company to the machine using the oai-file. It should also be possible for the operator to change the area if necessary before saving it in a prd-file.

It was decided to introduce the following new variables:

Var	Name	Type	Data type	Unit	Description	Files and priorities
23	SITEINFO	2	String	Text	Harvesting method (site or block).	oai/3, prd/3, pri/3
23	SITEINFO	3	Integer	Hectare	Area of the site in hectares.	oai/3, prd/3, pri/3

The following update of variable 670 is suggested with the minutes as a consequence of the decision to implement var23_t3 (new text is underlined):

Var	Name	Type	Data type	Unit	Description	Files and priorities
670	UNITAREA	1	Integer	M2	Area of logging unit.	inv/2, prd/3, pri/3

§4 Production file for forwarders (prl-files)

It was decided at the previous meeting (2003-10-28) that the new type of forwarder file is to be called prl-file.

John Arlinger described the final proposal concerning how to implement a new file format for reporting forwarder production (appendix 2).

It was decided to introduce the new variables described in the following two tables.

New variables are described below (all with priority 1 in prl-files)

Var no	Name	Type	Data type	Unit	Description
440	NUMTRNS	1	Integer	No	Number of transport objects in prl-file
441	TRNSDESC	1	String	Text	Transport object name (free descriptive text): 1...440_t1
		2	String	Text	Transport object code: 1...440_t1
		3	Integer	Dgrs	Latitude, integer as 0.00001 degrees, stored according to var521_t1, var521_t2 and var520_t1: 1...440_t1
		4	Integer	Dgrs	Longitude, integer as 0.00001 degrees, stored according to var521_t1, var521_t2 and var520_t1: 1...440_t1
		5	Integer	Masl	Altitude, meters above sea level, stored according to var521_t1, var521_t2 and var520_t1: 1...440_t1
		6	String	Yyyy mmdd hhmmss	Start date (when transport object is defined): 1...440_t1
		7	String	Yyyy mmdd hhmmss	Date when transport object is completed, no additional unloading at this transport object is done after this date: 1...440_t1
		8	String	Yyyy mmdd	Estimated harvesting date: 1...440_t1
442	TRNSSORT	1	Integer	No	No of assortments per transport object: 1...440_t1
		2	String	Text	Name of tree species per assortment and transport object (compare with var120): 1...442_t1 / 1...440_t1
		3	String	Text	Tree species code(see Swedish appendix) per assortment and transport object (compare with var120): 1...442_t1 / 1...440_t1
		4	String	Text	Description per assortment and transport object (compare with var121_t1): 1...442_t1 / 1...440_t1
		5	String	Text	Assortment codes per assortment and transport object (compare with var121_t2): 1...442_t1 / 1...440_t1
		6	String	Text	Additional identity description of assortment per assortment and transport object (compare with var121_t3): 1...442_t1 / 1...440_t1
		7	String	Text	Buyer per assortment (compare with var32_t2, see Swedish appendix) : 1...442_t1 / 1...440_t1
445	NUMLOAD-COD	1	Integer		Number of load codes in var446_t1
446	LOAD-CODE	1	Integer	Code	Codes set for registered data in var447, all loads follow the definition in this variable:1..var445_t1 See appendix (included in table 2 below).
447	LOADDATA	1	Integer		Measurement data for each load: 1...var445_t1/1...var228_t1.

New load codes, registered in var446_t1, describe what kind of data is stored in var447_t1

Load codes	Description
2	Load number
10	Transport object number. The number refers to the order of the transport objects according to variable 441. Number = 1...n, n = var440_t1.
401	Volume m3sob.
1401	Volume m3sob decimal parts.
402	Volume m3sub.
1402	Volume m3sub decimal parts.
450	Green/raw mass (kg)
460	Estimated no of logs
750	Operator number. The number refers to the order of the drivers in variable 212, type 1. Number = 1...var211_t2. Operator no. 1 is the operator that comes directly after the type number in Var 212.
760	Latitude, integer as 0.00001 degrees, stored according to var521_t1, var521_t2 and var520_t1.
761	1=North, 2=South The code in var522_t2 is valid for all trees if this code is excluded.
762	Longitude, integer as 0.00001 degrees, stored according to var521_t1, var521_t2 and var520_t1.
763	1=East, 2=West The code in var522_t4 is valid for all trees if this code is excluded
764	Altitude, meters above sea level, stored according to var521_t1, var521_t2 and var520_t

2000-series - User defined codes, not standardized

The following data (load codes) must be included in a prl-file:

10, 401 or 402, 450

All today existing variables that are needed in a production file from forwarders are presented below. Some descriptions have been shortened in order to decrease the size of the table.

Var	Name	Type	Description	Priority
1	FILETYPE	2	The variable shall assume one of the following values: apt, prd...	1
1	FILETYPE	3	Code page character set, ISO-code	1
3	MCHNNO	2	Unique machine identity for each company, ...	2
3	MCHNNO	3	Code describing type of machine, ...	1
5	VARIANT	1	Model variant for the bucking computer. ...	2
11	RESETDATE	4	Time and date when file was last reset (mandatory), normally at the same...	1
12	DATESAVED	4	Date when file was last saved	1
16	STARTDATE	4	Time and date for starting production at a site ...	1
17	ENDDATE	4	Time and date for ending a site. Used only ...	1
19	BREAKDATE	4	Date and time for a temporary break in the harvesting operation at a site ...	2
20	RESTARTDATE	4	Date and time for restart on a site (var 21) where the operations have ...	2
21	SITENO	1	Logging unit number (mandatory in PRD, PRI and DRF)	1
21	SITENO	2	Marking for cutting	2
21	SITENO	3	Compartment number	2
21	SITENO	4	Lot number	2
21	SITENO	5	Code to express if the logging site is certified or not: ...	2
22	FILEORDER	1	Order of production files (prd or pri), used when dividing production result from one site into several different files. In the first file FILEORDER = 1. ...	1
23	SITEINFO	1	Harvesting method	3
23	SITEINFO	2	Harvesting method	3
31	ORG	1	Organization, e.g. management district	2
31	ORG	2	Region	2
31	ORG	3	District	2
31	ORG	4	Working team	2

Var	Name	Type	Description	Priority
31	ORG	5	Wood pile	2
32	BUYER	1	Buyer	3
33	VENDOR	1	Vendor/seller	3
34	SUBCON	2	The contractors code	2
34	SUBCON	3	The name of the contractor	2
34	SUBCON	4	The address of the contractor	2
34	SUBCON	5	The e-mail address of the contractor	2
34	SUBCON	6	The telephone and fax numbers of the subcontractor	2
35	CONTRACTNO	1	Contract number	1
35	CONTRACTNO	2	Contract number in the Swedish VIOL-system	2
60	WEIGHTCAL	1	Number of scale calibrations	3
60	WEIGHTCAL	2	Date for calibrating scale: 1...var60_t1	3
60	WEIGHTCAL	3	Reference mass when calibrating scale: 1...var60_t1	3
60	WEIGHTCAL	4	Error of scale when calibrating: 1...var60_t1	3
60	WEIGHTCAL	5	Factor used when weighing, default value is 1000.	3
211	OPERATOR	2	Number of operators	2
212	DRIVERNAME	1	The name of the driver: 1...var211_t2	2
228	NUMLOAD	1	Number of loads	2
228	NUMLOAD	2	Number of loads/operator: 1...var211	2
258	DISTANCE	1	Covered distance, variable is reset together with product.....	2
258	DISTANCE	2	Covered distance/operator, variable is reset together with production: 1...var211	2
520	COORDREF	1	Position of coordinate registration in file...	2
521	COORDTYPE	1	Type of coordinate....	2
521	COORDTYPE	2	Coordinate system used in file: 1=WGS84 (Default)	2
522	COORDSTART	1	Latitude when file is created (abs. value), according to var521_t2 & var520_t1.	2
522	COORDSTART	2	1=North 2=South	2
522	COORDSTART	3	Longitude when file is created, (abs. value), according to var521_t2 & var520_t1.	2
522	COORDSTART	4	1=East 2=West	2
522	COORDSTART	5	Altitude, height above sea level, registered according to var521_t2 & var520_t1.	2
522	COORDSTART	6	Date and time when recording data in var522.	2
991	CHECKSUM1	0	Checksum for file as per checksum 1 in Kermit protocol...	1
992	CHECKSUM2	0	Checksum as per checksum 2 in Kermit	3
993	CHECKSUM3	0	Checksum as per checksum 3 in Kermit	3

§5 Harvesting directives and GIS application

John Arlinger described the final proposal concerning how to implement a new format for harvesting directives and GIS application (a separate report, Standardization of harvesting directives, has been written).

Suggestion with minutes: In the original proposal all new variables were supposed to be included with the present file structure. However, it was suggested by Jörgen Eriksson, ESE-Technique, that the specific variables used only by the GIS-application are to be stored in a new file type in order to keep the structure of the oai-file simple. It was thus suggested by Skogforsk that a new file type, called *.gdh (Geographic Harvesting Directives), is implemented. This also means that we need two new variables:

1. Variable for registering the identity (name) of the oai-file in the gdh-file (suggested var2_t3, ID)
2. Variable for registering the identity (name) of the gdh-file in the oai-file (suggested var2_t4, ID)

It was decided at the meeting to implement all suggested new variables needed in harvesting directives as described in the tables below.

New variables in ghd-file

Var no	Name	Type	Data type	Unit	Description	Priority
2	IDENTITY	3	String	Text	The name of the oai-file	2
460	GISFILE	1	Integer	No	Number of GIS-files with geographical/layer data (e.g. shp, mif, tif, jpg)	1
460		2	String	Text	Name of GIS-files with geographical/layer data (e.g. shp, mif, tif, jpg): 1...var460_t1	1
		3	Integer	Code	Layer editable in forest machine: 1...var460_t1 0 = true (default), 1 = false	2
		4	Integer	Code	Order of layer as presented in GIS application: 1...var460_t1 For example, 1 is the topmost layer	2
		5	Integer	Code	Layer has been modified in forest machine: 1...var460_t1 0 = not modified, 1 = modified, 2 = new/created Code must be 2 if file was created in forest machine, irrespectively of later modifications.	2
		6	String	Yyyy mmdd hhmmss	Date of last modification or creation in forest machine: 1...var460_t1	2
		7	Integer	Code	Type of tracking file created in forest machine: 1...var460_t1 0 = points, 1 = lines, 2 = polygons, 3 = not a tracking file (default if variable is missing)	2
		8	Integer	Code	Code specifying whether the file is sent together with oai-file or not: 1...var460_t1 0 = true, 1 = false (file expected to exist in receiving computer)	2
461	DBFILE	1	Integer	No	Number of files connected to GIS-files with complimentary/theme data (e.g. dbf, tab, dat, shx, twf): 1...var460_t1	1
		2	String	Text	Name of files connected to GIS-files with complimentary/theme data (e.g. dbf, tab, dat, shx, twf): 1...var461_t1/ 1...var460_t1	1
		3	Integer	Code	File sent together with oai-file: 1...var460_t1 0 = true, 1 = false (file expected to exist in receiving computer)	2
462	LAYER-DSCR	1	String	Text	Column name for name of feature (free text), in files connected to GIS-files with complimentary/theme data (e.g. dbf, tab, dat, shx, twf)	1
		2	String	Text	Column name for unique id (free text)	2
		3	string	Text	Column name for description (free text)	2
		4	string	Text	Column name for treatment (free text)	2
		5	string	Text	Column name for marked in terrain, eg. painted borders Codes: 0 = yes, 1 = no (default)	2
		6	string	Text	Column name for warning (whether machine activities are permitted or not) Codes: 0 = no warning (default), 1 = warning.	2
		7	string	Text	Column name for warning distance (m).	2
		8	string	Text	Column name for format class. Used for controlling the appearance of all features included in a specific layer. Format classes defined in var465.	2
463	OTHFILE	1	Integer	No	Number of other files included with oai/ghd-file (all relevant file types allowed)	2
		2	String	Text	Name of other files included with oai/ghd-file: 1...var463_t1	2
		3	Integer	Code	File sent together with oai/ghd-file: 1...var463_t1 0 = true, 1 = false (file expected to exist in receiving computer)	2

Var no	Name	Type	Data type	Unit	Description	Priority
464	TRACK-ING	1	Integer	Code	Indicates what type of tracking file is to be generated by the forest machine 0=points, 1=lines, 2=polygons, 3=no tracking file needed (default)	2
465	VISFORM	1	Integer	No	Number of format classes per GIS-file: 1...var460_t1	1
		2	String	Text	Id/name of format classes: 1...var465_t1/ 1...var460_t1	2
		3	Integer		Color (RGB) per format classes: 1...var465_t1/ 1...var460_t1	2
		4	Integer	Code	Line style per format class: 1...var465_t1/ 1...var460_t1 0=solid, 1=dash, 2=dot, 3=dash-dot, 4=double solid	2
		5	Integer	Points	Line thickness, no of points, (independently of line style): 1...var465_t1/ 1...var460_t1	2
		6	Integer	Code	Fill style: 1...var465_t1/ 1...var460_t1 0=SolidFill, 1=TransparentFill, 2=HorizontalFill, 3=VerticalFill, 4=UpwardDiagonalFill, 5=DownwardDiagonalFill, 6=CrossFill, 7=DiagonalCrossFill, 8=LightGrayFill, 9=GrayFill, 10=DarkGrayFill	2
		7	Integer	No	Symbol number (from font file stored in var466) : 1...var465_t1/ 1...var460_t1	2
		8	Integer	Points	Symbol size: 1...var465_t1/ 1...var460_t1	2
466	FONTFILE	1	String	Text	Name of font file used for symbols to be presented in GIS application.	1
		2	Integer	Code	File sent together with oai/ghd-file: 1...var460_t1 0 = true, 1 = false (file expected to exist in receiving computer)	2

New variables in oai-file

Var no	Name	Type	Data type	Unit	Description	Priority
2	IDENTITY	4	String	Text	The name of the ghd-file	2
33	VENDOR	2	String	Text	Seller's name code	2
33		3	String	Text	Seller's name (contact person)	2
33		4	String	Text	Seller's address (contact person)	2
33		5	String	Text	Seller's e-mail (contact person)	2
33		6	String	Text	Seller's phone/fax number (contact person)	2

§6 Definition of stems

Average stem volume is often used as a basis for paying harvester entrepreneurs and in some cases for paying the forest owner. It is therefore important to know how different computer manufactures define a stem.

The results of a questioner sent out (October, 2003) to the different manufactures are described in table 1. For Valmet Maxi 2 & 3, Timbermatic 300 and Motomit IT the definition of a stem is that it must consist of at least one classified log according to a price matrix in the apt-file. For Ponsse a stem must consist of one log that is at least 150 cm long and with a top diameter of at least 40 mm and for Dasa 4 a stem must consist of a log that is at least 50 cm long.

Minimum diameter is decided by the price matrixes in the apt-file for Valmet, Timberjack and Motomit. For Ponsse it is always 40 mm while there is no diameter limit in the case of Dasa.

Tabel 1. Definition of stem-restrictions for different machine models.

Machine	Stem definition	Log definition	Minimum length	Minimum / maximum diameter	Maximum length/ tree
Ponsse Opti 4 G	1 volume counted log	> 150 cm long	151 cm	Min 40 mm, max 999 mm	20 no * 30 m = 600 m
Maxi 2X; Maxi 3X	>= 1 classified log**	Must be in a price matrix >10 cm	According to price matrix in apt-file	Min according to head size, max 700 mm	60 m
Timbermatic 300 *	>= 1 classified log (in stm >1 m) **	Must be in a price matrix	According to price matrix in apt-file	Min according to apt-file, max 900 mm	60 m
Motomit 4+, IT and pc 0.62	>= 1 classified log	Must be in a price matrix or >150 cm	According to price matrix in apt-file	Min according to apt-file, max 1400 mm	50 m
Dasa 4	1 log >= 50 cm	1 log >= 50 cm	>= 50 cm	No limits	No limit

* Unclassified logs are not handled in pri-files.

** Price must be > 0 in price table

The definitions used by Valmet, Timberjack and Motomit are very similar in that they are all based on that at least one classified log must be cut. Ponsse's definition is also quite similar to the three manufactures mentioned above. Only Dasa diverge significantly with a length requirement (≥ 50 cm) as the only rule.

The reason for Dasa to not use "a valid classified log" is that this definition will mean that a stem which is large enough for cutting one valid log may be excluded. For example, a stem will not be counted if one single log, which is 585 cm and has a top diameter 50 mm, is cut while the maximum length is 580 cm. A stem would have been registered if a log with a length of 570 cm and a diameter of 60 mm had been cut.

It was decided at the previous StanForD-meeting (2003-10-28) that a proposal for a standardized definition of a stem was to be presented by Skogforsk.

It was decided to implement the following definition of a stem:

1. The sum of the length of all logs from one stem must be larger than the minimum length of all available price matrixes and
the diameter at minimum length, from stump, must be larger than the minimum diameter in all price matrixes, in order to be registered as a stem.

The idea is to use this definition as the basic overall definition, meaning that no logs or volumes from trees that do not follow the definition are to be included in any StanForD-files at all.

A proposal is presented in the following table (new text is underlined):

Var	Name	Type	Data type	Description
221	NUM-STEMS	1	Integer	Number of processed (harvested) stems. <u>The sum of the length of all logs from one stem must be larger than the minimum length of all available price matrixes and the diameter at minimum length, from butt end, must be larger than the minimum diameter in all price matrixes, in order to be registered as a stem.</u>
		2	Integer	Total number of trees harvested on a site after the start date (STARTDATE, var16_t4). Never reset during harvesting at a specific site. Used for checking that all files have been included when calculating the total production of a site. <u>The sum of the length of all logs from one stem must be larger than the minimum length of all available price matrixes and the diameter at</u>

				<u>minimum length, from butt end, must be larger than the minimum diameter in all price matrixes, in order to be registered as a stem.</u>
222	NUM-STEMSPC	All		<i>New description according to above included</i>
223	NUM-STEMOP	All		<i>New description according to above included</i>
224	NUM-PLPSTM	All		<i>New description according to above included</i>
503	NUM-STEMDB	All		<i>New description according to above included</i>
244	OUT-SPEC	All		<u>Unclassified volume, only volume from stems included in var221 t1 are registered.</u>
249	TOTAL-VOL	1	Integer	Total solid volume (including volumes in var243 and var244) /operator/tree species: 1..var211/1..var111 <u>Only volume from stems included in var221 t1 are registered.</u>

It was also decided that this definition is included in the main document as it, to a certain extent, is valid for a very large number of StanForD variables and file types.

§7 Items for discussion and information

CONTROL OF HARVESTER MEASUREMENTS

Jan Sondell and Tapio Räsänen informed about the ongoing projects concerning control and calibration. A document including a demand specification will be completed in May.

OPERATIONAL MONITORING OF FOREST MACHINES

John Arlinger informed about the present situation. The document describing how to implement operational monitoring has been updated with some improved descriptions and examples mainly based on questions from manufacturers. However, no changes have been required to the data structure or the definitions of variables so far. A new and updated version will be sent out shortly. It is still of great importance that developers working on this issue stay in touch with the StanForD secretary in order to avoid diverging implementations.

STATUS AND TIME TABLE FOR PRI-FILES

Johan J. Möller described the present situation concerning pri-files and John Arlinger distributed the last and final work report concerning pri-files (Arlinger, J. Möller, J. & Sondell, J. 2003. A description of pri-files – Background, structure and examples. Arbetsrapport 559, Skogforsk). Please contact Skogforsk if more copies are needed.

NEW BARK FUNCTIONS PRODUCTION FILE FOR FORWARDER

John Arlinger informed about ideas concerning new improved bark functions. The functions presently used in Sweden have quite large systematic errors for pine. A project for developing new functions has been carried out by Skogforsk. A final report will be ready before July 2004. A proposal for how to handle this issue will be presented at the next meeting.

§8 Other issues

No other issues were discussed.

§9 Next meeting

Next meeting will take place on Tuesday October 26th, 2004, at Skogforsk in Uppsala, starting at 10.00 a.m. Proposals for the meeting shall be the secretary by hand not later than September 15th 2004.

§10 End of meeting

Jan Sondell (chairman) closed the meeting.

Secretary

John Arlinger

METSÄTEHO Oy
 Asko Poikela
 Tapio Räsänen
 2004–03–29

Proposal for a new bep –file (butt end profile) and a new variable 8xx (170 or ... ?), types 1-11 (BUTTDIAM)

Background

At the present different calculation methods are used in harvesters for extrapolating butt end diameter values from the first measured values. Butt end profile is created either using linear or non-linear functions or diameter coefficient tables. The tests in Finland have shown that the neiloid-shape profile of the butt end is not predicted well enough with these methods, this is especially true for larger trees. Very often the diameters are also underestimated. Different harvester head models start diameter measuring at different heights. Falsely extrapolated diameter values lead to incorrect volumes of the butt end. Control volume measurements in the tests also showed that most of the total stem volume error, 35 – 65 %, originates from the 0 – 1 meter part of the first log.

The aim of a project, carried out by Metsäteho, has been to standardize the extrapolation methods for all harvesters. In the project new coefficient tables for butt end diameter extrapolations have been developed. The data needed for calculating the tables have been prepared by the Finnish Forest Research Institute (Metla) and they are based on the sample tree data from the Finnish National Forest Inventories (VMI). The tables were calculated using the VMI-data and specific taper curve and stump height models (Laasasenaho, 1982) for pine, spruce and birch separately. The tables are valid for the whole of Finland, although it is known that there might be some deviations in the stem profiles for certain areas, like in Northern Finland and coastal areas. Special coefficient functions based on the tables have been developed by Metsäteho.

The models by Laasasenaho are based on measurements from the 1960's. Laasasenaho showed in his thesis (1982), that the models were non-biased in the butt-end. It is necessary to make it possible to update the tables or functions as the average shape of the butt-end may have changed over time.

Tables and functions give the extrapolation coefficient of a certain point as a result of measured diameter at breast height (also referred to as the “reference height”) and distance (height) of the extrapolation point from the point of the felling cut. In the tables $d_{1.3}$ is classified in 1 cm classes (50 cm) and the distance in 10 cm classes (0 – 130 cm). Functions do not need any classification (rounding to the nearest 1 or 10 cm values). The output from the tables or functions is a coefficient, e.g. 113,2 % (or 1132 in per mille format). Measured $d_{1.3}$ multiplied with the given coefficient will give the extrapolated diameter. Below is an example of a coefficient table for pine, as well as the formulas and parameters of the functions. Observe that it is suggested that it should be possible to change the width of the DBH and distance classes as well as the reference height.

There has been an agreement, based on discussions with the Finnish machine manufacturers, to implement the new extrapolation method, preferably as quickly as possible. Machines could use either tables or functions depending on their present method or processing capacity. The change in extrapolation method shall not affect the volume calculation method (in 10 cm steps with conical function) of the butt end.

Normally, there should not be any need to change the tables and functions after they have been accepted to be used. Still there is a possibility that they need to be updated some time, for instance if new data for checking the coefficients will be collected. Similar kinds of extrapolation tables can also be prepared for new tree species or they could be used in other countries than Finland as well. It would therefore be wise not to hardcode them. It is suggested that it should be possible to load and update them into bucking computers using specific new butt end profile (bep) files. Apt-files were not considered to be a good way to set and update the tables and functions, because the updates will be done seldom. It was seen that the files are a part of measurement settings and it is machine manufacturers' task to set the latest recommended or agreed tables and functions to the machines, not the forest companies who use the apt files. However, it was seen that this should be done in a standardized way so that the entrepreneurs and forest companies can easily check which tables or functions are in use. A bep file is therefore suggested to be described and implemented for a new StanForD file.

These new methods should be implemented in new versions of bucking computers. Older versions are probably not needed to be updated. It would cause a total change in the control measurement practices and updates of the calipers, too. However, the changes affect the present control measurement system and measurement regulations, but this has not been discussed with the forest owner part or timber measurement authorities yet.

Example of an extrapolation coefficient table for pine using 130 as reference height:

Tree species: pine		Distance from the felling cut point, cm												
d _{1.3} , cm	0	10	20	30	40	50	60	70	80	90	100	110	120	130
8	138,6	130,2	124,1	119,7	116,4	113,8	111,6	109,8	108,1	106,4	104,8	103,2	101,6	100,0
9	138,1	129,7	123,7	119,2	115,9	113,3	111,2	109,4	107,7	106,1	104,6	103,1	101,5	100,0
10	137,5	129,3	123,3	118,8	115,5	112,9	110,8	109,0	107,4	105,9	104,4	102,9	101,5	100,0
11	137,0	128,9	122,9	118,4	115,1	112,5	110,4	108,7	107,1	105,6	104,2	102,8	101,4	100,0
12	136,4	128,5	122,5	118,1	114,7	112,1	110,1	108,4	106,8	105,4	104,0	102,7	101,3	100,0
13	135,8	128,1	122,2	117,8	114,4	111,9	109,8	108,1	106,6	105,2	103,9	102,6	101,3	100,0
14	135,3	127,7	121,9	117,5	114,2	111,6	109,5	107,8	106,4	105,0	103,7	102,5	101,2	100,0
15	134,7	127,3	121,6	117,3	114,0	111,4	109,3	107,6	106,2	104,9	103,6	102,4	101,2	100,0
16	134,2	127,0	121,4	117,1	113,8	111,2	109,1	107,5	106,0	104,7	103,5	102,3	101,2	100,0
17	133,7	126,7	121,2	116,9	113,6	111,0	109,0	107,3	105,9	104,6	103,4	102,3	101,1	100,0
18	133,2	126,4	121,0	116,8	113,5	110,9	108,9	107,2	105,7	104,5	103,3	102,2	101,1	100,0
19	132,7	126,1	120,8	116,7	113,4	110,8	108,8	107,1	105,6	104,4	103,2	102,1	101,1	100,0
20	132,3	125,9	120,7	116,6	113,3	110,7	108,7	107,0	105,6	104,3	103,2	102,1	101,0	100,0
21	131,9	125,6	120,6	116,5	113,3	110,7	108,6	106,9	105,5	104,3	103,1	102,1	101,0	100,0
22	131,5	125,4	120,5	116,5	113,3	110,7	108,6	106,9	105,4	104,2	103,1	102,0	101,0	100,0
23	131,2	125,2	120,4	116,4	113,2	110,7	108,6	106,8	105,4	104,2	103,1	102,0	101,0	100,0
24	130,8	125,1	120,3	116,4	113,2	110,7	108,6	106,8	105,4	104,1	103,0	102,0	101,0	100,0
25	130,5	124,9	120,2	116,4	113,2	110,7	108,6	106,8	105,4	104,1	103,0	102,0	101,0	100,0
26	130,2	124,8	120,2	116,4	113,3	110,7	108,6	106,8	105,4	104,1	103,0	102,0	101,0	100,0
27	130,0	124,6	120,1	116,4	113,3	110,7	108,6	106,9	105,4	104,1	103,0	102,0	101,0	100,0
28	129,7	124,5	120,1	116,4	113,3	110,8	108,6	106,9	105,4	104,1	103,0	102,0	101,0	100,0
29	129,5	124,4	120,0	116,4	113,3	110,8	108,7	106,9	105,4	104,1	103,0	101,9	101,0	100,0
30	129,3	124,3	120,0	116,4	113,4	110,8	108,7	106,9	105,4	104,1	103,0	101,9	101,0	100,0
31	129,1	124,2	120,0	116,4	113,4	110,9	108,7	107,0	105,4	104,1	103,0	102,0	101,0	100,0
32	128,9	124,0	119,9	116,4	113,4	110,9	108,8	107,0	105,5	104,2	103,0	102,0	101,0	100,0
33	128,7	123,9	119,9	116,4	113,4	110,9	108,8	107,0	105,5	104,2	103,0	102,0	101,0	100,0
34	128,5	123,8	119,8	116,3	113,4	110,9	108,8	107,0	105,5	104,2	103,0	102,0	101,0	100,0
35	128,3	123,7	119,7	116,3	113,4	110,9	108,8	107,0	105,5	104,2	103,0	102,0	101,0	100,0
36	128,1	123,6	119,6	116,3	113,4	110,9	108,8	107,1	105,5	104,2	103,0	102,0	101,0	100,0
37	127,9	123,4	119,5	116,2	113,3	110,9	108,8	107,1	105,5	104,2	103,0	102,0	101,0	100,0
38	127,7	123,2	119,4	116,1	113,3	110,9	108,8	107,0	105,5	104,2	103,0	102,0	101,0	100,0
39	127,4	123,1	119,3	116,0	113,2	110,8	108,8	107,0	105,5	104,2	103,0	102,0	101,0	100,0
40	127,2	122,8	119,1	115,9	113,1	110,7	108,7	107,0	105,5	104,2	103,0	102,0	101,0	100,0
41	126,9	122,6	118,9	115,7	113,0	110,6	108,6	106,9	105,5	104,2	103,0	102,0	101,0	100,0
42	126,6	122,3	118,7	115,5	112,8	110,5	108,6	106,9	105,4	104,1	103,0	102,0	101,0	100,0
43	126,2	122,0	118,4	115,3	112,6	110,4	108,4	106,8	105,3	104,1	103,0	101,9	101,0	100,0
44	125,8	121,7	118,1	115,1	112,4	110,2	108,3	106,7	105,3	104,0	102,9	101,9	100,9	100,0
45	125,4	121,3	117,8	114,8	112,2	110,0	108,2	106,6	105,2	104,0	102,9	101,9	100,9	100,0
46	124,9	120,9	117,4	114,4	111,9	109,8	108,0	106,4	105,1	103,9	102,9	101,9	100,9	100,0
47	124,3	120,4	117,0	114,1	111,6	109,6	107,8	106,3	105,0	103,8	102,8	101,8	100,9	100,0
48	123,7	119,8	116,5	113,7	111,3	109,3	107,6	106,1	104,8	103,7	102,7	101,8	100,9	100,0
49	123,1	119,2	116,0	113,2	110,9	109,0	107,3	105,9	104,7	103,6	102,7	101,7	100,9	100,0
50	122,3	118,6	115,4	112,7	110,5	108,6	107,0	105,7	104,5	103,5	102,6	101,7	100,8	100,0

Appendix 1

Function (with reference height 130 cm):

$$D_L = \left[1 + \left(a_0 * (1,3 - L) + a_1 * (1,3 - L)^{a_2} \right) / 100 \right] * D_{1,3}$$

(formula 1)

where
 D_L = diameter at the distance L from the felling cut point, cm
 $a_0 \dots a_2$ = butt end profile parameters (per tree species), results of formulas 2 - 4
 L = distance from the felling cut point, m
 $D_{1,3}$ = measured diameter at the height of 1,3 m (reference height) from the felling cut point, cm

Models for butt end profile parameters:

$$a_0 = a_{00} + a_{01} * D_{1,3} + a_{02} * D_{1,3}^2 + a_{03} * D_{1,3}^3 + a_{04} * D_{1,3}^4$$

(formula 2)

$$a_1 = a_{10} + a_{11} * D_{1,3} + a_{12} * D_{1,3}^2 + a_{13} * D_{1,3}^3$$

(formula 3)

$$a_2 = a_{20} + a_{21} * D_{1,3} + a_{22} * D_{1,3}^2$$

(formula 4)



where

$$D_{1,3} = \min(50; D_{1,3})$$

Parameter values of the model:

Tree species	a_{00}	a_{01}	a_{02}	a_{03}	a_{04}
Pine	24,30	- 1,324	0,039372	- 0,0003850	0
Spruce	30,46	- 3,399	0,181337	- 0,0043459	0,00003908
Birch	27,04	- 2,004	0,066531	- 0,0007020	0
	a_{10}	a_{11}	a_{12}	a_{13}	
Pine	1,00	0,381	- 0,006291	0	
Spruce	- 0,35	0,143	0,016430	- 0,0003800	
Birch	0,41	0,440	- 0,006870	0	
	a_{20}	a_{21}	a_{22}		
Pine	7,70	- 0,233	0,003056		
Spruce	12,65	- 0,556	0,008019		
Birch	8,85	- 0,300	0,004027		

For big trees ($D_{1,3} > 50$ cm) the *proportional* shape of butt-end is kept similar to 50 cm trees. When using tables, coefficients are taken from the last row and when using functions, $D_{1,3}$ is delimited to 50 cm in parameter functions (formulas 2- 4).

Suggestions

A new bep -file (butt end profile) is suggested to be implemented. Existing StanForD variables that should be taken into bep -file are:

	<u>priority</u>	
var1 FILETYPE t_2	1	
var1 FILETYPE t_3	1	
var3 MCHNNO t_1	2	
var3 MCHNNO t_2	3	
var3 MCHNNO t_3	3	
var3 VARIANT t_1	2	
var12 DATESAVED t_4	1	Date when bep file was last saved

Comments: bep was changed with the minutes to spp (stem prediction parameters).

Following new variables are suggested. 800 –series variable can be used in testing the extrapolation method, but further a permanent variable number should be defined.

Var #	Name	Type	Data type	Unit	Description	Files and priorities
8xx, (170?)	BUTTDIAM	1	Integer	Code	Type of butt end profile extrapolation method. Used in the extrapolation of butt end diameter values. Volume calculation of butt end is done according the extrapolated diameters. Method can be chosen separately for each tree species: (0 or lacking code = machine specific system for extrapolation none or present system) 1 = coefficient tables 2 = functions: 1...var111_t1.	BEP / 1 PRD / 2 PRI / 2 STM / 2 STI / 2 KTR / 2
		2	Integer	cm	Reference height / tree species: 1...var111_t1. Diameter measurement height from the felling cut point. Normally breast height (130 cm in Finland, 120 cm in Sweden) is used for extrapolation of diameter values.	BEP / 2
		3	Integer	Integer	Number of diameter classes / tree species in extrapolation coefficient table: 1...var111_t1. Measured and classified (rounded to the nearest cm) diameter of the tree at reference height.	BEP / 2
		4	Integer	Integer	Number of distance classes / tree species in extrapolation coefficient table: 1...var111_t1. Distance is the classified distance of the diameter to be extrapolated from the felling cut point.	BEP / 2
		5	Integer	cm	Diameter class values of the reference height in extrapolation coefficient table / tree species. Values can be e.g. 8 – 50 cm in 1 cm intervals.: 1 ... var8xx_t4 / 1...var111_t1. If the measured diameter at reference height is greater than the greatest diameter class, the greatest class is used.	BEP / 2
		6	Integer	cm	Distance class values (distance from the felling cut point) in extrapolation coefficient table / tree species. First value is 0 cm and last is the value of the actual reference height in var8xx_t1 (e.g. 130 cm). Intervals normally 10 cm.	BEP / 2
		7	Integer	‰	Extrapolation coefficient tables: coefficient values (multiplying values) per mille / distance class / diameter class / tree species.:	BEP / 2

Appendix 1

					1...var8xx_t3 / 1 ... var8xx_t4 / 1...var111_t1. Example: measured diameter at reference height (normally dbh) of stem = 23,3 cm, distance of extrapolation point = 90 cm, coefficient value in table at (23, 90) = 1042 → diameter value at 90 cm = 23,3 cm * 1,042 = 24,3 cm (243 mm).	
		8	Integer	Code	Code for type of diameter extrapolation function / tree species. Used only if var8xx_t1 = 2.: 1...var111_t1. 1 = function described above or see appendix X 2 = other (description):	BEP / 2
		9	Integer	Integer	Number of parameters of the diameter extrapolation function / tree species: 1...var111_t1.	BEP / 2
		10	String	Text	Names of the parameters of the diameter extrapolation function (e.g. a ₀₀ , a ₀₁ ...): 1... var8xx_t9 / 1...var111_t1.	BEP / 3
		11	Integer	Integer	Integer part of the parameter value, negative values are possible: 1... var8xx_t9 / 1...var111_t1.	BEP / 2
18XX	BUTTDIAM	11	Long integer	1/1000 000000	Decimal part of the parameter value in 1/1000000000ths (maximum 9 decimals): 1... var8xx_t9 / 1...var111_t1.	BEP / 2

There is also a need to save the information concerning which extrapolation method has been used in stm, prd and pri files. The information could contain:

- type of the extrapolation method (table or function) var8xx_t1
- name of the bep -file in which the table or parameter values have been given
 - should this be given in a new type of var2 ID or in a special variable?
 - proposal: new variable var2 ID t_3 The name of the bep file
- reference to the detailed description of the method and values
 - StanForD appendix ?

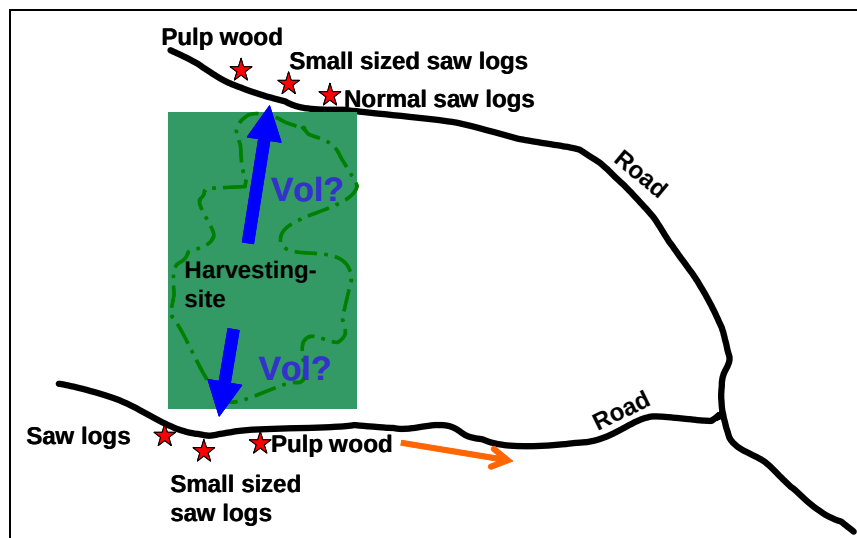
In stm-file the information could be given for each tree, in prd per tree species and in pri either per tree or per tree species. The suggestion is that the information is given only once per each tree species in every file type.

These suggestions have been discussed and accepted in the Finnish StanForD meeting on the 25th of March, 2004. Changes might come to these later when implementations to the bucking computers and testing will be started.

The prl-file

A NEW STANFORD-FILE FOR REPORTING FORWARDER PRODUCTION.

Draft!



Background

An increasing number of manufacturers are installing PC-computers and GPS-receivers in forwarders. This means that there are new possibilities to generate StanForD-files like drf- and prd-files from forwarders. Production files from forwarders are of great interest to many organizations/companies since information concerning available volumes of wood at the landing is very important for planning the wood flow from forest to industry.

PRESENT PRD-FILE

There are today 215 standardized variables that can be included in the prd-file, excluding variables with priority 4. At least 85 (perhaps up to 102) of these variables can only be generated by harvesters and not by forwarders. This is due to the fact that most of these variables are based on information originating directly from the measuring devices of the harvester head. It is, for example, assumed that only a harvester, and not a forwarder, can keep track of stems (eg DBH) or stem types, number of logs, diameter and length of individual logs.

Approximately 25 variables in the prd-file originate directly from the apt-fil and 13 variables can only be generated by a forwarder. The forwarder variables have all been added to the standard quite recently.

Is it possible for a forwarder to keep track of all assortments (price matrixes)? Probably not in Sweden, if they are not color-marked, since logs belonging to different price matrixes often have the same dimensions and are delivered to the same customer in one batch. However this is probably not necessary since all assortments that are mixed into one pile will be destined for the same industry, meaning they are all considered as one unit when leaving the forest. Already today several forwarders have simple functions for registering what species and assortment is unloaded or loaded.

There are, in other words, two major problems with the present prd-file from a forwarder perspective:

1. Almost 50% of the variables in the prd-file are useless for forwarders
2. It is not possible to include production data concerning several landings/piles on one site within the present structure without a major update of the file type.

SUGGESTION

A new type of production file is therefore suggested. This file should only be used by forwarders. It was decided to call this file prl (**p**roduction **l**oad) at the StanForD meeting held on the 28th of October 2003.

This document contains minimum requirements on the information sent in the form of a production file from the forwarder. It also describes a suggested data structure as well as required variables. All new variables are described in appendix 1 (table 1 and 2).

Terminology

The term *pile* is normally used to describe a physical pile, at roadside, containing one or more assortments (that is price matrixes) destined for the same industry. A *landing* is normally defined as a limited area where the logs are stored in piles before transportation from forest to industry, meaning that several piles are normally stored at one landing. It is, at least in Sweden, quite common to use several different landings within the same harvesting site/object as well as storing the same assortments in different piles at different landings. It is in other words necessary to have the possibility to register the volumes per pile in order to be able to plan the logistical operations between forest and industry.

The term *Transport object* is, in this document, defined as one or more assortments /price matrixes handled as one unit when forwarding to roadside and transporting it to industry. A *Transport object* may be defined as an individual physical pile as well as all piles within one harvesting object.

If the volume of each forwarded assortment is to be kept separate we will have to register one *Transport object* for each assortment. It is fully possible to give all *Transport objects* the same coordinates. These coordinates may very well represent the landing as a whole rather than the exact physical position of a single pile. It is also possible to only register one single *Transport object* representing the total volume from a specific site if there is no interest in keeping volumes from different assortments apart. However, this means that it will be impossible to tell the forwarded volume of a specific assortment like for example spruce pulp wood.

Observe that assortment and price matrixes are used as synonyms in this document.

Data from other StanForD-files

The forwarder must be able to utilize information in the prd/pri-file (as well as oai or apt) in order to minimize registration errors as well as making the registration for the operator simple. It must, in the forwarder, be possible to read site identities, price matrix codes, types of volumes etc. directly from the prd/pri-file used by the harvester and use this information when recording data in the prl-file.

It may also be of interest to read a pri/prd-file from the harvester on the same harvesting object in order to compare and possibly correct the transported volumes with the harvested volumes. If a pri-file is used it may also be possible for the operator to estimate the date of harvesting with a reasonably high precision if the harvesting date and coordinates of each stem is registered in the pri-files.

Data in prl-file

Data that probably should be included in a prl-file:

- Identity variables as in pri- and prd-files (for Sweden, see Swedish StanForD appendix)

- Production (mass, volume, no of logs) specified per:
 - load
 - operator
 - transport object (pile/landing)
 - species
 - price matrix
- Date/time of unloading
- Date/time of harvesting (estimation)
- Date/time of completion (forwarding finished)
- Transport object identity and coordinates
- Calibration of scale
- Transport object exposure (not included in present proposal but may be of interest in the future):
 - exposed to sun, sunny
 - not exposed to sun, shaded

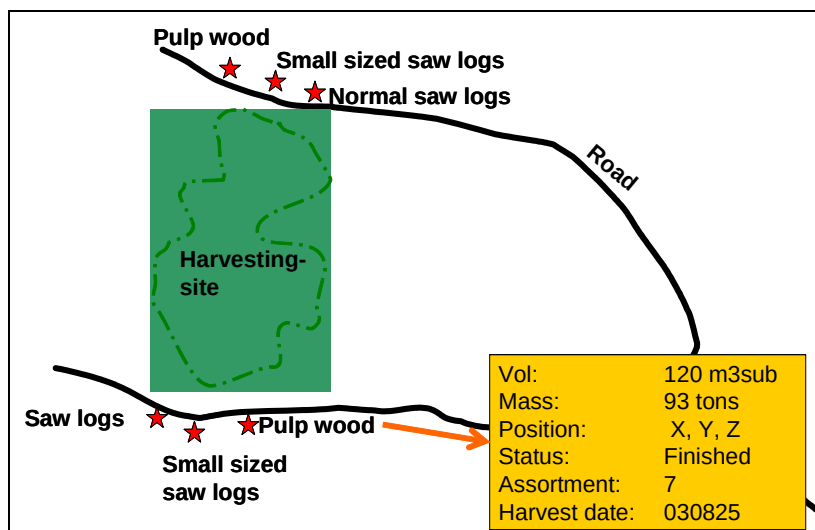


Figure 1. Example illustrating relevant data for a Transport object (for example pile) with pulp wood logs at one of two landings.

Observe that several piles at roadside containing the same assortments can exist within the same harvesting object. *Transport object* is defined as a unit of logs located at the roadside where all logs normally are to be transported together to one industry.

The issue of the exact volume within a specific transport object is somewhat complex due to the fact that the forwarder does not know when and how the logs are transported by truck from the forest to the industry. In order to solve this problem the administrative system must have quite precise knowledge about the activities of the trucks.

Structure of prl-file

The production data could be stored using the same principles as the pri-file (Arlinger et al, 2003). That means that we store information concerning each individual load that is unloaded (table 1).

Table 1. Example illustrating the structure for forwarding variables

VarNo	Name	Type	Data					
445	NUMLOAD-COD	1	6					
446	LOAD-CODE	1	2	10	402	450	760	762
			<u>Load No</u>	<u>Transport object</u>	<u>Vol</u>	<u>Mass</u>	<u>CrdX</u>	<u>CrdY</u>
447	LOAD-DATA	1	1	1	9	7200	218	554
			1	2	3	2400	219	554
			2	3	13	10400	220	556
			3	1	12	9600	230	540

Figure 2. Example illustrating what the data in table 1 would look like in a StanForD-file

```
445 1 6~ 446 1 2 20 402 450 760 762~2446 1 LoadNo Pile Vol Mass CrdX CrdY ~ 447 1 1 1
9 7200 218 554 1 2 3 2400 219 554 2 3 13 10400 220 556 3 1 12 9600 230 540~
```

All possible types of load data are presented in table 2 (a complete description can be found in appendix 1). It must be possible to set in the machine what data (in table 2) that is to be recorded in the prl file as for example position and operator may not be needed by all users.

Table 2. Information possible to register each time the forwarder is unloaded

Description
Load number
Transport object number (ID/name)
Volume, m3sob
Volume, m3sub
Green/raw mass (kg)
Estimated no of logs
Operator number
Position (latitude, longitude, altitude)

It will also be necessary to implement a new variable where identities, status and coordinates of each *Transport object* is given as well as the assortments (price matrixes) to be included in a certain transport object (table 3). This will mean that the operator does not need to register the current assortment each time unloading takes place. It will be enough for the operator to register the identity of the *Transport object*.

It must be possible to define the coordinates manually if no GPS exists or if the operator needs to define a different coordinate than the present GPS-coordinates at the time of registration. The operator may for example be ordered by his employer to always use the same reference coordinates for all *Transport object* within a specified harvesting object.

Table 3. Suggested new variables for storing transport object information

Var no	Name	Type	Data type	Unit	Description
440	NUMTRNS	1	Integer	No	Number of transport objects in prl-file
441	TRNSDSC	1	String	Text	Transport object name (free descriptive text): 1...440_t1
		2	String	text	Transport object code: 1...440_t1
		3	Integer	Dgrs	Latitude, integer as 0.00001 degrees, stored according to var521_t1, var521_t2 and var520_t1: 1...440_t1
		4	Integer	Dgrs	Longitude, integer as 0.00001 degrees, stored according to var521_t1, var521_t2 and var520_t1: 1...440_t1
		5	Integer	Masl	Altitude, meters above sea level, stored according to var521_t1, var521_t2 and var520_t1: 1...440_t1
		6	String	yyyy mmdd hhmmss	Start date (when transport object is defined)
		7	String	yyyy mmdd hhmmss	Date when transport object is completed, no additional unloading at this transport object is done after this date
		8	String	yyyy mmdd	Estimated harvesting date
442	TRNSSORT	1	Integer	No	No of assortments per transport object: 1...440_t1
		2	String	code	Tree species code(see Swedish appendix) per assortment and transport object: 1...442_t1 / 1...440_t1
		3	String	Text	Description per assortment and transport object (same as stored in var121_t1): 1...442_t1 / 1...440_t1
		4	String	Text	Assortment codes per assortment and transport object (same as stored in var121_t2): 1...442_t1 / 1...440_t1
		5	String	Text	Additional identity description of assortment per assortment and transport object (same as stored in var121_t3): 1...442_t1 / 1...440_t1
		6	String	Text	Buyer per assortment (same as stored in var32_t2, see Swedish appendix) : 1...442_t1 / 1...440_t1

Discussion

As mentioned previously it may be of interest to utilize the production file from the harvester (pri or prd) in order to adjust the volumes reported by the forwarder. However, we do have a problem if put too much trust into those figures (for example volumes per assortment as recorded by the harvester) since there tends to exist a certain flow of volumes between different assortments during forwarding. The harvester operator may for example register a certain log as a saw log while the forwarder operator, being able to see some “hidden” damages to the log, decides to unload the log in the pulp wood pile at roadside. Systematic flows, as described above, between different assortments are common in Sweden today.

User interaction

The work of the operator at a certain site may be divided up into three steps:

1. Forwarding started at a site. Identities and perhaps production data is imported from harvester production file (prd or pri). Observe that it must be possible to import new prd/pri-files during the operation at a site without resetting the prl-file.
2. *Transport objects* are defined by the operator. The following data is register for each *Transport objects*: name, identity, location (coordinates), included assortments, an estimated harvesting date as well as the current date. All relevant identity information are also to be registered for each assortment.
It must be possible to define new *Transport objects* during the operation at a site.
3. The operator selects the current transport object when unloading as well as the status of the *Transport objects*. The operator manually registers unloaded volume, mass or number of logs per *Transport objects* if the forwarder is not equipped with a scale (figure 3).

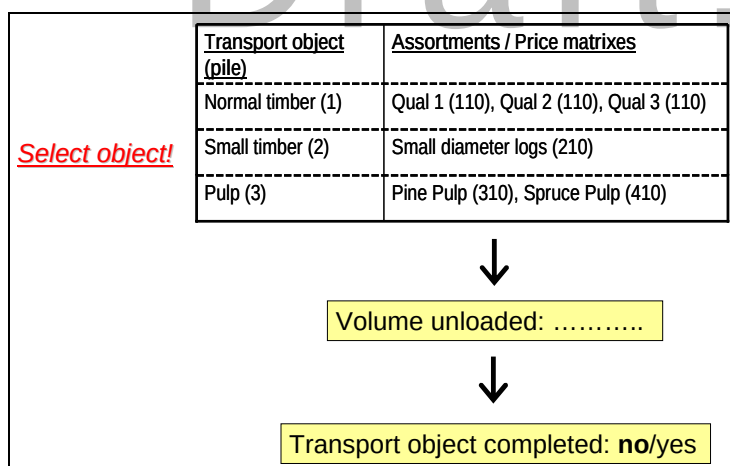


Figure 3. Flow chart describing the data registered by the operator each time the forwarder is unloaded, observe that the volume/mass is only registered manually if the forwarder is not equipped with a scale.

References

Arlinger, J, Möller, J & Sondell, J. 2003. A description of pri-files. Background, structure and examples. Arbetsrapport 559, Skogforsk, Uppsala, Sweden.