REVIEW PAPER

National Forest Inventory in Poland

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Abstract

In addition to stand-wise inventory, Poland carries out continuous national forest inventory (NFI) program based on sample plot measurements and statistical methods. The method is highly comparable with traditional inventory methods. Currently, the NFI has become the primary information source for national statistics on forests in Poland. This review describes methodology and current results of the NFI in Poland.

Key words: national forest inventory, growing stock volume estimation, forests in Poland

Forests in Poland

According to the data published by the Central Statistical Office, obtained by stand-wise inventory (SWFI), the total area of forest land in Poland is 9.14 million ha, which amount to the forest cover of 29.2% of the country area. Only 18.5% of the forests are in private hands. Out of all public forests, over 77% are managed by the State Forests holding (SF), a special public entity operating on the self-sustaining principle, performing public duties and supervised by the Minister of Environment. National parks cover 2% of the Polish forests.

Total growing stock volume is estimated to be over 2,404 million m^3. The harvested timber stem volume in estimated to be over 45 million m^3 (which makes up 35 million m^3 of merchantable volume), of which over 38 million m^3 is harvested in the SF.

Outline of forest management planning in Poland

There are two levels of forest management in Poland: national and local. The national level is based on the national forest inventory. The local level is organized differently for forests under administration of the SF, forests within national parks and other forests.

For all forests administered by the SF, a detailed management plan is elaborated every ten years. The plan is financed by the SF. Its structure and scope is strictly regulated by the guidelines devised by forest scientists and managers and approved by the General Director of the SF. The main parts of the management plan are following: 1. management plan document covering current forest state, maximal felling volume for a ten-year period, nature protection programme, general spatial and temporal plan of cuttings, 2. SWFI database holding stand description and planning data, and 3. a geographic information system.

Forests within national parks are managed according to a protection plan, an official document which sets guidelines for managing the whole park area. There are no defined rules for developing such a plan.

There are three main tiers of public administration in Poland. The whole country is divided into 16 provinces, which in turn are divided into counties and the counties are divided into municipalities. Management of private forests is supervised by local administration at the county level. The county office is required to develop a management plan for all supervised forests every ten years. The plan is much simplified in comparison to that prepared for the SF forests. Lack of funding is a long-standing problem for county administrations, so forest management planning for private forests usually lags behind the required ten-year period and there is a certain proportion of plans that have already expired.

Beginnings of the NFI

The most important source of law regarding forests in Poland is the Forests Act, which was passed by the Polish Parliament in 1991 and has been amended several times since that. The Forests Act states that the SF are obliged to carry out the national inventory of all the country forests. The Forests Act entrusted with this task the Bureau of Forest Management and Geodesy (BMFG), a state-owned commercial company.

The NFI is Poland dates back to 1999, when the General Directorate of the SF assigned a grant to the Institute of Forest Research (IFR) to analyze methods of performing a large-area inventory of the forest. A set of guidelines was developed by the IFR with the participation of leading academic institutions in forestry and the BFMG. In 2002, employees of the BMFG conducted the first pilot work in the province of Poznań. After the pilot programme, an NFI manual was prepared and approved by the Minister of Environment.

In the years of 2005-2009, measurements of the first NFI cycle took place. After the first cycle, the manual was modified to take into account practical experience, the need of independent quality control and modified expectations concerning results of the inventory. The modifications did not change principles on which the Polish NFI is based upon, but it rather clarified several practical issues of field measurement procedures and introduced rules for external quality control.

In 2007, sample plots for the country-wide monitoring of forest health condition were integrated with the NFI's sample plot grid. Since then, the monitoring has been performed on a subset of the NFI plots.

General rules of the NFI

The main objective of the NFI is to assess the overall forest condition and its evolution on a large scale. The inventory is designed to provide reliable information on the forest, in particular on species structure, age, health status and presence of damage.

The inventory is carried out in forests of all forms of ownership. In accordance with the inventory manual, plantings shown in the land register may also be included, but they have been left out during the first two inventory cycles. They may be included in the inventory in the future.

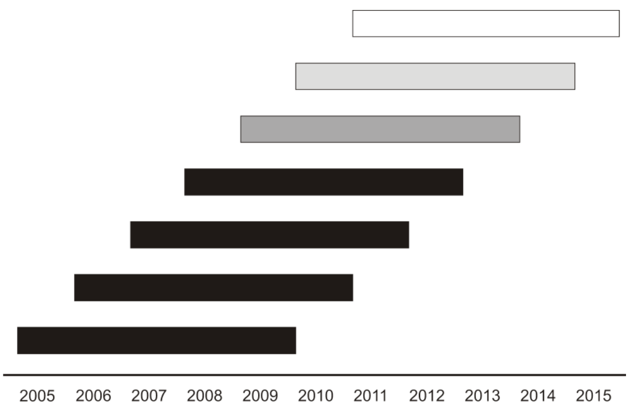

Figure 1. Schema of continuous forest inventorying used in the NFI

Results of the NFI are presented by forms of ownership, physiographical divisions, units of the state administration (provinces) and units of the SF administration (regional directorates).

The NFI is designed for continuous inventory. The inventory cycle length is 5 years, which means that yearly measurements and observations are carried out on 20% of all sample plots spread throughout the country. There are no gaps between cycles. Such a system provides that since the completion of the first cycle, any data set from five consecutive years has full statistical value. What is more important, this design continuously provides up-to-date information each year (Figure 1).

Methodology

The inventory is carried out on sample plots located in a regular grid. The ICP-Forest monitoring Level I grid (EEC 1987) was used as a 16×16 km wireframe, which was then divided into a 4×4 km grid. Nodes of the 4×4 km grid are the NFI primary points.

Sample plots were set up in L-shaped tracts with equal arms, with five points spread by 200 m one from another. The middle point is located at a node of the 4×4 km grid. Each tract located on the forest land is assessed every five years. Every fifth tract is assessed each year, so that a set of data for any given year covers the whole country area, albeit with density five times lower than the full 5-year cycle data set (see Figure 2). In the years of 2008-2012, a total of 28,284 sample plots were assessed, so given the country total

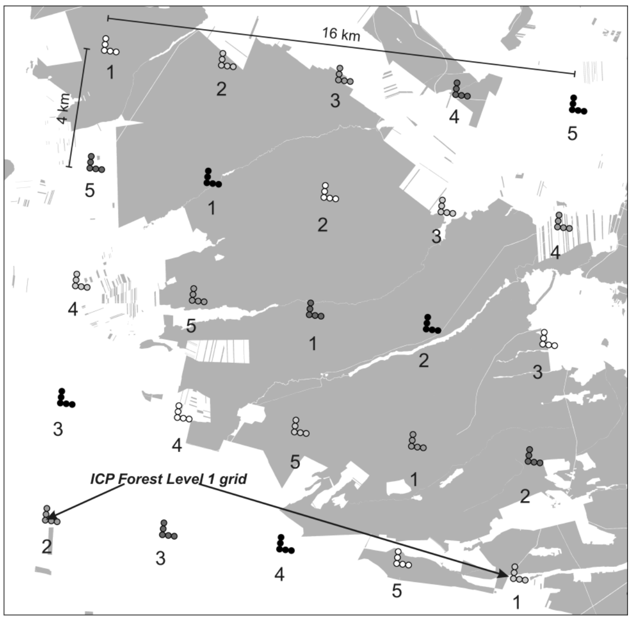

Figure 2. The NFI grid of sample plots

forest area being 9.1 million ha, one may calculate that each sample plot represents on average 323 ha of forest land.

To minimize the bias that might occur if an inventory team chooses arbitrarily position of a plot based on the field situation, plots were fixed on a forest map by their theoretical coordinates and then azimuths and distances from topographic features such as roads, forest edges, marked corners of forest units etc. were calculated. The field team's task was to identify these topographical features and perform geodetic measurement to the point, where a sample plot was to be established.

The plot was set up only if its center point happened to be located on land, which was categorized as forest in the public land register (Figure 3).

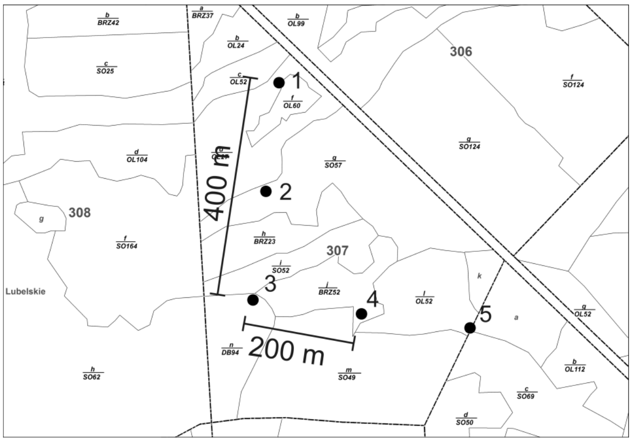

Figure 3. A sample plot tract

Assessments are performed on two types of circular concentric sample plots (A and B) (Figure 4).

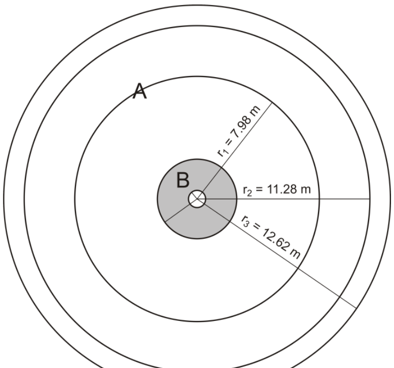

Figure 4. Sample plot layout

The size of Plot A depends on taxation features of the stand at the plot central point (Table 1).

If the plot is located on a slope, its radius is corrected (elongated) relative to the inclination angle of the slope, to maintain correct area of the plot when projected orthographically on a horizontal plane.

Table 1. Sample plot sizes

Stand features	Plot A area [m^2]	Plot A radius [m]
Age between 1 and 60 years or unforested land	200	7.98 (r_1)
Age over 60 years	400	11.28 (r_2)
Regeneration phase	500	12.62 (r_3)

If an administrative division boundary, a boundary between different forms of land ownership, a land use boundary or a stand subcompartment boundary, falls within the plot, the plot is divided into subplots. The radius of each subplot is also dependent on the age and vertical structure of this particular portion of the stand (Figure 5).

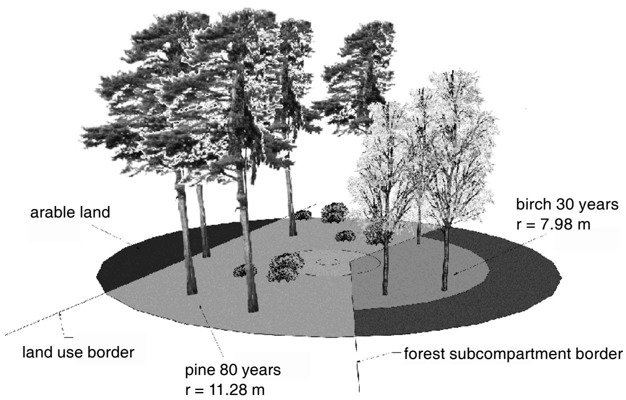

Figure 5. A single sample plot layout with subplot divisions

General information about the sample plot is recorded first, including: geographic coordinates, assessment date and time, inventory team ID, forest subcompartment address, ownership type, land use category, topographic plot location, forest stand origin, stand dominant species and age, quality class, forest cover and density index, stand vertical structure, forest site type, felling and silviculture activities, general health condition, damage types and intensity. Additionally, the following information is also recorded: forest function, nature protection form, protection category, forest management type.

In the plot A, all alive trees, shrubs and standing dead trees (from 7 cm in breast-height diameter) are recorded, as well as lying dead trees (from 10 cm in diameter), and also the presence of stumps (from 10 cm in diameter). A full set of data is recorded every five years in the plot.

The following data are recorded for all standing trees in the plot A: stand layer, average age in an age-species group, distance and azimuth from the plot center, breast-height diameter (dbh), damage type, location and severity, crown height and filling.

A set of five trees that are closest to the plot center is identified from each age-species group in the plot. The trees in the set are then ordered by their dbh and the third one is chosen for height measurement. In monocultured stands (a single age-species group representing over 70% of the stand), a group of six trees closest to the plot center is identified, ordered by theirs dbh and then the third and the fourth one is chosen for height measurement.

For stumps and lying dead wood in the plot A, the following data are recorded: location, species, diameter (both for stumps and logs) and the degree of decomposition.

The plot B is a doughnut-like 20-m^2 area outlined by two circles: the outer one with the radius of 2.59 m and the inner one with the radius of 0.56 m. In the plot B, all trees and shrubs below 7 cm in dbh are measured and assessed. The features that are recorded are as follows: location in the plot, species, cover area, average height, type and severity of damage.

No soil analysis is performed during NFI measurements. It is worth to note, though, that in Poland, forest condition, soil condition and forest health monitoring is carried out – as a separate activity – on sample plots of the same 4×4 km grid as the NFI (plot no. 3 in the tract), so such additional data is available for the NFI sample plots.

Field work organization

All work regarding data collection and analysis is performed by the BFMG. Data collection is done by 60-70 teams from 12 branch offices of the BFMG between June and end of August. Each team consists of 2 experienced workers (taxators). They are equipped with compass, measuring tape, ultrasound rangefinder, electronic caliper (radio- or Bluetooth-enabled), electronic altimeter (Bluetooth-enabled), handheld terminal or tablet device, GPS device, binoculars.

Currently, data is collected only in the form of database using hand-held devices and the application developed in-house by the BFMG. Data from individual sample plots are brought together in the branch offices and then transferred via the Internet to the main office, where it is aggregated and processed. The originals of all documentation, such as topographic schemes, field drawings, plot layout sketches, plot description, photographs etc., remains stored in the branch offices (Figure 6).

Translation of the Polish terms used in the sketch:

dokument źródłowy – data sheet

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rozmieszczenie drzew na powierzchni próbnej – tree locations in the sample plot

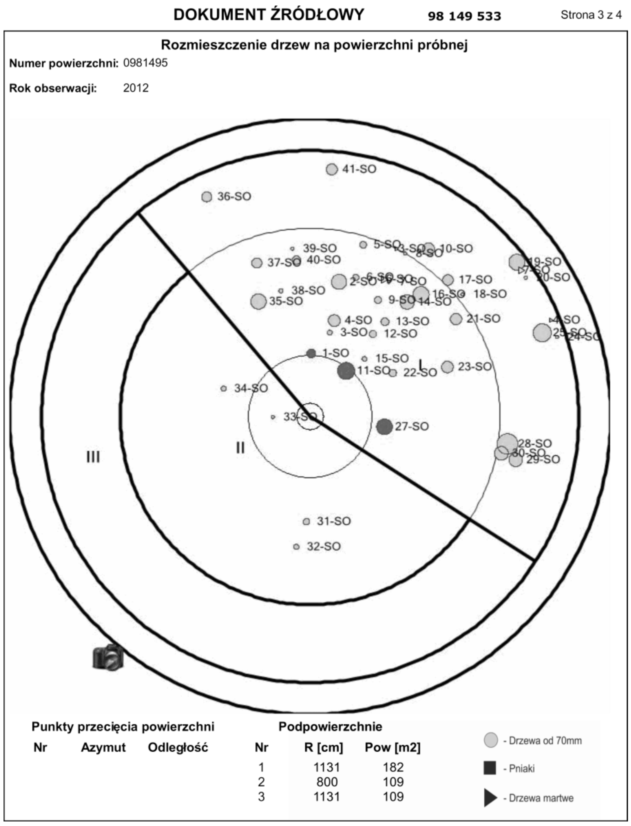

Figure 6. Example sample plot layout sketch

numer powierzchni – plot number

rok obserwacji – assessment year

punkty przecięcia powierzchni – locations, where subplot boundaries cross plot outer circle

nr – number

azymut – azimuth

odległość – distance

podpowierzchnie – subplots

R [cm] – subplot radius in cm

Pow [m2] – subplot area in m^2

drzewa od 70 mm – trees with dbh over 70 mm

pniaki – stumps

drzewa martwe – dead wood

Several levels of control have been implemented for the data acquisition process as follows: 1. automated controls in data collection applications, 2. internal inspection by the branch office, 3. internal inspection by the main office, 4. automated controls of data completeness and reliability, 5. external inspection and work acceptance (State Forests, Institute of Forest Research, Ministry of Environment). At least 5% of the plots must be verified (remeasured) by external inspection. Additionally, internal BFMG regulations state that at least 5% of the plots done by each team must be verified (remeasured) by the enterprise internal control.

Result analysis

The basic unit, for which statistical analysis is performed, is an intersection of administrative division at the province level, the SF division at the regional directorate level, physiographic division at the natural forest region level (Zielony and Kliczkowska 2012) and ownership category. Such an intersection is called a calculation unit (CU).

High level results are normalized to the official forest area established by the Central Statistical Office.

The methodology of calculations is described below.

Single tree volume calculation

The methodology of tree volume calculation is based on the work of Bruchwald et al. (2000). Currently in Poland, volume calculation in stand-wise forest inventory is performed by a statistical method based on the results of measurements of individual trees on a set of sample plots. The same methodology is used for both NFI and SWFI for single-tree volume calculation and for sample plot volume calculation.

Volume of a single tree with breast-height diameter ≥ 7 cm is calculated according to the formula:

$$v_q = \frac{\pi}{40000} \times d^2 \times h \times f_q \quad (1)$$

where: v_q is tree volume (m³), d is breast-height diameter of the tree (cm), h is tree height calculated from the height curve formula (m), f_q is dbh shape figure (form factor, depending on dbh and h).

To calculate tree height, the Näslund function is used for each species-age tree group in a plot (Näslund 1929):

$$h = \left(\frac{d}{a + b \times d}\right)^2 + 1{,}3, \quad (2)$$

where: h is tree height (m), d is tree breast-height diameter (cm), a, b are coefficients.

The coefficients a and b are calculated as follows:

$$a = \frac{D}{\sqrt{H - 1{,}3}} - b \times D, \quad (3)$$

$$b = o \times H^r, \quad (4)$$

where: D is average breast-height diameter of the stand ($D = \sqrt{\frac{\sum d^2}{n}}$, where: n is a number of trees, d is breast-height diameter of an individual tree); H is average height of the species-age tree group ($H = \frac{\sum h}{n}$, where h – tree height) o, r are coefficients.

The coefficients o and r (Bruchwald et al. 2000) have the values listed in Table 2.

For birch, the coefficient b is calculated by the formula:

$$b = 0{,}364043 - 0{,}375941\sqrt{H} \quad (5)$$

For other tree species, coefficients from the above table are used according to a mapping table which, for each tree species, determines coefficients for which species from the above table should be used. The mapping table was not included in this paper due to its size and is available on request from the author.

The dbh shape figure (form factor, f_q) of thick wood for each tree species is calculated according to the formula:

$$f_q = f_1 \times s, \quad (6)$$

where: f_1 *is* dbh shape figure of thick wood in bark (see below), s is ratio of tree volume to in-bark volume (see below).

The above variables are calculated using the following empirical formulas (some of them were published before in Bruchwald et al. (2000), other were elaborated by Bruchwald, unpublished results):

pine:

$$f_1 = \frac{1}{1 + \left(\frac{d}{1{,}2895 + 0{,}90645 \times d}\right)^4}, \quad (7a)$$

$$s = \left(\frac{d - 6}{0{,}2834 + 0{,}988 \times (d - 6)}\right)^4, \quad (7b)$$

spruce:

$$f_1 = 0{,}34 + \frac{0{,}684}{\sqrt{d}}, \quad (8a)$$

$$s = 1 - 225{,}73(d - 1)^{-3{,}2542}, \quad (8b)$$

fir:

$$f_1 = 0{,}4132 + \frac{0{,}4779}{\sqrt{H}} + 0{,}4426 \times H^{-1{,}6259}(D - d), \quad (9a)$$

$$s = 1 - 559{,}4519 \times d^{-3{,}5946}, \quad (9b)$$

oak and ash:

$$f_1 = 0{,}5441 \times d^{-0{,}0415}, \quad (10a)$$

$$s = \left[\frac{d - 3}{0{,}9549 + 0{,}9439 \times (d - 3)}\right]^4, \quad (10b)$$

beech (lowlands):

$$f_1 = 0{,}46 \times D^{-0{,}008} + (0{,}0059 - 0{,}0001D) \times (D - d), \quad (11a)$$

$$s = 1{,}1168 - \frac{48{,}115}{d^2}, \quad (11b)$$

beech (highlands):

$$f_1 = 0{,}5526 \times D^{-0{,}0566} - \left(0{,}0001 - \frac{1{,}6317}{D^2}\right) \times (D - d), \quad (12a)$$

$$s = 1{,}2224 - \frac{3{,}9316}{d}, \quad (12b)$$

birch and black locust:

$$F_1 = 0{,}669802 - 0{,}07496122 \times \ln(d), \quad (13a)$$

$$f_1 = F_1 - [(1{,}17477 + 0{,}0008625 \times D^2)^2 - 1{,}3] \times \left(\frac{1}{D} - \frac{1}{d}\right), \quad (13b)$$

$$s = 1{,}03242 - \frac{50{,}051}{d^{2{,}3}}, \quad (13c)$$

alder:

$$f_1 = 0{,}5755 \times D^{-0{,}609} - \left(0{,}0001 - \frac{0{,}4561}{D^2}\right) \times (D - d), \quad (14a)$$

$$s = 1{,}0207 - \frac{16{,}613}{d^2}, \quad (14b)$$

aspen:

$v_q = a + b \times h,$ (15a)

$b = 0{,}0000529644 \times d^{1{,}88236}$, (15b)

if: $d \leq 40$ then: $a = 0$

if: $d > 40$ then: $a = -0{,}729897 + 0{,}115514 \times \sqrt{d}$ (15c)

hornbeam:

$v_q = a + b \times h,$ (16a)

if: $d < 45$ then: $a=0$ $b=(-0{,}016008+0{,}006824 \times d)^2$, (16b)

if: $45 > d \leq 51$ then: $a = -1{,}47263+0{,}030648 \times d$, $b = -0{,}033182+0{,}002765 \times d,$ (16c)

if: $d > 51$ then: $a = -4{,}10794+0{,}082111 \times d,$ $b=0{,}068102+0{,}000784 \times d,$ (16d)

Douglas fir:

$$f_q = \left[0{,}358 + 0{,}06 \times \left(\frac{h}{d} - 0{,}9\right)\right] \times \left(\frac{H}{h - 1{,}3}\right)^{3{,}8} - \frac{160}{D \times (H - 1{,}3)^2} \quad (17)$$

lime tree:

$v_q = a + b \times h,$ (18a)

if: $d \leq 35$ then: $a=0$ $b=0{,}0000545466 \times d^{1{,}85815}$, (18b)

if: $d > 35$ then: $a=(-0{,}532622+0{,}0163865 \times d)^2$ (18c)

For other tree species, the above formulae are used as determined by a special table mapping other tree species to the above species. The mapping table was not included in this paper due to its size and is available on request from the author.

Volume of tree parts

If only a part of the tree is present, its volume is calculated using its diameter in the middle of the trunk length:

$$V=g_{l/2} \times l, \quad (19)$$

where: V is tree volume in bark (m^3), $g_{l/2}$ is cross-section area in the middle of the trunk length, calculated from the diameter according to the formula:

$$g = \pi \times \frac{d^2}{40000}, \quad (20)$$

where: d is diameter in the middle of the trunk length – (cm, 1 decimal digit), l is trunk length (only the part with the diameter e≥7 cm) – (m, 2 decimal digits).

Stand quality

Stand quality is established for each age-species group (a group of trees of the same age and species) in a sample plot by comparing the average tree height within the group with respective values in the Polish reference tables of stand volume and increment (Szymkiewicz et al. 1986).

The average tree height for an age-species in a sample plot group (H_a) is calculated as follows:

$$H_a = \frac{\sum(d^2 \times h)}{\sum d^2}, \quad (21)$$

where: h is individual tree height, d is dbh.

If the age of a particular species in the stand is higher than the maximal age in the tables, stand quality for the maximal table age is used. If the age of a particular species in the stand is lower than the minimal age in the tables, stand quality is assessed by the taxator in the field.

Density index

Density index for a sample subplot is calculated as the sum of partial density indexes for age-species groups in the subplot:

$$w_g = \frac{V_g}{V_t}, \quad (22)$$

where: V_g is volume per 1 ha of an age-species group, V_t is volume per 1 ha according to the volume tables.

Increment calculation

Current increment in a sample plot/subplot for each tree species is calculated as follows:

$$Z_v=V-v+U,$$

where: is current gross increment; V is tree volume at the end of the inventory cycle; additionally, volume of young trees that have reached the dbh above

7 cm in the analyzed period of time is assessed; v is tree volume at the beginning of the inventory cycle; U is volume of trees that have been removed since the previous inventory from the sample plot in the analyzed period of time (i.e. do not grow in the sample plot anymore); volume at the beginning of an inventory cycle is used.

To ensure comparability of the data, only trees from subplots of the same size at the beginning and the end of the cycle are used for increment calculations.

Felling volume calculation

Volume of felling (timber removal) in the sample plot is calculated in two ways:

1. Using volume of the trees removed from the plot during the analyzed period of time, *and*

2. Using empirical tables of tree volume based on stump diameter and species (Bruchwald et al. 2001).

Calculating forest structure and volume for calculation units

The structure of the total forest area in individual CUs, for example according to the dominant tree species and age classes and subclasses, is determined by the structure of all sample plot that belong the a given CU. Each subplot is given a relative weight index based on the ratio of its area to the area of the whole parent plot.

The area of each age-species group within a CU is calculated by the following formula:

$$P_{gw} = \frac{n_{gw}}{n} \times P \,,$$

where: n_{gw} is relative number of sample plots (calculated using the above-mentioned ratio) in an age class (w) of a particular dominant species (g); n is total relative number of sample plots in the CU; P is area of the CU (based on the data from the Central Statistical Office).

Volume and other parameters (e.g. number of trees, number of stumps etc.) is normalized per 1 ha according to the following formula:

$$V_{1ha} = \frac{V_i}{p_i} \,,$$

where: V_{1ha} is volume normalized per 1 ha, V_i is volume of all trees in the sample plot (subplot), p_i is sample plot (subplot) size.

Accuracy of results

Error estimation

Theoretical error in volume calculation for individual CUs is determined by standard methods used in mathematical statistics, modified by the introduction of weight resulting from the relative size of the sample. The relative size of a sample subplot is calculated as the ratio of the area size to the area size of a full-size plot in a given stand type. Total number of observations in the analyzed unit is therefore usually non-integer number.

For each CU, the approximation error of volume calculation in age classes is assessed as follows:

$$p_k = \frac{W_w}{\sqrt{n_w}} \,,$$

where: W_w is the variation coefficient of the sample plot volume in a CU by age class; n_w is relative number of sample plots by age class (see above).

Coefficients of variation for each age class (W_w) in a CU are calculated as follows:

$$W_w = \frac{\sqrt{\dfrac{\sum (V_{wi}^2 \times z_{wi})}{n_w} - \left(\dfrac{\sum (V_{wi} \times z_{wi})}{n_w}\right)^2}}{\dfrac{\sum (V_{wi} \times z_{wi})}{n_w}} \times 100\% \,,$$

where: V_{wi}^2 is square of volume per 1 ha in each sample subplot (i) established in a particular age class (w); z_{wi} is relative sizes of sample subplots (i) in a particular age class (w); n_w is relative number of sample subplots in a particular age class.

Total approximation error for a CU is calculated as

$$p_o = \frac{\sqrt{\sum (p_k \times V_k)^2}}{\sum V_k} \,,$$

where: p_o is approximation error of volume calculation for the whole CU; p_k is approximation errors of volume calculation for age class; V_k is volume of age class in the CU (only age classes with minimum 3 observations are included - i.e. at least 3 sample subplots are present).

Total approximation error for units of higher levels is calculated in a similar manner.

General coefficients of variation for age classes and the total coefficient of variation are calculated by the following formula:

$$W = p_{inw} \times \sqrt{n_w} \,,$$

where: p_{inw} is approximation error in age class or in a higher level unit; n_w is relative number of sample subplots in age classes or within a higher unit level.

Comparison of the NFI results to stand-wise inventory results

A detailed forest management plan is prepared every ten years for all forests managed by the SF. The plan is based on stand-wise inventory performed by statistical analysis of the data gathered from temporary sample plots. The methodology of calculation is similar to that of the NFI, which has been described above (CILP, 2012) since it is also based on statistical analysis of a set of sample plots using the same calculation principles. Additionally, estimation of current growing stock in the SF is made every year, based on the stand-wise inventory results updated to the current year. Therefore, comparing the growing stock volume coming from the NFI to that coming from the updated stand-wise inventory available for the SF forests can be good predicative of overall accuracy of the NFI (Table 2).

Table 2. Comparison of the growing stock volume according to the results of the NFI and stand-wise inventory (State Forests, 2013a and 2013b).

State Forests Regional Directorate	NFI 2012 [thous. m^3]	stand-wise inventory + update 01.01.2013 [thous. m^3]	Difference, %
Białystok	155 179.1	153 065.4	1.4
Gdańsk	79 968.9	74 097.7	7.9
Katowice	160 991.5	140 880.9	14.3
Kraków	56 334.4	49 597.0	13.6
Krosno	122 898.1	116 619.4	5.4
Lublin	108 157.0	99 834.5	8.3
Łódź	73 816.4	68 913.2	7.1
Olsztyn	153 801.3	151 922.4	1.2
Piła	83 346.0	77 211.9	7.9
Poznań	103 127.9	98 459.4	4.7
Radom	81 085.0	80 831.6	0.3
Szczecin	176 137.8	167 043.5	5.4
Szczecinek	149 470.9	139 804.7	6.9
Toruń	110 492.0	101 363.7	9.0
Warszawa	47 369.3	43 828.9	8.1
Wrocław	144 245.3	135 993.5	6.1
Zielona Góra	101 945.3	95 195.9	7.1
State Forests total	1 908 366.1	1 794 663.6	6.3

The NFI volume estimation for all forests managed by the SF is 6.3 percent higher than that from the stand-wise inventory of the same forests.

Conclusion

The process of performing the national forest inventory in Poland, described in this paper, has several features that determine usefulness and reliability of the NFI. The NFI has been designed to be carried out on a permanent basis so as the time validity of the source data remains constant. The method proved to be highly reliable when compared to independently-gathered data from stand-wise inventory. The difference in stock volume has turned out to be around 6 percent. Currently, results of the NFI, which are published every year, are the source for official statistical reporting on forests, both at the national and international levels.

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НАЦИОНАЛЬНАЯ ИНВЕНТАРИЗАЦИЯ ЛЕСОВ В ПОЛЬШЕ

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Резюме

В дополнение к выдельной инвентаризации, Польша осуществляет постоянную программу Национальной инвентаризации лесов (NFI) на основе измерений на пробных площадях и использования статистических методов. Применяемые методы сравнимы с традиционными подходами инвентаризации. В настоящее время NFI стала основным источником информации для национальных статистических данных по лесам. В данном обзоре представлены методология и текущие результаты NFI в Польше.

Ключевые слова: Национальная инвентаризация лесов, оценка запасов насаждений, леса Польши