English and German Terminologies in Forestry Research on Growth and Yield: A Few Examples

Andreas Zingg
Swiss Federal Research Institute WSL, CH-8903 Birmensdorf; Switzerland
andreas.zingg@wsl.ch

Abstract
The exchange of data is becoming more and more important in forestry. For example, the expertise and data gained from growth and yield experiments are now useful in global ecological research. In Switzerland, long-term research plots that were laid out decades ago to satisfy local needs for information on forest growth have suddenly obtained an importance that was unforeseen at the time of their installation. Within this long time span a characteristic growth and yield and sylvicultural →terminology developed differently in different regions of the world. In this paper it will be shown how different →terms are used locally to refer to the same →concept in different geographic areas.
Forestry will always maintain its local character to some extent. For example, different local →terminologies have developed in particular areas in German-speaking countries and are resistant to change. Their origins can probably be traced back to the faculties of forestry at the different universities. The →term *top height,* in German *Oberhöhe* or *Spitzenhöhe* – with its numerous variants – exemplifies how having a variety of →definitions and interpretations does not create additional knowledge and how standardisation is possible.
In a few regions in Europe "uneven-aged" and "structured" forests are traditional regimes that are very similar in structure to some natural forests in, e.g., North America. The →terminology used to describe the forest structures and the management systems varies greatly from one continent to another. It is important that we find ways of agreeing on these →terms and of compromising with local ideological differences.
In 1959, IUFRO standardised the symbols used in forest mensuration. A perusal of the growth and yield literature reveals that, unfortunately, these symbols are still only used to a limited extent. Consistent use of these symbols would help to avoid a proliferation of different interpretations. It is proposed that these symbols should be included in the publications of SilvaVoc.

Keywords: forest terminology, forest management systems, forest mensuration, standardisation, historical background, Switzerland, IUFRO

1 Introduction

One impediment, which should not be underestimated, for co-operative work and for the exchange of data and results arises from local habits in the use of technical →terms. Often, these are adhered to even after it has become apparent that it is the →terms themselves rather than their meanings that differ. This does not just apply to the area of forestry →terminology, although this is what most directly affects us. Taking remedial action in this area makes collaboration easier and may even promote it. A further problem has to do with technical →terms which, in themselves, are not easily understood just like that or which are confusing. The accurate use of →terms is not promoted if they can only be understood correctly with the help of →definitions. Only clear choice of words can promote understanding.

Revising →terminological reference works offers an opportunity to improve the situation. These reference works help produce clear and comprehensible texts, both when translating into other languages and when editing in the first language. Efforts to revise them are

therefore welcome. It is clear that such work involves specialists in the particular disciplines concerned. The following contribution contains examples from growth and yield and silviculture research.

2 Ambiguous terms

Technical →terms in all languages must be chosen in such a way that they are intelligible on their own and that can be distinguished from other technical →terms as clearly as possible.

2.1 Example 1: *Ertragsfähigkeit* and *Ertragsvermögen*

The →terms *Ertragsfähigkeit* [De] and *Ertragsvermögen* [De] are linguistically difficult to distinguish both in German and in their English translations. According to Duden (Drosdowski 1998) *Ertrag* [De] (*yield* [En]; Terell *et al.* 1991) means "bestimmte Menge (in der Landschaft) erzeugter Produkte..." *Fähig* [De] (*capable* [En], *competent* [En], *able* [En]) is defined as "zu etwas in der Lage sein", and *-vermögen* [De] (*ability* [En], *capacity* [En]) as "Fähigkeit, Kraft". In *Wörterbuch der Forstwirtschaft* (Dictionary of Forestry, Weck 1966) the two →terms are described as →synonyms. In fact their meanings differ completely, as shown in Table 1.

The objective difference between these two →terms is that *Ertragsvermögen* [De] refers to the site, and *Ertragsfähigkeit* [De] to the actual stand. The lack of linguistic clarity in German can be avoided by choosing other →terms based on the French or English ones, e.g. *Standortsproduktivität* instead of *Ertragsvermögen* and *Bestandesproduktivität* instead of *Ertragsfähigkeit.*

Table 1. Definition of Ertragsfähigkeit and Ertragsvermögen according to various sources.

Source	Ertragsfähigkeit	Ertragsvermögen
Schütz (1965)	[En] site capacity (yield potential) [Fr] Capacité de production	[En] stand productivity (yield capacity) [Fr] Potentiel de production
Definitions given by Schütz	All the site factors that influence the growth of forest trees	Growth potential of trees in a stand
Bachmann (1990)	«Die *Ertragsfähigkeit* entspricht dem Maximalwert des durchschnittlichen Gesamtalters-Wertzuwachses eines ‹Idealbestandes›...»	«als *Ertragsvermögen* wird der von einem bestimmten Zeitpunkt an bis zur Verjüngung des Bestandes noch zu erwartende durchschnittliche jährliche Wertzuwachs pro Hektare bezeichnet.»
	The site capacity (yield potential) corresponds with the maximum value of the average all-age value increase for an ideal stand	Stand productivity is considered to be the stand's expected average annual increase in value per hectare from a specified time to the time of regeneration
Schmid-Haas (1990)	Synonyms given [De] Produktionskapazität [En] production capacity (site), yield capacity, productive capacity	potential cut, potential yield

2.2 Example 2: *selection* and *selective*

The →terms *selection* [En] and *selective* [En] are used in connection with thinning in forest stands. In principle, every thinning involves selection. The different types of thinning are distinguished by how trees are selected for felling (in rows, groups or individually). In "thinning from below", the trees to be felled are selected individually according to their social position in the stand, i.e. all suppressed or all suppressed and dominant trees. In "thinning from above", competitors of the trees selected for promotion are harvested. *Auslesedurchforstung* [De] according to SCHÄDELIN (1934) is a form of thinning from above in which other qualitative criteria besides competition are assessed. In a selection forest (*Plenterwald* [De]), the main criteria that guide the harvest selection are (1) continually encouraging regeneration and (2) maintaining or improving the stand structure. In "target diameter thinning", the harvest is determined according to the diameter of the stem. In all these forms of thinning, a **selection** is performed, i.e. the stand is **selectively** thinned.

In Collins' Dictionary of the English Language (HANKS 1979), *selection* [En] is defined as "**1.** the act or an instance of selecting or the state of being selected..." and *selective* [En] as "**1.** of or characterized by selection. **2.** tending to choose carefully or characterized by careful choice...". There is no essential difference in the meanings of these →terms. Nevertheless, there are examples in the literature of these →terms being confused or used wrong.

In FORD-ROBERTSON (1971) the following entries are to be found under *selection* and *selective*:

SELECTION CUTTING [USA], **SELECTION FELLING** [Cw] Fam. 10 5219
≠SELECTIVE CUTTING
The annual or periodic removal of trees (particularly the mature), individually or in small groups
(group-selection cutting [USA], **group-selection felling** [Cw part] = patch cutting [Canada]) from an 5220
*uneven-aged forest in order to realize the yield (→ YIELD DETERMINATION) and establish a new crop of *irregular[1] *constitution[1]. NOTE: [Cw] The improvement of the forest is a primary consideration (≈IFR) → SELECTION SYSTEM

SELECTION FOREST 5222
Forest treated and managed under the *selection system (≈BCF)

SELECTION (SYSTEM) (silviculture) Fam. 10 5225
An *uneven-aged *silvicultural system[1] in which trees are removed individually, here and there, from a large area each year (→ SELECTION CUTTING) —ideally over a whole forest or *working circle, but from practical considerations almost always over the annual coupes of *cutting series[1]; regeneration mainly natural and crop ideally *all-aged. Cf. GROUP-SELECTION SYSTEM

† **SELECTION THINNING** (silviculture) [Cw]
(1) = Borggreve thinning 5226
Removal of *dominants that have exceeded the

SELECTION THINNING *continued*
diameter limit prescribed, in favour of thinner trees of at least as good *growth form[1] and condition (after Borggreve)
(2) = Gurnaud/Biolley thinning 5227
Removal from a regular *high forest[1] of such trees as will promote its conversion to *selection forest (after Gurnaud and Biolley) → SELECTIVE CUTTING

SELECTIVE CUTTING [USA], **SELECTIVE FELLING** [Cw] Fam. 19 5228
= selective logging [USA] ≈creaming, culling, high grading [all USA] ≠SELECTION CUTTING
A type of *exploitation cutting[1] that removes only certain species (a) above a certain size, (b) of high value [W. Africa], known *silvicultural requirements and/or *sustained yields being wholly or largely ignored or found impossible to fulfil (≈BCF). NOTE: [USA] A forest so cut is termed a **culled forest** → SELECTION THINNING 5229

The process defined in the last entry is of a completely different sylvicultural quality from the others. With the other types of thinning listed, FORD-ROBERTSON (1971) does not use the →term *selective*. *Auslesedurchforstung* [De] according to SCHÄDELIN (1934), which is the most widespread type of thinning in Switzerland, is translated by DIEZ (1987) as *selective thinning* [En]. One possible →definition might read something like that of ZINGG *et al.* (1999):

> **SELECTIVE THINNING:** Type of thinning (according to Schädelin/Leibundgut) in uniform, even- or uneven-aged stands in order to promote the valuable tree, the so called elite tree. As a rule selective thinning is practised in the Swiss group selection.

The use of the →term *group selection* [En] corresponds with FORD-ROBERTSON's (1971) →definition. The disadvantage of this →definition is, however, that it uses *selection* [En] again and this →term has already been put to use e.g. in *selection forest* [En], *selection thinning* [En] and *selection cutting* [En] to describe a different sylvicultural activity. SCHÜTZ (1999), therefore, suggests following German usage in English and replacing *selection* with *plentering*, to refer to the sylvicultural activity in uneven-aged forests that conforms with the →definition of *selection forest* [En]. The corresponding →terms in English would then be: *plenter system* [En], *plenter thinning* [En], *plenter forest* [En], etc.

2.3 Example 3: *Mixed Stand*

In Europe, views on how to define *mixed stand* [En] are rather disparate. There is little consensus about whether mixed stands have to consist of more than one species of tree or whether structured or uneven-aged "pure" stands fulfil the criteria for a mixed stand. An example illustrates the disparity: The delimiting criteria used by the Federal Forest Inventory in Germany (SMALTSCHINSKI 1990) differ considerably from those used by the Swiss National Forest Inventory (EAFV 1988). The Swiss base their delimiting criteria for the mix ratio on a relatively crude classification system according to the proportion of the basal area covered by

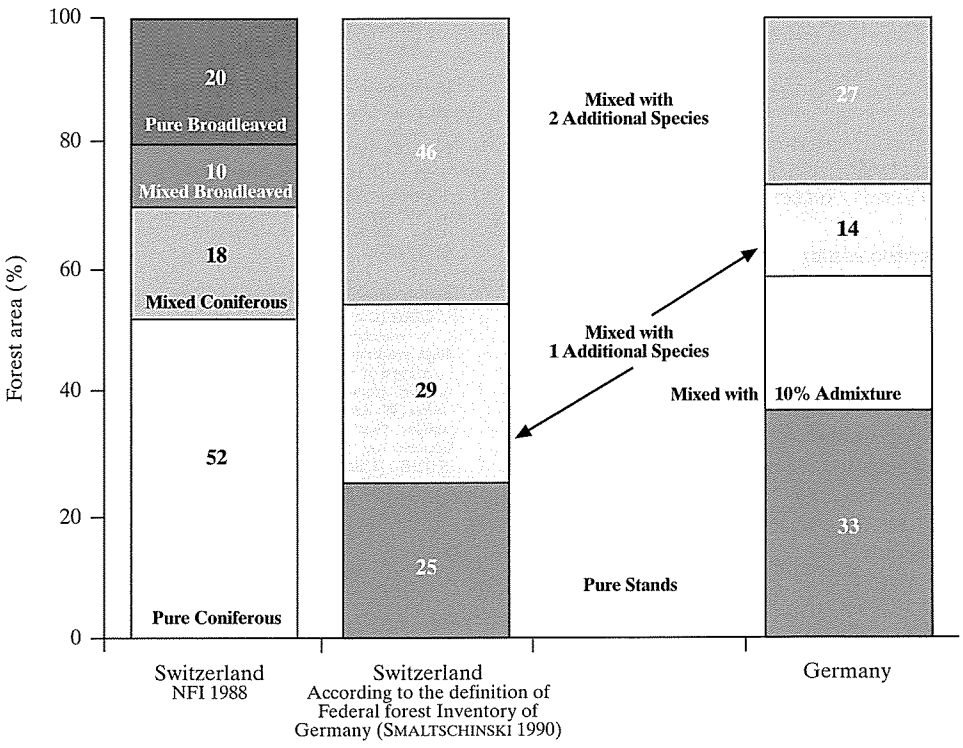

Fig. 1. Distribution of mixed-stand types in Germany and Switzerland according to the definitions of mixed stand used in the German and Swiss national forest inventories.

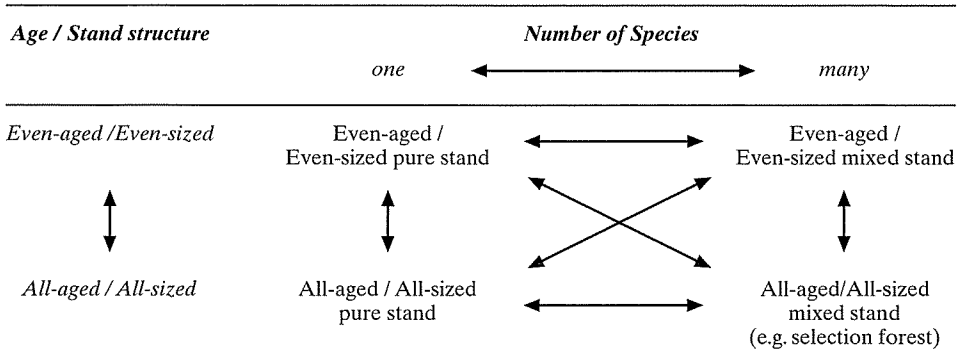

Fig. 2. Mixed Stands: Elements of definition (according to PREUHSLER 1992).

coniferous or broad-leaved trees. In Germany, on the other hand, stands with comparably small proportions of other tree species are already treated as mixed stands. In Switzerland, a stand is considered pure if more than 90% of the basal area consists only of coniferous trees or only of broad-leaved trees, regardless of whether in a coniferous stand, for example, there are several species of conifer or just one. This comparison shows that, if the →definition of *pure stand* [En] used in the German Federal Forest Inventory is applied in Switzerland, considerably fewer such stands will be identified (Fig. 1).

In order to provide a basic →definition of *mixed stand* [En], PREUHSLER (1992) produced a comprehensive diagram (Fig. 2) in which the various ways of defining the →term are summarised. The two-dimensional model has as axes "tree species" and "structure" or "age". A three-dimensional model can separate vertical structure from age or include an additional horizontal distribution pattern. Distinguishing age from structure is preferable as the two criteria are important and do not necessarily correlate tightly. To avoid this contradiction, it has been variously suggested that *even-sized* [En] or *all-sized* [En] should be used instead of *even-aged* [En] and *uneven-aged* [En].

3 Local Usage

Oberhöhe [De] (*top height* [En]) is an example that illustrates how different →terms may be used, in principle, for the same purpose or to express the same thing. How the →terms are defined and employed depends on the university or on the professor who teaches there. In German, the average tree heights in a tree collective describing a site or a forest stand are called, as a rule, *Oberhöhen* [De] or *Spitzenhöhen* [De]. In English, on the other hand, *top height* [En] is generally used, and in French *hauteur dominante* [Fr]. The meaning of *Oberhöhe* [De] is not immediately apparent. *Spitzenhöhe* [De] (roughly equivalent to *top height* [En]) could be taken to refer to the height of the tallest trees in a stand. *Dominante* [De] or *dominierende Höhe* [De] would be preferable. *Top height* [En], referring to the same thing, is also not clear. *Dominant height* [En] would be clearer. These →terms are not consistently used and all variants are to be found in the literature.

The collective under consideration is defined as a specific proportion of the thickest, or in some cases, the tallest trees. In principle, two main groups of *Oberhöhen* [De] (*top heights* [En]) can be distinguished:

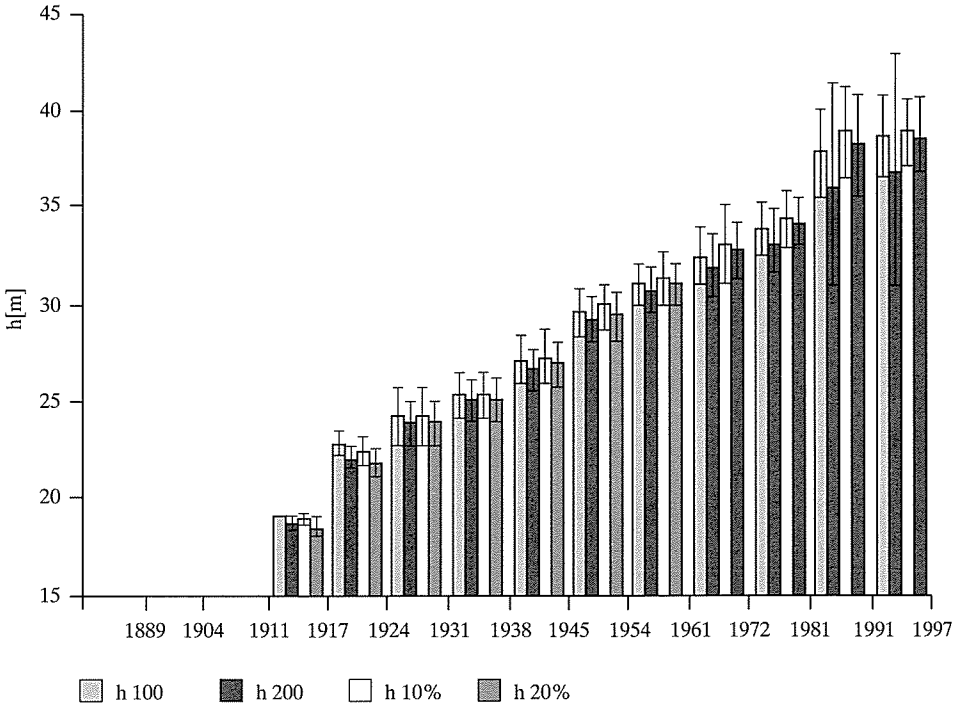

Fig. 3. Dominant heights, beech, Mühletaler Halde (Switzerland). H-degree: Measured height values.

- one depends on the total number of stems and is an absolute, fixed **number** of trees per area unit, e.g. the 100 thickest trees per hectare;
- the other also depends on the total number of stems but is a fixed **proportion** of trees, e.g. 10% or 20% of the thickest trees per hectare of a stand.

The use of *Oberhöhen* [De] (*top heights* [En]) to mean the 100 thickest trees per hectare is taught in Switzerland and, according to ASSMANN (1961), in Germany at the Department of Forestry at Munich University. In Baden-Württemberg, it refers to the 200 thickest trees (KRAMER and AKÇA 1995). This →term has been used to mean 20% of the thickest trees since WEISE (1880) and this usage is still propagated in the work of the University of Göttingen's Faculty of Forestry, where they distinguish it from *Spitzenhöhe* [De], defined as the fixed number of thickest trees per hectare. WENK *et al.* (1990), who taught at the Forestry Faculty of Dresden's Technical University, suggested using *Oberhöhe* [De] to refer to the mean height of 10% of the thickest trees.

A comparison of these views with reference to actual data shows that differences of the variously defined and calculated *Oberhöhen* [De] are probably statistically not significant. In a selection forest (*Plenterwald* [De]), this conclusion applies not only for calculations based on estimated and balanced height values, but also for calculations of the mean values for the trees measured. In an even-sized, even-aged beech stand, the differences cannot be statistically distinguished (Fig. 3). If $h_{10\%}$ is calculated on the basis of estimated height values, the results for the last three measurements, i.e. of the mature stand, appear to differ significantly from those obtained using →definitions of *top height* [En]. The differences are, however, small.

If the problem of tree height measurement is also taken into account, which was not the case in the calculations presented here, it seems clear that it is not worthwhile using different →definitions that are not significantly different. Unification is called for. Instead of using *Oberhöhe* [De] and *Spitzenhöhe* [De] or *top height* [En], it has been suggested that the →terms *dominante Höhe* [De] or *dominant height* [En] should be employed, adding further qualifications as necessary (ZINGG 1994). This makes even more sense in the light of the symbols recommended, namely h_{dom100}, h_{dom200}, $h_{dom10\%}$, or $h_{dom20\%}$.

4 Terminology and Symbols

On behalf of IUFRO, SOEST *et al.* (1965) published a report entitled "The standardization of symbols in forest mensuration". Unfortunately this has not been implemented since then either in the German or English forestry literature. Indeed, since the end of the 1950s the pressure to use short terms has grown with the increasing use of computers to calculate and present results. But it is the tables and graphics in particular that would become much easier for non-linguists to read in publications in a foreign language if standardised symbols rather than full texts, or the symbols or abbreviations invented by the authors were used.

Even a cursory and unsystematic look at the literature on forestry indicates that the IUFRO symbols are seldom employed. In none of the 74 texts studied on growth and yield-related themes that appeared in various publications were IUFRO symbols consistently used. In 23% of the articles modifications of the symbols were used that were easy to understand. In a further 23% authors introduced their own abbreviations, and in 54% the names of the variables were written out in the language of publication. Some course-books at least provide tables that list the customary local symbols and compare them with the IUFRO symbols and with other symbols used for those values (e.g. KRAMER 1988, KRAMER and AKÇA 1995, PARDÉ and BOUCHON 1988). Unfortunately, they are still not used consistently in these books.

At least forestry research institutions in Germany, Austria and Switzerland have agreed to employ IUFRO symbols in addition to the usual local symbols in standard evaluations of growth and yield-related data from experimental plots. The standardised forms have been published together with a certain unification of evaluation methods (JOHANN 1993a and b, NAGEL 1993, SPIECKER 1993). In order to take the standardisation process further, it would make sense when revising →terminology to provide the symbols and abbreviations for each →term.

5 Conclusion

Since one of the aims of SilvaVoc is to define →terminology and to provide rules for its use, IUFRO and/or SilvaVoc should exert a stronger influence on universities and research institutes so that, where necessary, local usage is replaced by a clearer →terminology that is as unified as possible. This influence can be exerted with the assistance of journals and their reviewers. For instance, lists of technical →terms conforming to those of SilvaVoc could be included with the rules or recommendations for reviewers. If an author nevertheless insists on using a different technical →term, he or she will have to explain why. Only clearly explained deviations from the approved →terminology will be permitted, and authors will have to show clearly that any technical →term they themselves create expresses something that already existing →terms do not. If authors cannot publish unless they use the approved →terminology, they will quickly change their ways to conform.

Tradition is no reason to cling to existing, but unclear →terms. New →definitions and the standardisation of →terminology have to take precedence. Care should, however, be taken in the new →definitions of →terms to refer to previously used →terms and to deviations or interpretative modifications. It would even make sense to include reasons for changes in terminological reference works. Adopting these measures should ensure that the use of clear technical →terminology improves comprehension in research.

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