

CzechTerra – landscape inventory

March 16-17, 2010

About the evaluation

In this evaluation we assess the performance of the CzechTerra landscape inventory from the point of view of the items listed below. We have studied the inventory without considering that other similar inventories, such as the Czech NFI and the EU-Lucas, to some extent provide similar information. Thus, we have neither made direct comparisons of inventory systems nor assessed overlaps and gaps between them.

In addition to the assessments we have suggested areas that might be considered for further development.

Note: Grade is expressed in scale from 1 to 10. Ten is the best.

Topic:	Scope of the inventory	Grade:	8
Reasoning:			
<p>The CzechTerra inventory focuses on providing national level information for international reporting/decision making (e.g. to the Climate Convention and its Kyoto Protocol, and the Convention on Biological Diversity) and for national policy purposes. The variables included generally are straightforward, allowing for a streamlined inventory that does not ‘complicate things’. While it may sometimes be argued that more information is better (if costs are not considered) we argue that the simplicity of the scope of the inventory is a strength, and a factor that creates a potential for the inventory to last in the long run without being too dependent on continuity of staff, severe budget cuts, etc.</p> <p>In case the information requirements would increase in the future, the scope of the inventory fairly easily could be expanded regarding what variables are assessed. Another potential expansion would be to increase the number of plots, so that reliable information would be obtained also for regions and for sparsely occurring land categories. For example, the latter type of expansion might be of interest if the inventory would be used also for the reporting required (outside reserves) for the EU Habitats Directive. Another example is if more detailed information would be required for specific forest types and activities (like species selection in regenerations) for national forest policy purposes. At present, due to the rather limited number of plots, the inventory has some shortcomings with regard to for what subdivisions reliable information can be provided.</p> <p>While the connections between information requirements and variable selection (and inventory dimensioning) appear to be well elaborated, just like in most other inventories there is room for further improvement of the linkages between data acquisition and decision making/reporting. Such work would need to be conducted in close collaboration with the responsible Czech state agencies.</p>			

Topic:	Inventory design	Grade:	8
Reasoning:			
<p>An inventory design in area based surveys basically is composed of the plot layout (geographical locations of the plots and the intensity of the plots), the shape and size of the plots, the temporal frequency of the inventory, and possible ancillary information used for the sample selection. Inventory design is one of the crucial factors when considering the efficiency of an inventory, e.g. the standard error of core estimates at a given cost.</p> <p>The data used in the CzechTerra inventory are (1) elevation zone information, (2) data acquired from high resolution aerial ortophotos, and (3) data from field plots. The co-use of field measurements and aerial ortophotos is one of the advantages of the inventory since the efficiency is increased.</p> <p>While a large number of different designs may serve a certain purpose, below we touch upon a couple of questions that might be discussed considering the efficiency of the CzechTerra system. However, since the design of the CzechTerra now is established we would like to clearly state that we do not propose any substantial changes of the design but rather stress that it is important to continue using the basic design that has now been established.</p> <p>Considering our general assessment of the CzechTerra system the following questions could be further discussed: (a) whether to use single plots or cluster of plots, and (b) the role of aerial photographs and the design of the photo interpretation part of the inventory.</p> <p>The choice between single plots versus plot clusters depends, among other things, on the time required to measure a plot and the spatial correlation between the studied features in the landscape. If conditions in the landscape change within fairly short distances and a crew has an ability to measure several plots per workday, it is often efficient to use designs where the plots are clustered. Clustered plots were not selected in the CzechTerra, and the arguments were that a single plot requires substantial time to be measured and that a single-plot design is easier to handle than a cluster plot design. Although we do not propose any changes of the design we believe that a cluster plot design might have been more efficient when focusing on the estimation of the growing stock and related break-down categories. In this case the workload on an individual plot would also need to be reduced.</p> <p>Another issue is the spatial layout of the remote sensing units, i.e., their size and density. The purpose of remote sensing in the CzechTerra is twofold: (1) improved area estimation, and (2) estimation of landscape metrics. The design of the remote sensing part was selected as a compromise between these two purposes. For area estimation alone a completely different designs would have been more efficient. In this context, to some extent it remains to be verified that a 450*450 meter large landscape is the relevant size for which landscape metrics should be derived.</p>			

Topic:	Remote sensing component	Grade:	9
Reasoning:			
<p>In this part we consider only the technical part of the remote sensing component of CzechTerra. The spatial layout is discussed under the design (above).</p> <p>Aerial photographs are used to estimate the areas of the 43 land categories, and consequently the values of landscape metrics. In total 1599 localities are employed for this purpose.</p> <p>The interpretation method appears to be very efficient, like the entire remote sensing component. A potential improvement for the future would be to consider using interpretation in 3D images to improve the classification accuracy.</p>			

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Topic:	Field methodology	Grade:	10
Reasoning:			
<p>The basic field methodology applied within the CzechTerra is ‘cutting edge’ in an international comparison. Not least this is demonstrated by the fact that the FieldMap technology has been adopted for use in a large number of forest and landscape inventories internationally. The routines used for marking of plots and basic measurements and assessments also appear to be very well adapted to the needs.</p> <p>Like in all inventories of this kind there is an obvious risk that both measurements and visual assessments will contain errors. Thus it is important that strict routines for checking and follow-up are developed and applied. Also in this regard the procedures applied appear to be very well adapted to the needs.</p> <p>We also note that the inventory comprises several novel features that appear to be adequately handled, e.g. the soil sampling component and the selection of sample trees for stem shape measurements.</p> <p>Apart from the above positive assessment we note that the fieldwork on a single plot appears to be quite time consuming. Thus it might be worthwhile to investigate if there is room for further improvement of the efficiency.</p>			

Topic:	Data processing and estimation	Grade:	7
Reasoning:			
<p>The data processing within CzechTerra appears to be straightforward and good. It follows a logical sequence from field data collection, through several control routines, to computations of basic results. A strength of the system is that the same type of databases are used throughout the entire chain of work.</p> <p>The estimation principles appear to be well founded and accurately applied in most cases. An interesting feature is the ambition to obtain locally accurate estimates. One example is how volume models and stem profiles are estimated.</p> <p>However, some issues related to the estimation probably could be further developed. Some examples are:</p> <ul style="list-style-type: none"> - At present, area estimates are taken solely from the air photo interpretation. While this is probably a fair decision it is known that classification errors often occur in remotely sensed data and it might thus be worthwhile to explore the potential of formally linking the field inventory and the air photo interpretation in the estimators. However, as pointed out by the Czech team during the review there are several issues, e.g. linked to area matching, which would need to be resolved in this connection. - The methods used for assessing the precision of the estimators appear to leave some room for further improvement. One issue regards to formally consider the two-phase estimation principle in the procedures for variance estimation. - While substantial time is spent on the landscape/remote sensing component of the inventory, so far rather limited efforts appear to have been spent on developing appropriate and ecologically relevant landscape metrics using the data. 			

Topic:	Results	Grade:	9
Reasoning:			
<p>The result calculation and production is highly automated and efficient. The team has selected the "tasks" to be handled. We are convinced that the tasks have been elaborated in collaboration with the national data users on the basis of the information requirements. Currently the results are all 'state estimates'; in the future it will be relevant to develop results also on changes, and potentially even use the data as input to prediction systems whereby the consequences of different silvicultural and harvesting regimes at national level can be evaluated.</p>			

Topic:	Logistics and organization	Grade:	8
Reasoning:			
<p>Overall, the proposed logistics and organization appears to be very relevant. For example, the system appears to be fairly insensible to external factors that may otherwise cause problems.</p>			

Topic:	International relevance	Grade:	8
Reasoning:			
<p>The CzechTerra system provides information mainly at national level and mainly according to internationally standardized definitions, well suited for international reporting/decision making. A main objective of the inventory is to provide information to international agreements, such as the Climate Convention, and thus the inventory has a high international relevance.</p> <p>While most of the indicators are derived according to international standards several local definitions are also maintained, e.g. related to how tree species composition is derived. While we consider this to be a novel innovation and a strong point of the inventory, care must be taken when communicating the results so that information according to national and international standards is not mixed.</p>			

Topic:	Cost efficiency	Grade:	10
Reasoning:			
<p>Overall, the CzechTerra inventory system appears to be highly cost efficient. Indeed, it is probably one of the most cost-efficient field-based national inventory systems of this kind that can be found globally.</p>			

Topic:	Overall evaluation	Grade:	9
Reasoning:			
<p>Our overall assessment of CzechTerra is very positive. Specifically we would like to point at the following advantages of the system:</p> <ul style="list-style-type: none"> - Clear scope and objectives, focusing on needs for national level policy and international reporting - Straightforward procedures and a strong chain of activities from inventory planning to compilation of results - Cost-effectiveness; substantial amounts of required information at limited cost 			

- Several components are very advanced, for example the FieldMap system and the procedures used for the air photo interpretation

Due to the many interesting features of the CzechTerra system, as a final remark we would like to encourage the development team to publish a description of the system, as well as individual details, in scientific journals.

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