

# **Land Consolidation in Forest Areas – The German Approach in Terms of Sustainability –**

**Ralf WILDEN, Germany**

**Key words:** forest industry cluster, forestry, increasing stock of wood, proprietary structure, road network, integrated rural development, land consolidation

## **SUMMARY**

Woods belong to the most important earthly resources. Besides their balancing function for ecology woods hold an extensive economic potential.

The fact that the stock of wood is increasing continuously in Germany shows that this potential is not used to the full extend.

In many cases unfavourable proprietary structures as well as an insufficient road network make an economic utilisation of the resource wood impossible.

On the basis of examples from Northrhine-Westfalia it is shown, that with means of land development the utilisation of the resource wood in consideration of ecological interests can be improved.

## **ZUSAMMENFASSUNG**

Wälder gehören zu den wichtigsten Ressourcen der Erde. Neben ihrer ökologischen Ausgleichsfunktion bergen Wälder ein erhebliches ökonomisches Potential.

Die Tatsache, dass in Deutschland der Holzvorrat stetig wächst, belegt, dass dieses Potential nicht in vollem Umfang genutzt wird.

Oft verhindern ungünstige Eigentumsstrukturen sowie ein unzureichendes Wegenetz eine ökonomische Nutzung des Rohstoffes Holz.

Es wird anhand von Beispielen aus Nordrhein-Westfalen aufgezeigt, wie durch Instrumente der Landentwicklung die Nutzung des Rohstoffes Holz unter Berücksichtigung ökologischer Belange verbessert werden kann.

# Land Consolidation in Forest Areas – The German Approach in Terms of Sustainability –

**Ralf WILDEN, Germany**

## 1. FOREST DATA

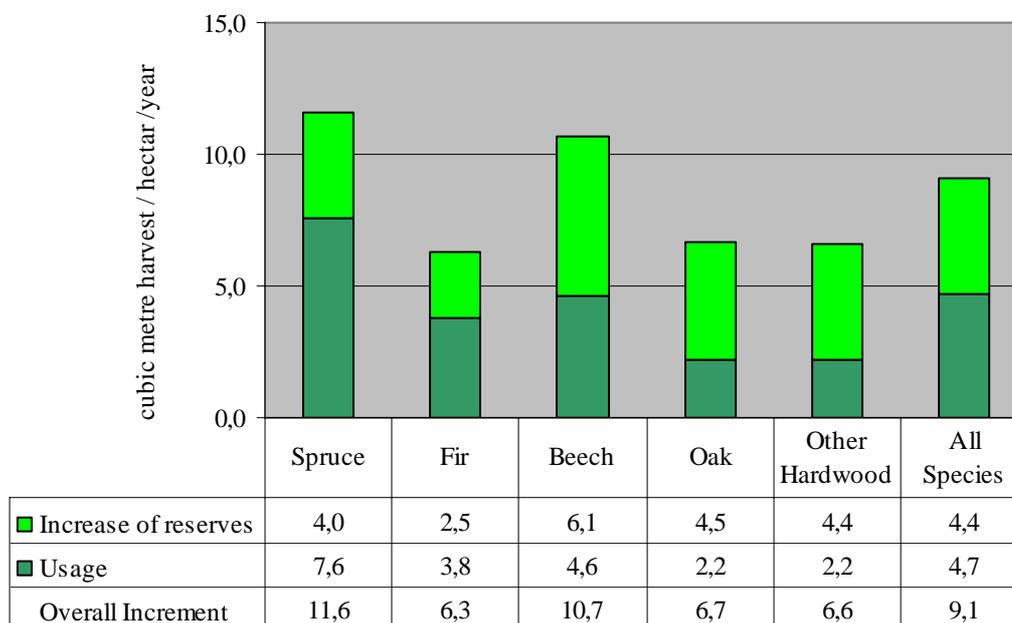
### 1.1 Forest area and species

26 % of Northrhine-Westfalia – which is equivalent to an area of approx. 890.000 ha - is stocked with wood, thereof 48 % with coniferous forest and 52 % with broadleaved forest. The principal species are spruces (36 %), beeches (18 %) and oaks (16 %).

### 1.2 Stock and use of wood

The stock of wood is increasing permanently. In the period 1987-2001 the overall increment of wood amounted 9,1 cubic metre of harvest per hectare per year. Thereof only 4,7 were harvested, so that the reserves increased about 4,4 cubic metre of harvest per hectare per year. The relation for the main species is shown in the following diagram (Schulte, 2003).

Increment and Usage 1987 - 2001



As a result it can be stated that only 2/3 of the increment in softwood and only 1/3 of the increment in hardwood were used. In terms of sustainability more wood could and should be used.

A further usage should be forced not only for the strengthening of the economic sector forestry but also for the health of the forests, because thinning strengthens the resistance of forest stands on the whole. Since a few decades forestry has to deal with novel forest damages resulting predominantly from air pollution. An active forest cultivation reduces the results of these external influences (Holzabsatzfonds, 2004).

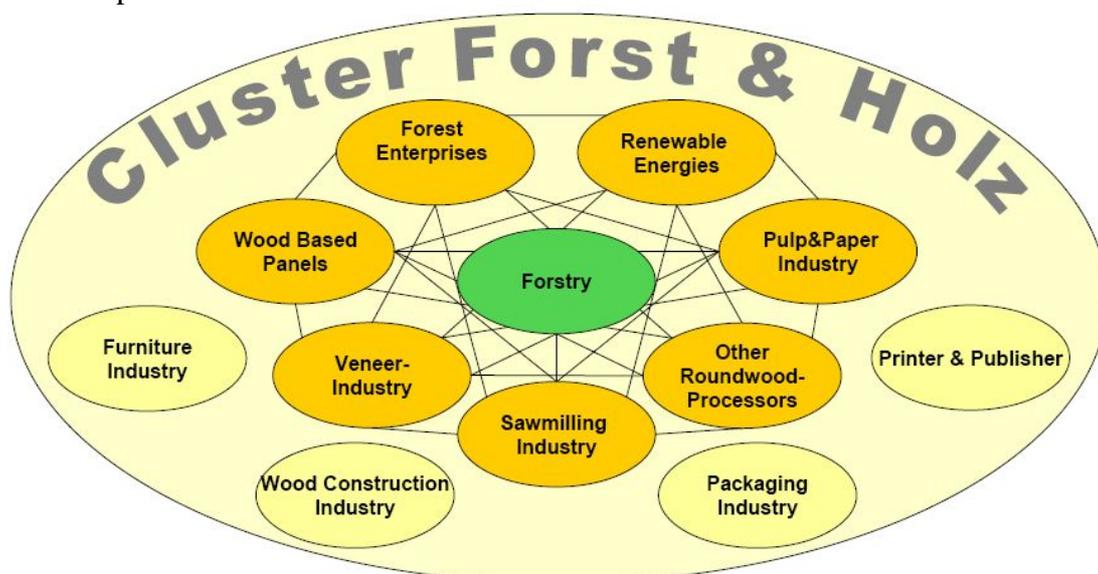
### 1.3 Forest Industry Cluster

According to a definition of the European Union the forest and timber economy are to be regarded as a unit. To this unit the category groups forestry, wood processing industries, wood trade, cellulose- and paper production, paper and paper processing inclusive packing as well as printing and publishing trade belong. This general complex can be defined as the so mentioned “wood cluster”, which outputs over 100 billion euro annual turnover in Germany as well as approximately one million jobs. This corresponds to a portion of approximately three per cent of the gross domestic product. (BMVEL, 2004).

In Northrhine-Westfalia the idea of the cluster has been taken up in 2000 by restructuring the tasks of the ministries, whereby the Ministry of the Environment and Conservation, Agriculture and Consumer Protection (Ministerium für Umwelt und Naturschutz, Landwirtschaft und Verbraucherschutz – MUNLV NRW) got in addition to the forestry tasks the competence for the wood processing industries (Wald und Holz.NRW, 2003). As an opening balance for the cluster the MUNLV NRW commissioned a study - the so called “Clusterstudie Forst&Holz” (Schulte, 2003) with an anglophone memorandum “cluster study forest industry in Northrhine-Westfalia – memorandum” (Jaakko Pöyry Consulting 2003).

The cluster is composed of 3 layers:

- forestry
- 1. consumption level and
- 2. consumption level.



**Figure 1:** Structure of the forest industry cluster (Jaakko Pöyry Consulting 2003)

It is shown that in Northrhine-Westfalia 257.000 employees - 3 % proportion of Northrhine-Westfalia in total - are employed in the forest industry cluster with a turnover of 33.200 Mio. EUR – 7,2 % proportion of the gross domestic product. Forestry, although it has only a small part in the number of employees (5.500, 2 %) and the turnover (356 Mio € 1 %), is the crucial core of the cluster, because it is the raw material furnisher for the consumption levels.

The clusterstudy shows in a SWOT-analysis strengths, weaknesses, chances (opportunities) and threats of the cluster. Relating to forestry and land development in forest areas two conclusions of the analysis are to be emphasised:

- Chance in mobilisation of further raw material potentials (cp. 1.2) for the forest industry and energy production to achieve a higher value added to the forest owners and
- Threat in higher risk of calamity because of fail of thinning.

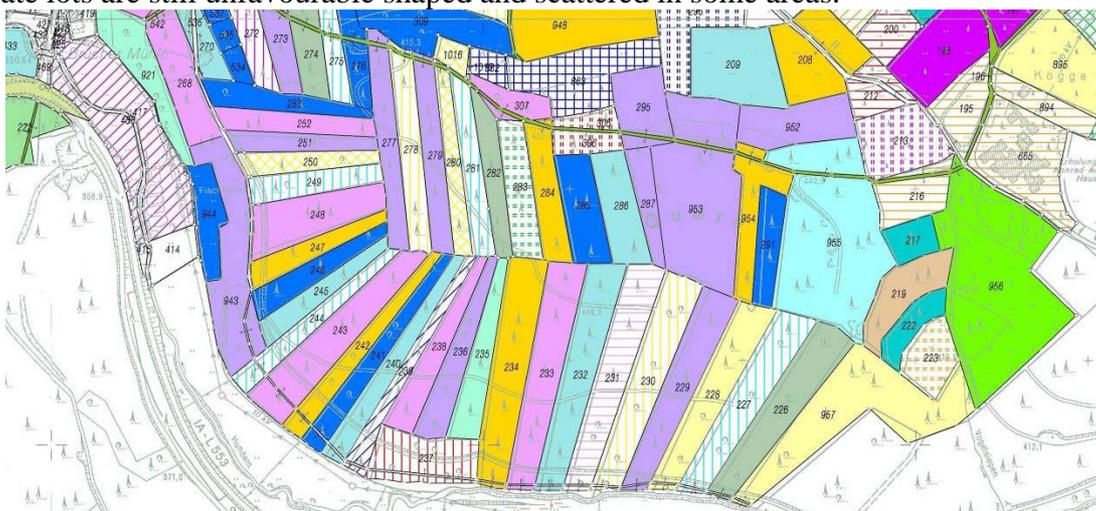
### 1.4 Future demand for lumber

It's not possible to foreknow the future demand for the raw material lumber. But there are some trends, which evince an increased demand for wood in the future; especially because of the high price for oil:

- Use of wood for the production of biomass-energy
- Increased demand for firewood
- Increased building projects with wood-construction.

### 1.5 Proprietary structure

In Northrhine-Westfalia 15 % of the wood area is state forest, 19 % corporate forest and 66 % private forest. Remarkable is the high percentage of private forest is Northrhine-Westfalia, for whole Germany the percentage is 44 %. State forest is normally consolidated. By contrast private lots are still unfavourable shaped and scattered in some areas.



**Figure2:** fragmentation of freehold in the Sauerland-area, each colour represents an owner.

In these areas a forestry usage is often only possible with above-average effort, e.g. long skidding distances or uneconomic loading of single trunks from small harvesting entities. This debases the sales revenue such, that unfavourable shaped parcels are often not harvested. In these cases values lie idle.

## 1.6 Road network

Another important aspect for harvesting in the forest, which can partly be enhanced in Northrhine-Westfalia, is the road network. Forest roads are necessary for lumber removal as well as for accessibility for harvesting and in cases of emergency.



**Figure 3:** This road in the Sauerland-area can only be used for skidding, for trafficability with lumber trucks it needs an adequate induration and width.

## 2. LAND DEVELOPMENT MEASURES IN FOREST AREAS

### 2.1 Integrated Rural Development

Forest is a formative element of cultivated landscape and has next to the before mentioned economical also a social and ecological importance. It plays an important role in protecting the natural assets air, ground and water, is a habitat for numerous animal- and plant species, space for recreational activities and furnisher of the renewable primary product wood.

This shows that various demands have to be co-ordinated to avoid conflicting interests concerning the use of land. A sustainable development can only be reached under consideration of interrelations of economical, ecological and social aims (Thomas, 1998). This approach is implemented by integrated rural development.

*“Integrated rural development aims to harmonize the social, cultural and economic demands the region faces with its ecological functions. The different demands on the rural region – economical, ecological and social – are considered jointly and across sector” (BMVEL, 2005).*

Since 2004 the federal-state joint task for the improvement of agricultural structures and coastal protection (Rahmenplan der Gemeinschaftsaufgabe “Verbesserung der Agrarstruktur und des Küstenschutzes vom 21. Mai. 2004) and the northrhine-westfalian funding guideline for the integrated rural development (Richtlinie über die Gewährung von Zuwendungen zur Förderung einer integrierten ländlichen Entwicklung vom 19. Oktober 2004) provide for two new *strategic instruments* as eligible:

- integrated rural development strategies and
- regional management.

The „Integrated Rural Development Strategy“ serves as a conceptual and strategic basis and the „Regional Management“ as an organisational and operational basis for integrated rural development. The approach can be characterised as a regional (not municipal), cross-sector and partnership (cooperation between policymakers, administrations, the various economic sectors and the citizens) approach.

The first strategies are still running, so that concrete results can not yet be presented. Relating to forests the aspects forestry, protection of biotopes and species as well as recreation have to be involved. Possible results can be:

- demand for land consolidation, voluntary land exchange or consolidation of silvicultural co-operatives
- corrective maintenance of forest roads
- specific guidance of visitors by signposting and information boards
- construction of car parks for hikers, shelters and refuges
- dialogue about economic cycles on regional levels
- etc.

A possible realisation of the latter item, is the buildup of regional cluster structures of all branches that deal with wood, as described in the forest industry cluster study.

## **2.2 Land consolidation**

Land consolidation can pursue a lot of different aims. Depending on how comprehensive the aims and how complex the measures for fulfilment of these aims are, different kinds of land consolidation measures according to the German Land Consolidation Act (FlurbG, 1976) can be applied. Below these measures are exemplified by examples.

Land consolidation can be carried out with a view to improving the production and working conditions in agriculture and forestry as well as promoting the general use and development of land (sec. 1 FlurbG). The purpose of land consolidation is due to sec. 37 FlurbG. It allows for a lot of measures, particularly:

- Consolidation and reshaping of scattered or uneconomically shaped parcels to obtain units of a more favourable location, shape and size
- Construction of roads, water bodies and other common facilities
- land-scaping measures
- Village renewal measures.

This comprehensive task of land consolidation considers an integrated approach for rural development.

Under certain conditions a simplified land consolidation according to sec. 86 FlurbG can be implemented. In this procedure the enabling of land development measures and the resolving of conflicting interests is more in the foreground than an extensive reorganisation of land holdings. If the creation of a new road system and water resources projects is not required, the land consolidation procedure in type of accelerated land consolidation on the base of sec. 91 FlurbG can be concentrated on the merging and reshaping of parcels in conjunction. In particular cases it has to be decided, which of the mentioned procedures is suitable for the concrete aims.

For land consolidation in forest areas special regulations concerning woodland (sec. 85 FlurbG) have to be considered. According to these regulations the forest's association and the forestry commissioner are to be concerned at different steps of the procedure. For the process of the land consolidation in forest areas the regulation of No. 4 is very important: "Where the value of standing timber is to be assessed, the principles of the valuation of standing timber shall be applied." This valuation is a further step in the process of a land consolidation procedure.

In most cases land consolidation is not restricted to forest areas, but also includes agricultural areas and villages in order to consider the interrelations of these areas and to ensure a holistic development of the region. This corresponds to the before mentioned integrated approach of land consolidation.

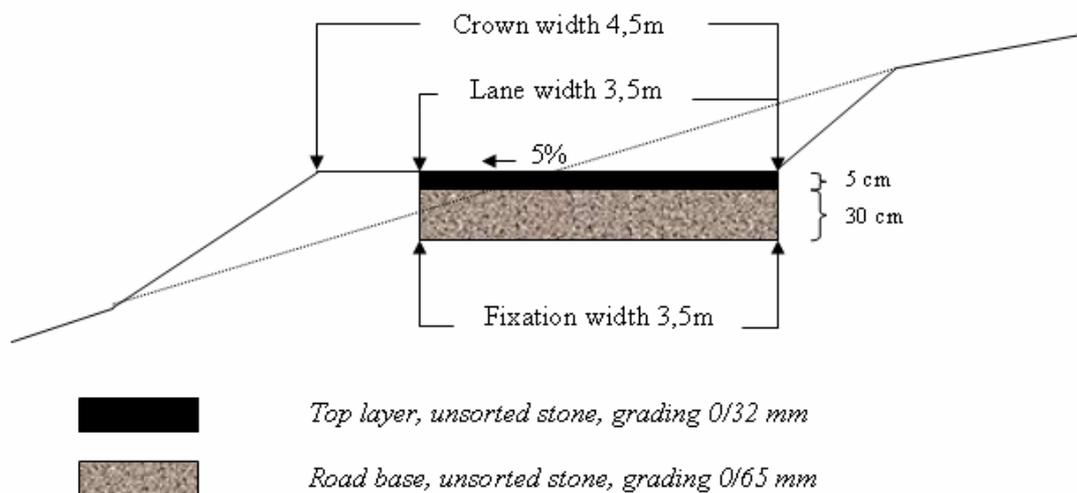
### 2.2.1 Construction of Roads

By land consolidation the lots shall be made accessible by ways (sec. 44, para 3 FlurbG). The importance of roads for a forestal usage was already illustrated before. The planning of the road network has to take into account the future compensatory land allocation. In forest areas especially the topography and the principles of cultivation are decisive for the planning. It is necessary to involve the forest authorities as experts in the planning process. The extend of roads has to make sure that harvested wood can be skidded to lumber yards at the roads. The extend varies according to the topography. In hill areas wood should be skidded upwards. In steep slope areas the extend of roads should be higher than in flat areas.

Experiences have shown that it is advantageous to construct the roads immediately after the plan according to sec. 41 FlurbG has been approved and prior to the implementation of the land consolidation plan. The main advantages of this proceeding are:

- As early as possible lumber can be transported by trucks.
- The road network is the frame for the compensatory land allocation. After construction of the roads the participants can estimate in a better way which is the best location for their new lots and communicate this to the land consolidation authority during the hearing on wishes regarding compensation (sec. 57 FlurbG).

As a reason of costs and ecology the construction is nowadays nearly exclusively done with waterbound layers (gravel road). For the drainage the roads have a cross-fall in direction to the valley and drains are constructed where necessary.



**Figure 4:** typical cross section for forest roads

Often lumber trucks have to pass villages. In these cases conflicts can arise. In the procedure Windhausen I lumber removal through one of the villages could only be done after all parking cars were removed. One curve was so narrow, that even experienced drivers had problems with passing this curve. The ideal solution would have been a bypass road for forestry. But this was not possible because of the topography. During the planning of a village renewal measure in this village the aspect of lumber removal was considered as a main target and the forest authority was involved. The run of the curve and the parking situation will be changed so that lumber removal won't be a problem anymore. The construction will take place in summer 2006. In the procedure Milchenbach the situation was different. A bypass-road could be constructed, so that lumber trucks can drive around the village. So it was possible to maintain and structure the old design and lay-out of the streets without enlarging the street's profile. Both examples show the integrated approach, where road construction and village renewal go hand in hand.

## 2.2.2 Land Allocation

Land Allocation aims at functional configuration of forestal used areas by means of

- Consolidation of scattered parcels
- Improvement of the form of parcels
- Exchange between agricultural and forestal lots
- Abolition of rights of use
- Splitting-up of common property.

The allocation shall be in such a way, that large-area lots of land with access to a forest road are generated. The risk of calamities shall be minimised. For example a high risk of windthrow arises, if boundaries run along ridges.

An example of consolidation of scattered parcels and the improvement of the form of parcels can be seen in an extract of the map that shows the ownership before and after the land consolidation Milchenbach.



**Figure 5:** Extract of the ownership structure before (left) and after (right) the land consolidation Milchenbach

Before the land consolidation the average amount of separate wood areas was about 26 per forestry-enterprise; in particular cases even 50. The annual use of wood averaged only 3,5 solid cubic metre per ha, whereas the increase of wood can amount up to 11 solid cubic metre per ha. The sales revenue from the wood was extensively debased by high income-related expenses (felling, processing and skidding to roads that are drivable by lumber trucks) caused by an insufficient net of roads as well as unfavourable shaped and fragmented real estates. In

some cases the costs were higher than the sales revenue. The clearance of the extreme fragmentation of holdings (from average 7 to 1), the clearance of uneconomical parcel forms (previously often lots of 100 m long, very narrow forest parcels) as well as the improvement of the road network have first rendered possible a sustainable cultivation. After the land consolidation the felling has reduplicated compared to 1977, without harming the principle of sustainability. Silvicultural necessary arrangements can now be conducted. They enhance the growth and stability of the wood (Zerhau, 2004).

### 2.2.3 Landscape Development Measures

Landscape development measures aim to sustain and improve the ecological functions of forests. Often conflicts between economical and ecological aims occur. A common conflict results from classifications of protected areas in forests. After classification e.g. an area may not be afforested with specific species or not used extensively. This is an economic disadvantage for the owner of the particular area. On the other hand often a specific economic use inhibits the establishing of an expedient biotope network.

Land consolidation can help to develop the landscape by:

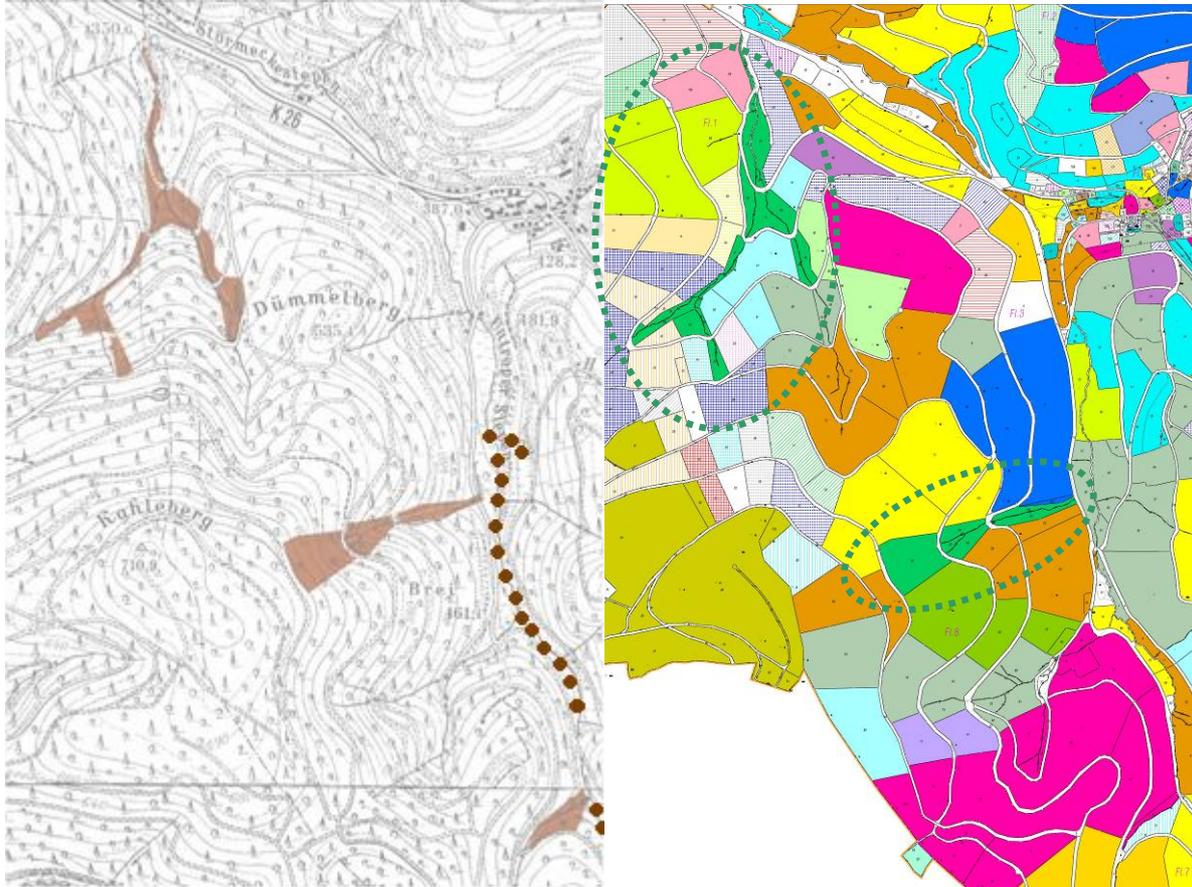
- Protection of valuable forest-biotopes per allocation to public ownership (federal state, county, municipality etc.)
- Networking of biotopes
- Nature-orientated designing of the edge of the woods
- Agreements with land owners regarding the execution of landscape development measures and monetary compensation for use.

During the land consolidation procedure Kirchveischede spruces were removed to reestablish the habitat-potential of a rivulet vale. The worthwhile habitat for a riverine vegetation with a unique flora and fauna had been occupied and shadowed by the spruces. Furthermore the natural scenery was disturbed, because the rivulet was hardly perceivable. The rivulet vale is still in private ownership. Agreements between the body of participants and the private land owners ensure an environmentally sound usage and prohibit the reforestation with spruces. The agreement is component of the land consolidation plan and unfolds thereby its longterm legal effect.



**Figure 6:** Rivulet vale in Kirchveischede before (left) and after (right) the removal of spruces

The allocation of valuable forest-biotopes and networking of biotopes has been realised in the land consolidation procedure Milchenbach. Existing forest biotopes (e.g. ecological valuable beech forest) were allocated to the federal state Northrhine-Westfalia. Conterminous to these biotopes spruces in rivulet vales were removed as described before.



**Figure 7:** The left map shows part of a biotope network. Dotted are areas where spruces were removed during the land consolidation. On the right a map of the land allocation is shown. The state Northrhine-Westfalia (in darkgreen) has got ownership of most of the areas of the biotope network.

### 2.3 Voluntary land exchange

The voluntary land exchange (on the base of sec. 103a - 103i FlurbG) is the simplest and fastest (and most inexpensive) land consolidation measure. Parcels of two (as a minimum) or more owners are exchanged and merged. The voluntary land exchange differs from other land consolidation procedures in one fundamental aspect: The voluntariness of all owners of land and all parties with rights on the respective parcels has to be ensured during the whole procedure. It includes decisions on the exchange of corresponding parcels or shares of parcels, merging of parcels, transfer or extension of rights and the new boundary lines. Wherever possible, whole parcels shall be exchanged. So, this procedure is only reasonable, if the road network fulfils all claims and the parcels that shall be exchanged are yet shaped in a favourable way.

All in all the procedure offers a quick and inexpensive procedure to react to agricultural and forestall deficiencies or to nature conservancy demands on specific parcels.

## 2.4 Procedure by law on community forest

This procedure is unique for areas with silvicultural co-operatives. The Law on Community Forest (Gemeinschaftswaldgesetz NRW) stipulates the legal relationship of silvicultural co-operatives. The procedure, which can be initiated on behalf of an improved forestal cultivation or a simplified administration, has to be conducted under the provisions of the Land Consolidation Act. It aims at the consolidation of smaller co-operatives.

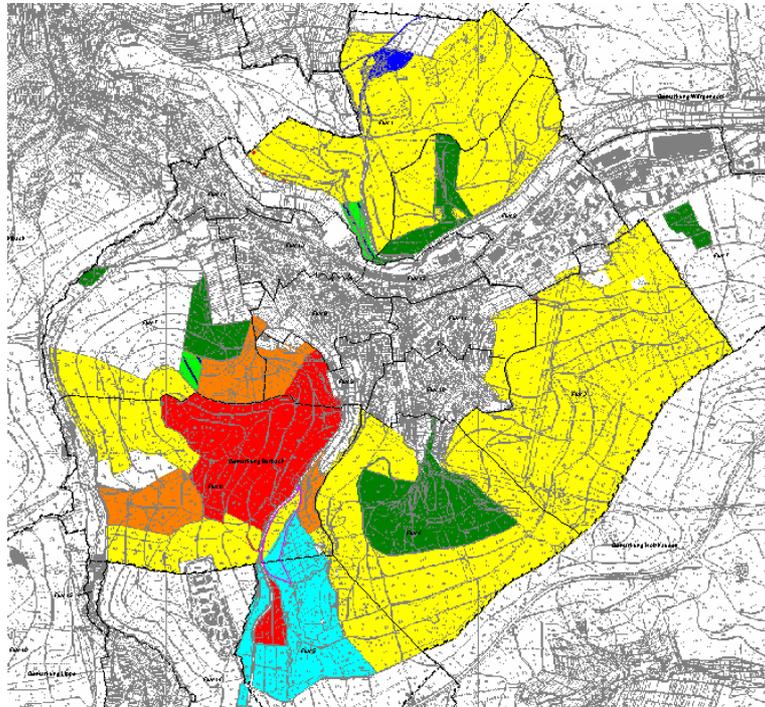
The benefits of the procedure for the cultivation are:

- Appropriate size
- Abolition of disturbing cultivation-borderlines
- Simplified and profitable timber-sale
- Reduced operational risk (e.g. in case of calamities)

The benefits for the administration are:

- Only one board and one cash management instead of two or more
- Only one stock book

For the assessment of the claim to compensation in shares of the new co-operative for all shareholders the valuation of the ground and the standing timber is necessary. Mostly both valuations are done in coordination with the board of the body of participants in a simplified way.



**Figure 8:** Six forest co-operatives that have been consolidated to one co-operative

## REFERENCES

- Bundesministerium für Verbraucherschutz, Ernährung und Landwirtschaft (BMVEL) (ed.), 2004, Charta für Holz, page 10, Bonn
- Bundesministerium für Verbraucherschutz, Ernährung und Landwirtschaft (BMVEL) (ed.), 2005, Ländliche Entwicklung aktiv gestalten – Leitfaden zur integrierten ländlichen Entwicklung, page 7, Bonn
- Deutsche Landeskulturgesellschaft (DLKG) (ed.), 2006, Sonderheft 1 - Ländlicher Raum auf Roter Liste, Mainz
- FlurbG, 1976, Flurbereinigungsgesetz in der Fassung vom 16. März 1976, Bundesgesetzblatt I, S. 546, in der Fassung der Bekanntmachung vom 12.08.2005, Bundesgesetzblatt I, S. 2354
- Holzbsatzfonds, 2004, Die deutsche Forstwirtschaft - Zahlen und Fakten, Natürlich Holz, page 29
- Jaakko Pöyry Consulting, 2003, Cluster study forest industry in Northrhine-Westfalia – Memorandum, publication of the Ministerium für Umwelt und Naturschutz, Landwirtschaft und Verbraucherschutz (MUNLV), Düsseldorf
- Schulte, A., 2003, Clusterstudie Forst&Holz, publication of the MUNLV, Düsseldorf
- Thomas J., 1998, Non-polluting land use and sustainable development in rural regions – support through land consolidation and village renewal, International Federation of Surveyors (FIG; XXI. Congress Brighton, Commission 7)
- Wald und Holz.NRW, 2003, Vorwort zur Clusterstudie, <http://www.forst.nrw.de>
- Zerhau, R., 2004, Förderung der allgemeinen Landeskultur und einer integralen Landentwicklung mit dem Instrument Bodenordnung im Verfahren Milchenbach, Jahrebericht der Verwaltung für Agrarordnung 2003, pages 30 – 35, publication of the MUNLV, Düsseldorf

## BIOGRAPHICAL NOTES

Academic experience: Dipl.Ing. geodesy, Rheinische Friedrich-Wilhelms-Universität Bonn

Current position: Land consolidation supervisor, local land consolidation authority Siegen

Practical experience: Cadastral surveying, land surveying, land consolidation

International experience: since 2005 member of EU INTERREG IIIC - project FARLAND (Future Approaches to Land Development)

## CONTACTS

Dipl.Ing. Ralf Wilden  
Amt für Agrarordnung  
Hermelsbacher Weg 15  
57072 Siegen  
Germany  
Tel. + 49 271 5981128  
Fax + 49 271 5981229  
Email: [ralf.wilden@afao-siegen.nrw.de](mailto:ralf.wilden@afao-siegen.nrw.de)  
Web site: [afao-siegen.nrw.de](http://afao-siegen.nrw.de)