

APPLIED PERIOD PRESENTATION

R.O. Mugabe
MSc. EF 2008-2010

Supervisor:
Prof. Dr. Marc Hanewinkel

10.12.2008

Outline of Presentation

1. Work Schedule
2. Economic Models
3. Climate Envelopes
4. Host Organization

Schedule of Activities

Table 1: Applied Period Work Schedule

Time	Activity	Output
Task 1: Review of Economic Models		
Week 1	Collection and review of literature More literature review	Zero draft
Week 2		
Week 3		Final report
Week 4		
Task 2: Climate Envelopes		
Week 5	Review of literature Data gathering	Literature reviewed Data assembled
Week 6		
Week 7	Data analysis Report writing	Climate envelopes developed Final Report
Week 8		
AP Report Compilation and presentation		
Week 9 & 10	Report writing and Presentation	In progress

Economic Models in Forest Management

R.O. Mugabe
MSc. EF 2008-2010

Peculiar Features of Forestry:

- ✓ Multiproduct Nature
 - ✓ Long Gestation Period
 - ✓ Both Product and Factory
 - ✓ Several management interventions
- Difficult to predict the result of any single intervention (Ogweno, 1995)
- Hence use models (Duku-Kakyire and Nanang, 2002)

Two Groups of Models

1. Growth and Yield Models:

- Forecasting tree and stand growth and yield

2. Economic Models:

- Economic and financial analysis of forestry investments
- Evaluating forestry against other land uses

The Basic Model: *Faustmann Equation*

$$\text{Max } v = \frac{R_t}{(1+i)^t - 1} \dots\dots\dots 1$$

- In perfect markets, NPV max.-Force behind activity to which land is put (Klemperer, 1994)
- Land (soil) expectation value (LEV): Max. amount an Investor can pay for bare land and earn acceptable interest (Oderwald & Duerr, 1990)

Underlying Assumptions:

1. Perfect Market:-Investors can borrow any amount at the prevailing interest rate, r is known and constant
2. Future timber and input prices are known and constant for all future periods
3. Future timber yields are known and constant for all periods
4. Forest land can be bought or sold in a perfect market

Application to EAC: *Rotation Period*

- Rotation age a classical problem in forestry
- Several criteria:-economic, silvicultural, physical, salvage , etc
- Economic criteria:- Fell when:
 - land/forest value \geq MAR (Klemperer, 1994)
- Oftenly:- concept of *annual forest value growth percent* (Löfgren and Mattsson, 1995)

➤ The Principle:-As the forest grows its value increases to a max. and then declines. Thus, fell when value is max.

$$\text{Annual forest value growth \%} = \frac{(H_{y+1} + L_{y+1}) - (H_y + L_y) + (a - c)}{H_y + L_y} \dots\dots\dots 2$$

FPO Theorem: “A forest shall be cut when the rate of change of its value with respect to time is equal to the interest rate on the value of the stand plus the interest on the value of the forest land”

Application to UAS System:

- Characterized by (Knoke and Plusczyk, 2001):
 - Trees of all ages and sizes
 - Single tree or group selection harvests
- In sustainable AUS: constant harvests
- Classical problem:-Determination of the best cutting cycle and reserve growing stock

➤ The LEV applies but with modifications since:

➤ AUS starts with bare land and end with a continuous forest. Both bare land and reserve growing stock needed (Buongiorno, 2001)

$$LEV = \frac{v' h_t}{(1+i)^T} - v' y_t \dots \dots \dots 3$$

Application to Forest Conversion:

➤ Why conversion?

- Increasing demand for close-to-nature forests
- Problems with monocultures e.g. susceptibility to fires
- Changing climatic conditions

➤ Need for tools to explore economic and ecological impacts of transformation

➤ Desired stand structure is described by the number per unit area of the different tree sizes and their species before and after the conversion.

- Conversion strategies evaluated by 1. economic criteria e.g. NPV (Haight and Monserud, 1990), 2. ecological criteria e.g. diversity indices (Buongiorno et al., 1994)
- Optimization models (integrated with growth simulators) that maximise economic returns, subject to ecological constraint or vice versa

Integration of Risks in Forest Evaluations:

➤ Why integrate risks?

- Timber and input prices fluctuate
- Interest rate subject to fluctuation
- Projected yield main not be realized due to e.g. storms

➤ Two methods for Risk Accounting:

1. Addition of Risk Premium (Reed, 1985)
2. Computer Simulation e.g. Monte Carlo Simulation (Klemperer, 1994)

Valuation of Non-market Forest Goods:

➤ Why Value?

- Public goods with no markets
- Most lack formal markets
- Increasing demand for certified forest products

➤ Thus not included in financial analysis of forestry projects-leading to unfavourable Conclusions

Two Methods:

1. Direct method:-Contingent valuation (CVM)

- Use surveys to obtain an individual's preference/valuation for environmental goods
- Open ended questions in which the target population is asked about WTP or WTS (Viesten et al., 2007)

2. Indirect method:-Travel cost (TCM)

- Assume direct complementarity between a market good and the environmental good (Klemperer, 1994)
- Demand is revealed by how much recreationers are willing to pay to visit the site
- Hedonic travel cost method value attributes of the recreation site (Snyder, 2007)

Climate Envelopes for Eight Tree Species in SW Germany

R.O. Mugabe
MSc. EF 2008-2010

Forestry in SW Germany:

- 38% covered by forests (Hanewinkel, 2005)
- State forest authority successful in managing the forests
- Current management goal: Transformation-Convert monocultures into mixed stands with high diversity

Rising Concern:

- Changes in ecological conditions due to increased warming and change in land use impacts the forests (Kölling and Zimmermann, 2007)
- Already increasing air temperature is impacting phenology of tree species in the region (Schröder, 2005)
- Species respond to ecological changes

➤ Analysis of potential shift in the range of key tree species is necessary for devising appropriate conservation strategies and selection of suitable species for transformation

➤ Climate Envelope provide a quick way of achieving this (Pearson and Dawson, 2003; Hijmans and Graham, 2006)

Method

Data:

➤ Climate data from WorldClim
(www.worldclim.org)

➤ Projected increase in mean annual temperature of 1.8°C (Spekat et al., 2007)

➤ Tree species distribution data from Tree Species Maps for Europe (www.afolu.org)

Climate Envelopes Construction

➤ Development of climate envelopes achieved through a combination of ArcMap tools, performed in GIS environment

Results

Silver fir

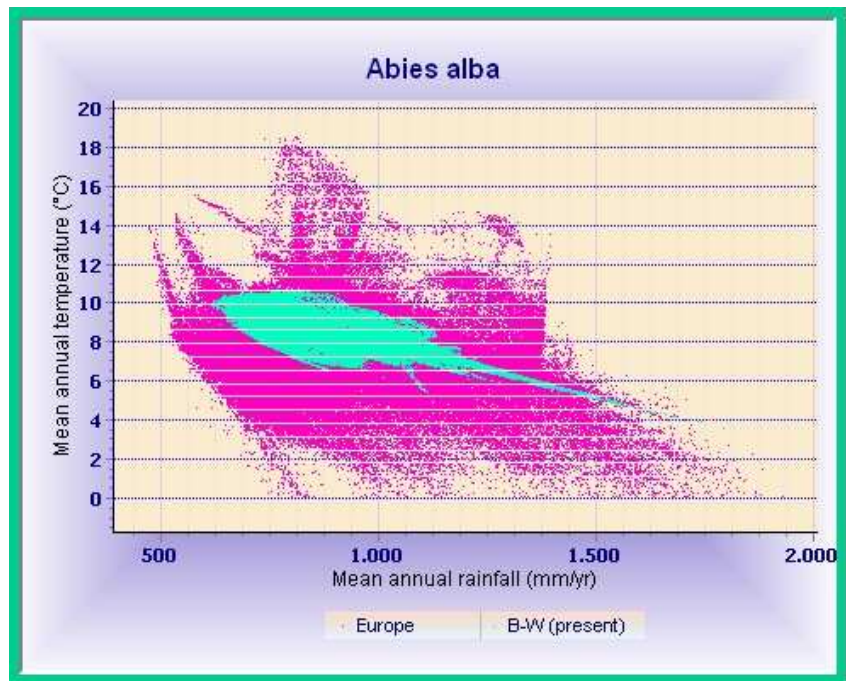


Fig. 1a: Current Climate space

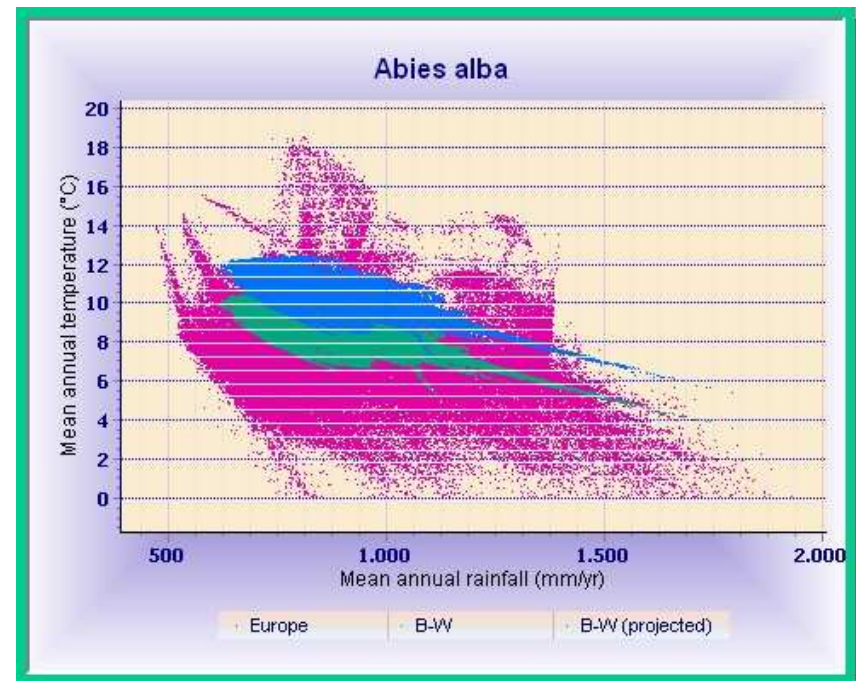


Fig. 1b: Projected climate space

Maple

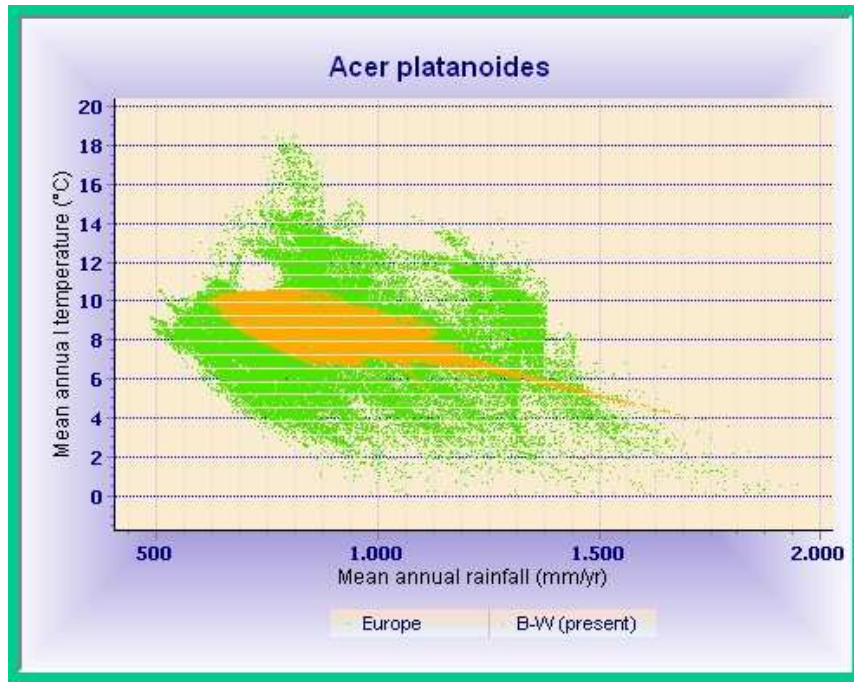


Fig. 2a: Current climate space

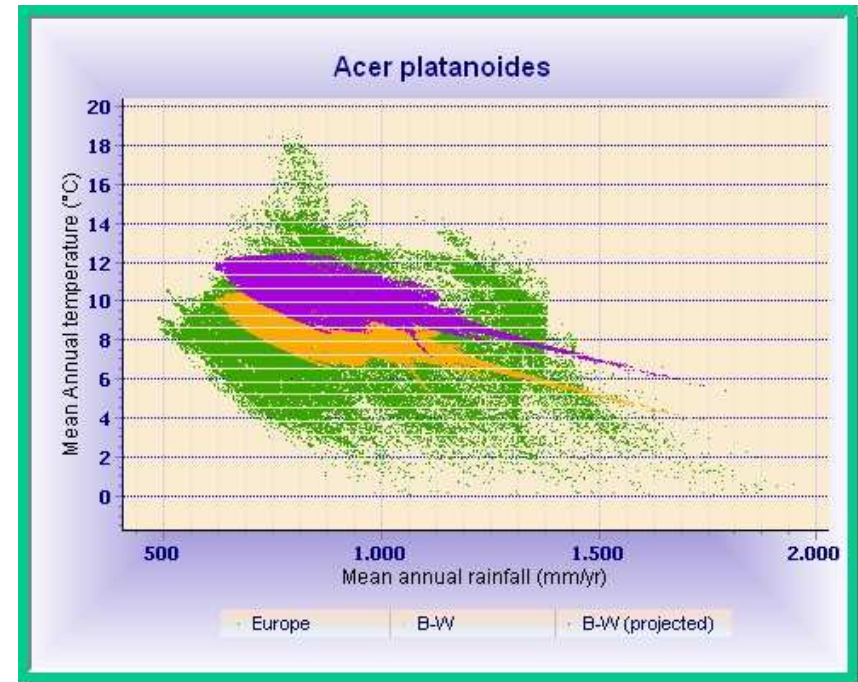


Fig. 2b: Projected climate space

Norway Spruce

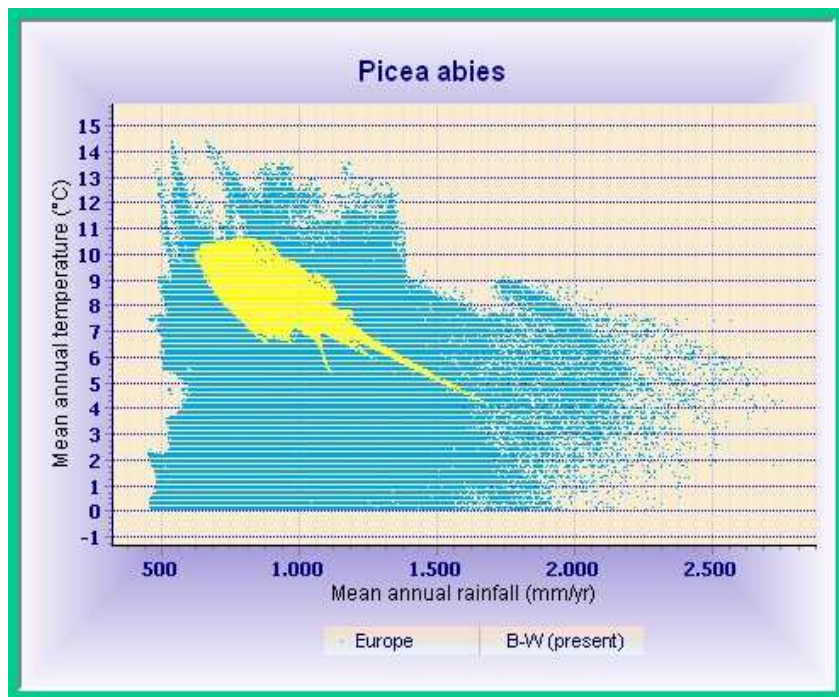


Fig. 3a: Current climate space

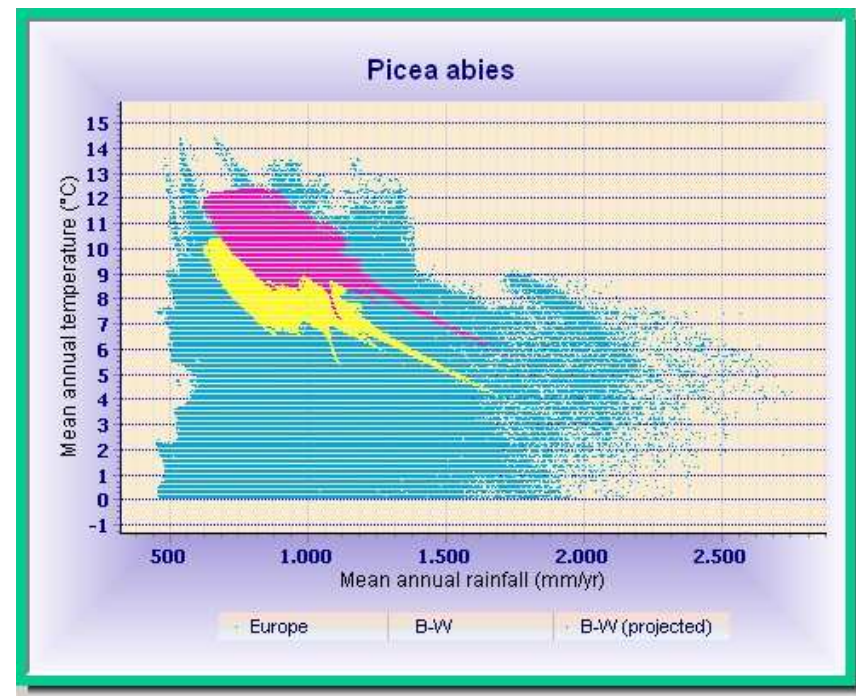


Fig. 3b: Projected climate space

Douglas fir

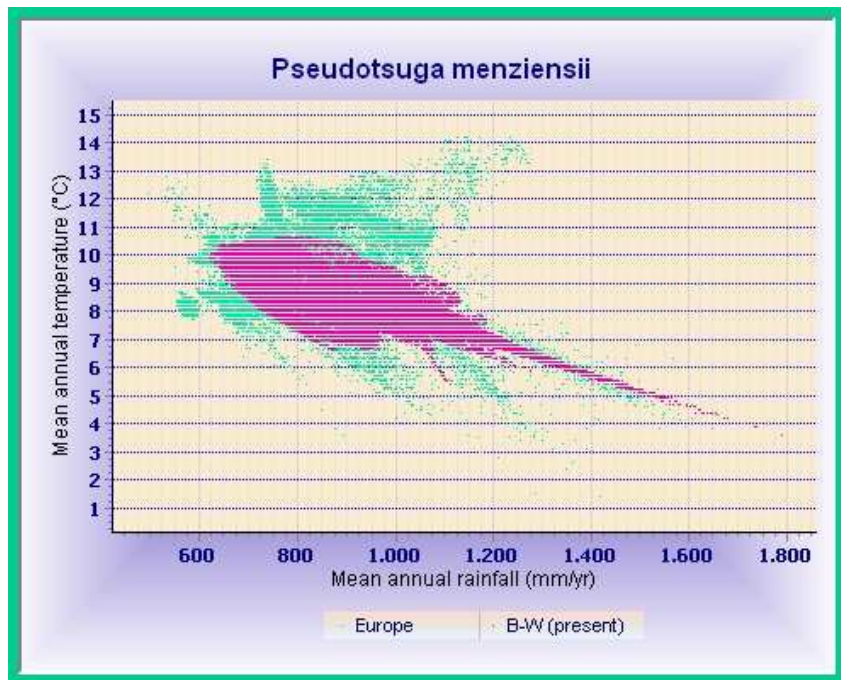


Fig. 4a: Current climate space

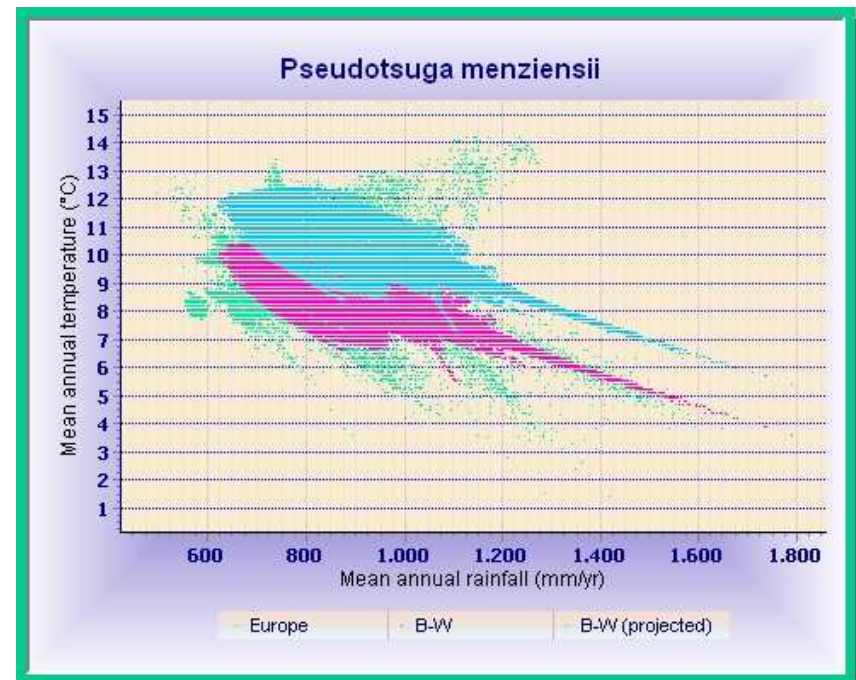


Fig. 4b: Projected climate space

Scots pine

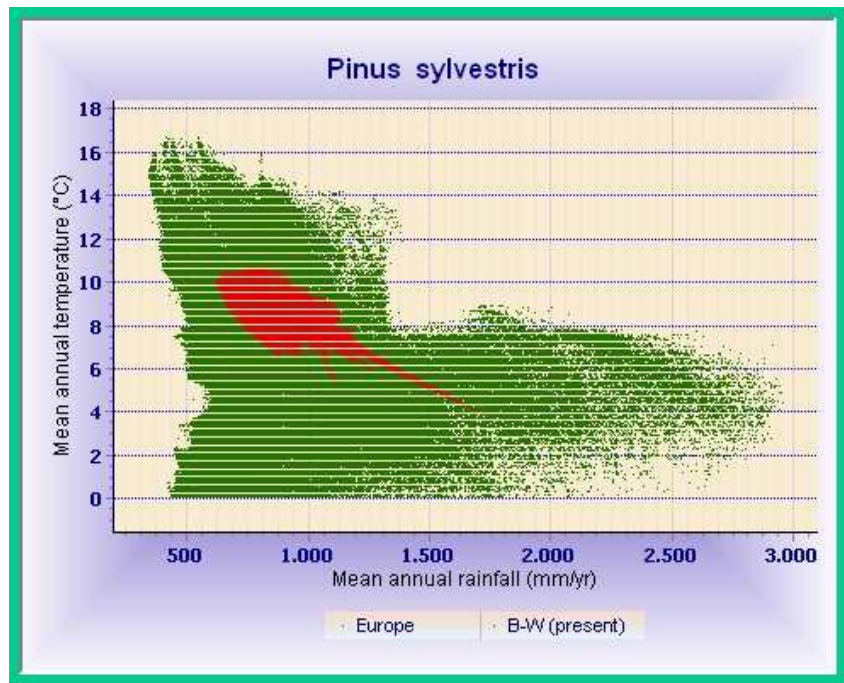


Fig. 5a: Current climate space

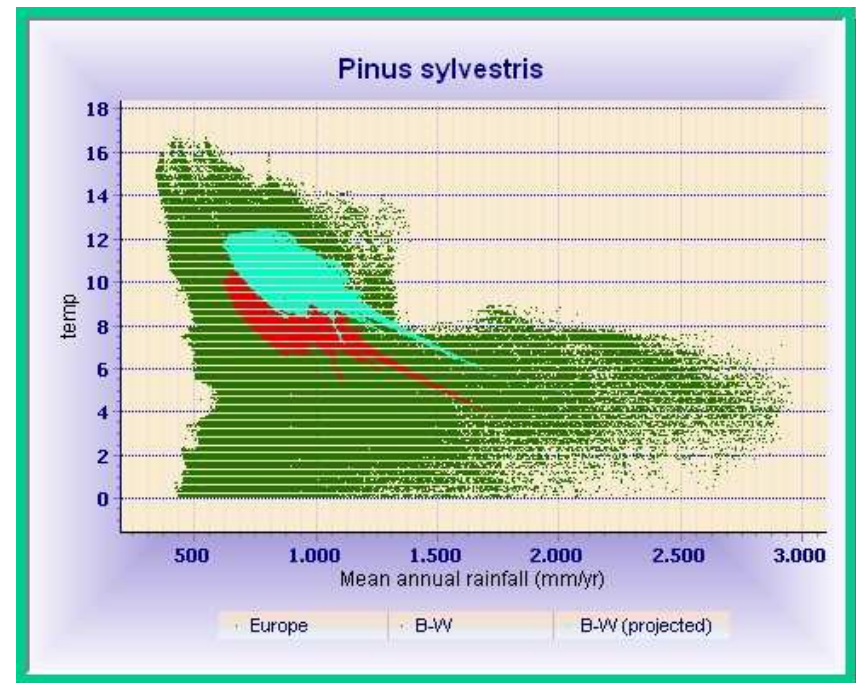


Fig. 5b: Projected climate space

European beech

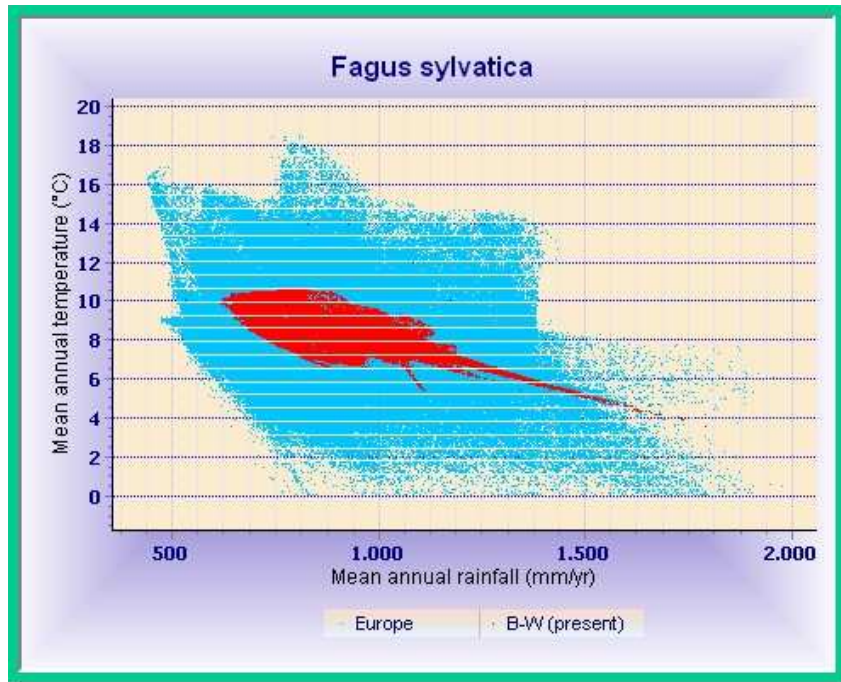


Fig. 6a: Current climate space

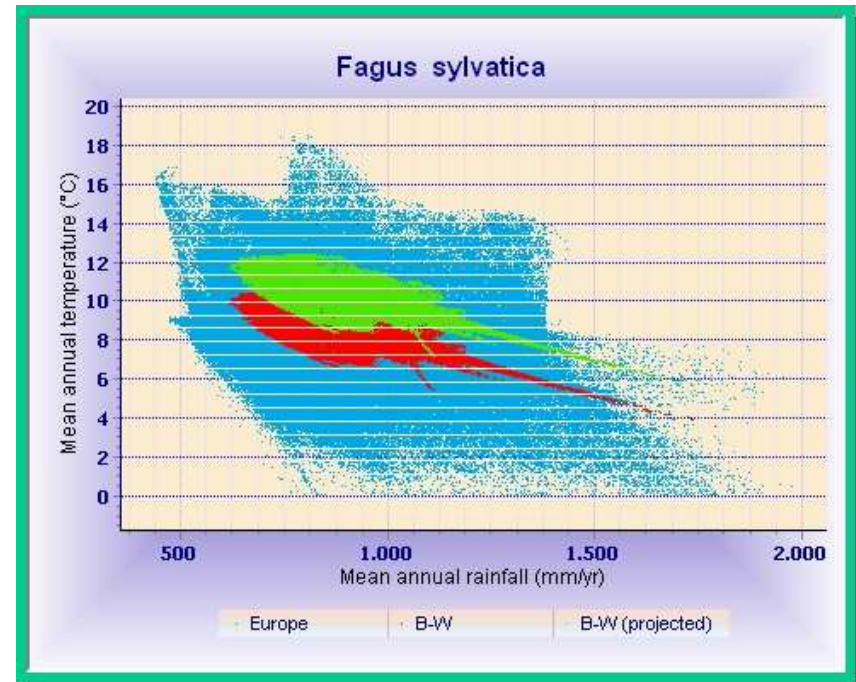


Fig. 6b: Current climate space

Quercus robur

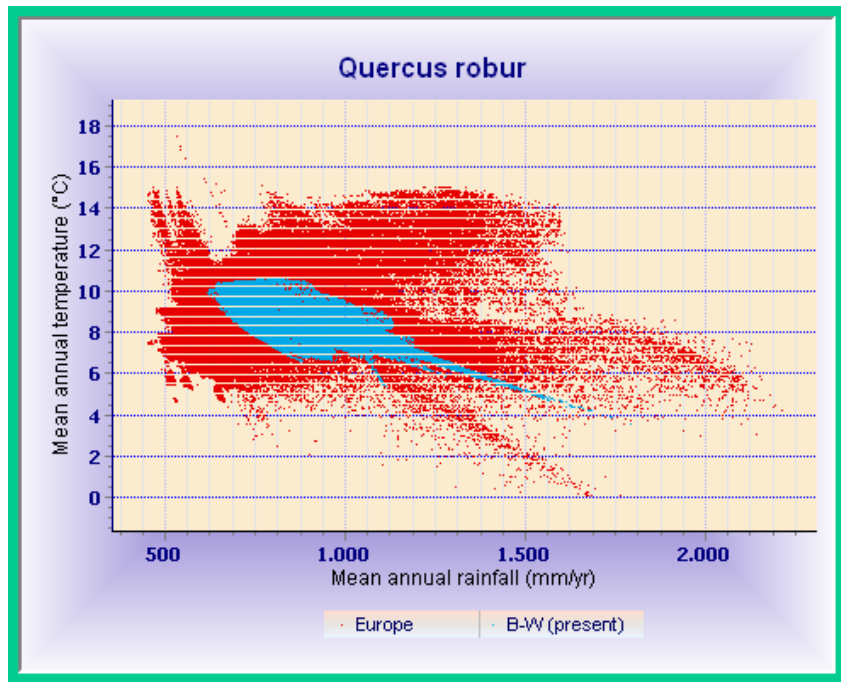


Fig. 7a: Current climate space

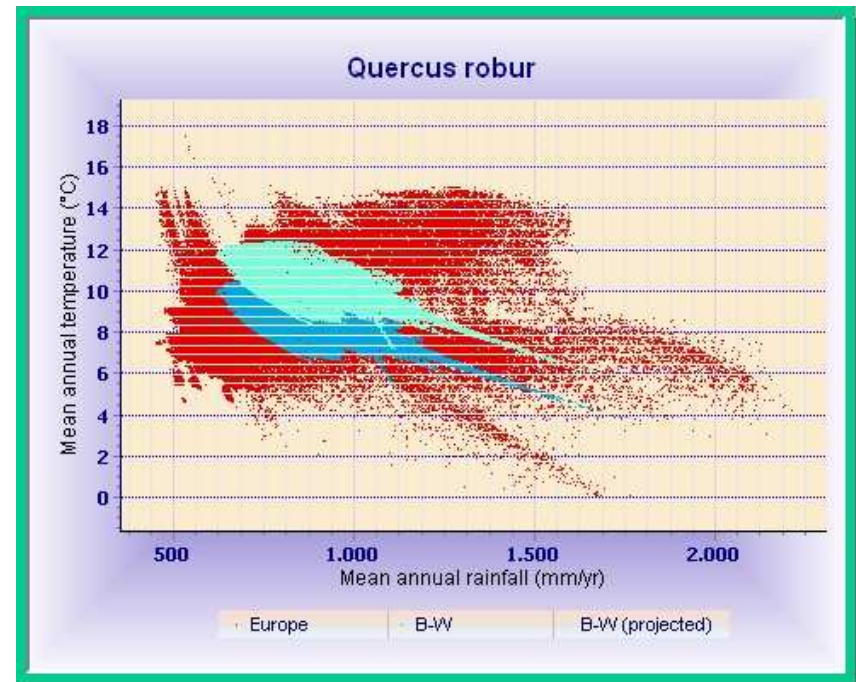


Fig. 7b: Projected climate space

Q. petraea

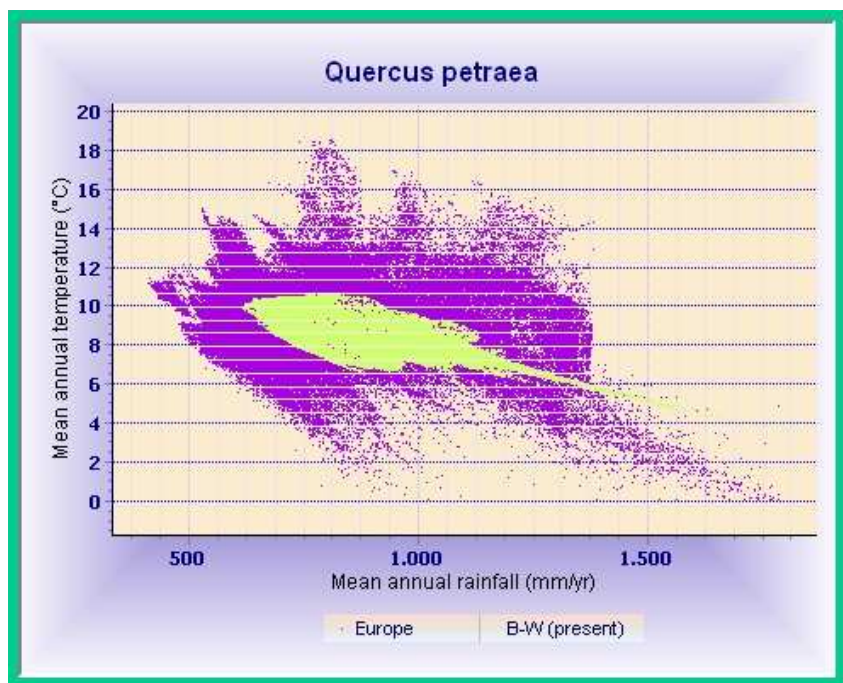


Fig. 8a: Current climate space

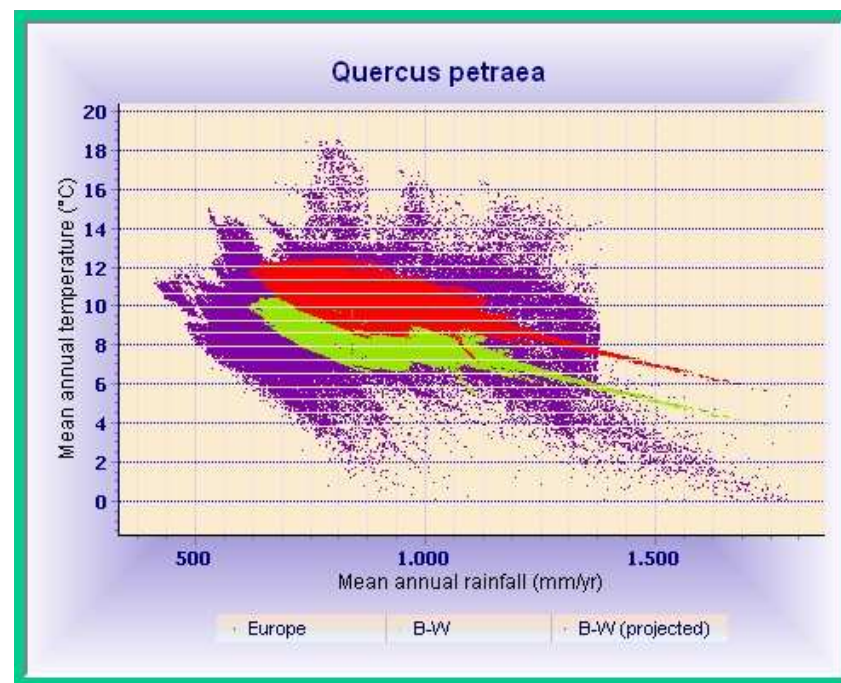


Fig. 8b: Projected climate space

Conclusions and Recommendations:

- The projected increase in temperature threatens the existence of siver fir, Douglas fir, spruce and maple
- Safe scenario for beech, pine, Q. robur and Q. petraea at the projected condition
- Climate envelopes are only limited to climate factors. Incorporation of other factors of growth recommended. Can be achieved through new methods e.g. GLM, ANN
- Only temperature increase considered. How about possible changes in precipitation

The Forest Research Station of Baden-Württemberg (FVA)

R.O. Mugabe
MSc. EF 2008-2010

Overview:

- Founded in 1958 through amalgamation of :
 1. Badisch Forest Research Facility (Karlsruhe 1870)
 2. Wuerttembergish Forest Research Facility (Stuttgart-Hohenheim, founded in 1872)
- Forest Research facility of Baden-Württemberg
- Also operates in Rheinland-Pfulz

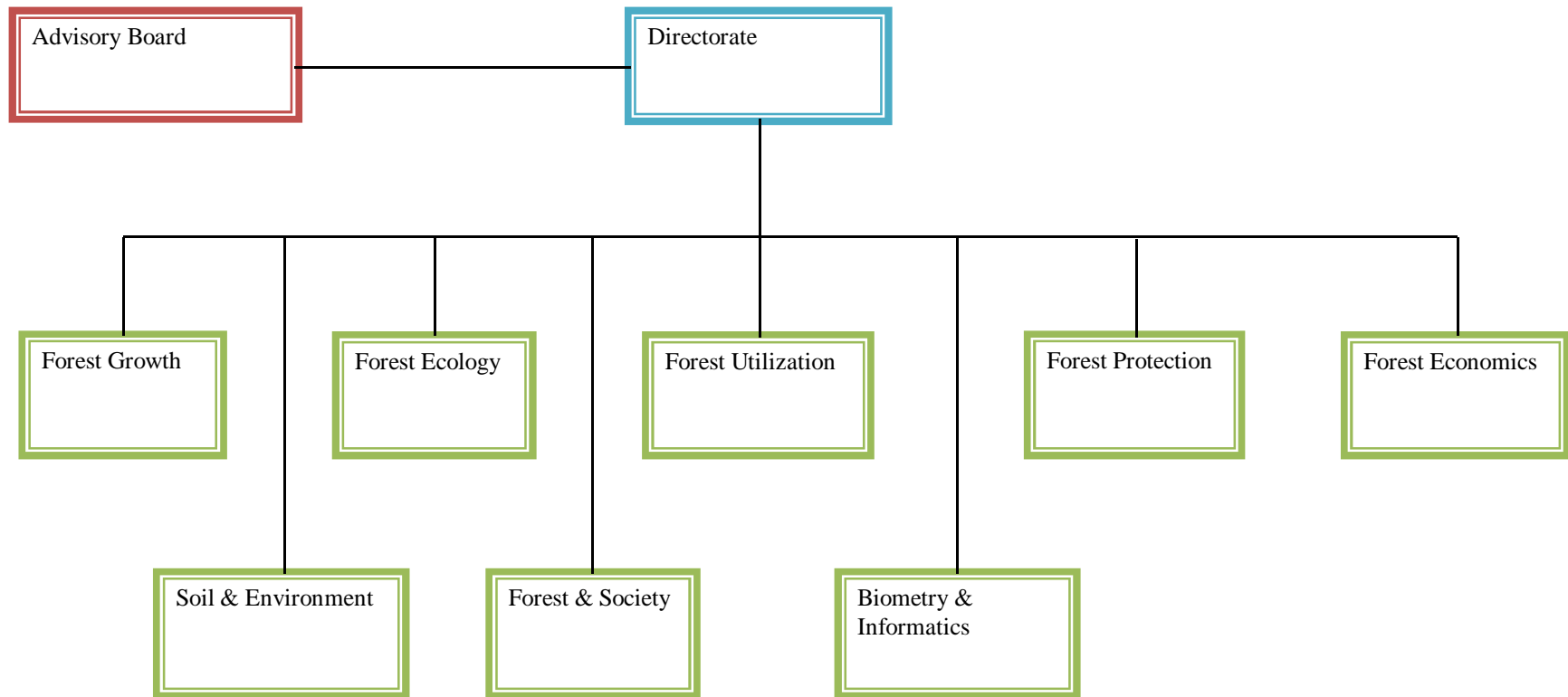
Mission:

➤ According to the Forest Act (§76 LWaldG) the Institute's mission is to provide rationale possibilities to the forest and timber industry to fulfill the multiple functions of the forests, and to investigate the ecological relationships between forests and the environment

Key Competences:

1. Long term forest research and monitoring
2. Research and development for practitioners
3. Knowledge transfer

Organisation:



Source: www.fva-bw.de

SWOT Analysis

Strengths:

- Has a large database (data from long-term surveys and national forest inventory)
- Long experience in research (in operation since 1958)
- Ideal location (close to university, France, Swiss)
- Innovative developments (inventory methods and software, Linder)
- Certified by the EU, IUFRO & EFI. Currently, the director is Chairman of EFI.

Weaknesses:

- The institute prepares and submits its budget by December but it knows of the budget approval and allocation only late in April.
- Some departments (e.g. economics, utilization and protection) are usually interrupted with ministry tasks
- Open for international research projects but only restricted to B-W and to a limited extent to the whole of Germany.

Opportunities:

- Competitors e.g. NWGRI and BFRI have more tasks and lacks long-term research experience. Others are too small for large projects like Natura 2000 & FFH
- New communication technologies (e.g. Lidar), inventory and regionalization of models offers opportunities for tackling emerging challenging research and communication needs
- Global concerns e.g. climate change and environmental awareness offer opportunities for more funding and acquiring new resources

Threats:

- The changing environment may render some of the protection measures being developed for threatened species ineffective.
- Development in information technology may render some of the FVAs methods obsolete
- Loss of key staff e.g. the loss of resourceful personnel in the departments of forest growth and forest protection recently to competitors
- Possible cuts in future state funding

Acknowledgements

- ✓ European Commission
- ✓ FVA
- ✓ Albert Ludwigs University
- ✓ Prof. Marc Hanewinkel
- ✓ Dr. Petra Adler
- ✓ Dr. Edgar Kublin
- ✓ Mrs. Marianne Stadler
- ✓ Staff-Library for Institute of Forest Growth



Danke!

This document was created with Win2PDF available at <http://www.win2pdf.com>.
The unregistered version of Win2PDF is for evaluation or non-commercial use only.
This page will not be added after purchasing Win2PDF.