Opportunities and risks using alien plant species for biomass production and as energy crops for liquid biofuel production - examples from Tunisia

Christophe Neff KIT

Eucalyptus occidentalis **coppice in the Kef region in Tunisia**
Photo: By courtesy of Ali Aloui

Outline

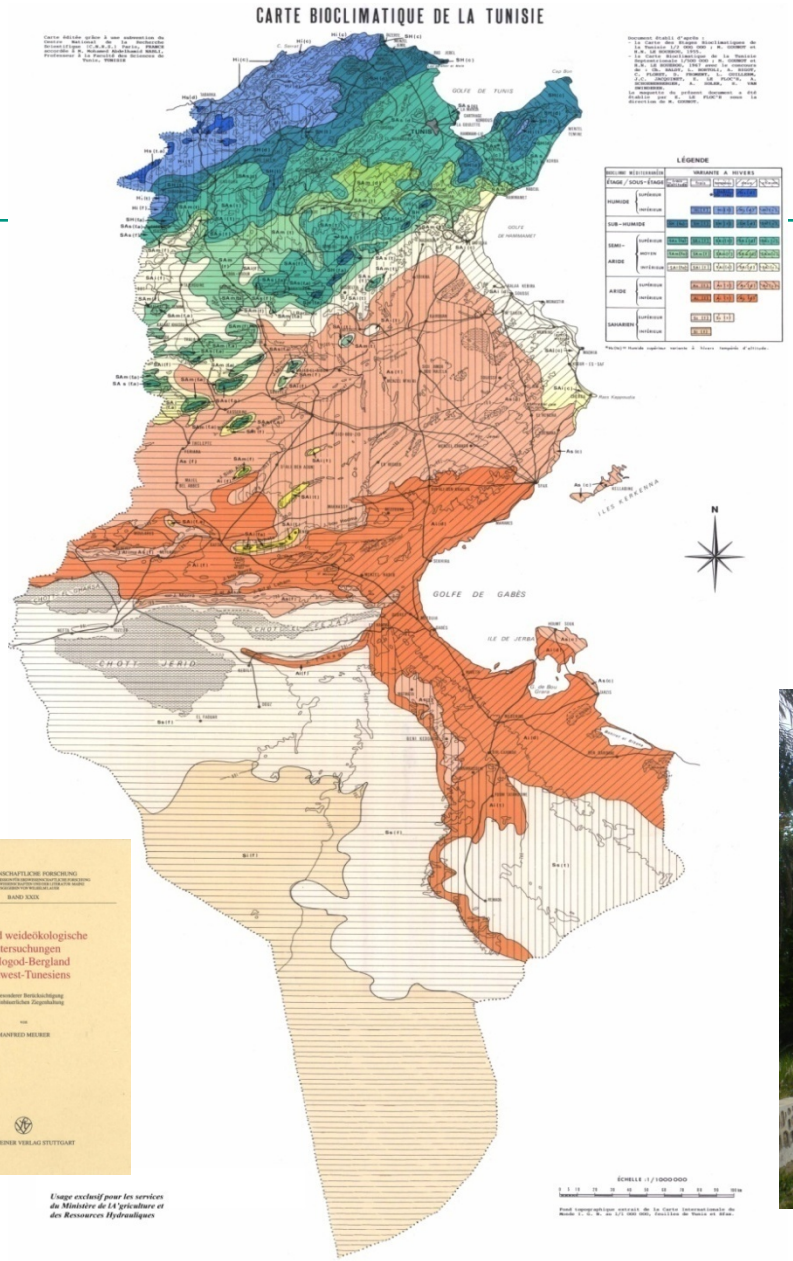
- Climate Change and exotic plant species in Tunisia (Theory)
- Bioenergy and exotic plant species in Tunisia (Application)
- What we (Wg Neff IFGG -KIT) can provide for a Sino-German research cooperation concerning „invasive exotics plants“

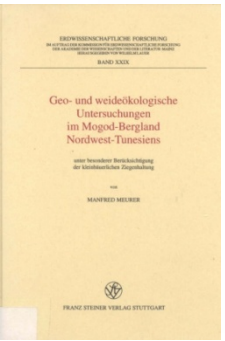
Tunesienprojects at the IFGG
Talk = Results of the two BMZ/GTZ studies

- ***«Stratégie nationale d'adaptation de l'agriculture tunisienne et des écosystèmes aux changements climatiques» (National strategy for adaption of tunisian agriculture & ecosystems to climate change) (group leader Ecosystem & Ecosystem services 2030)***

- ***« Technologies de production de biocarburants au niveau international et application pour la Tunisie - Appui à la mise en oeuvre de la convention cadre sur le changement climatique (UNFCCC, CCC/GTZ)» (Production technology of liquid biofuels at international level & application for Tunisia – facilities for the agremeent of climatic change (Kyto-Protocoll)) (Head of the Project)***

- ***Both Studies were fully financed by BMZ/GTZ***





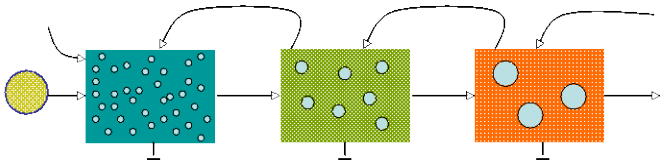
Photos: C.Neff + A.V. Mai

République Tunisienne
Ministère de l'agriculture et
des ressources hydrauliques

gtz

Coopération technique allemande

« Elaboration d'une stratégie nationale d'adaptation de l'agriculture tunisienne et des écosystèmes aux changements climatiques »



Stratégies d'adaptation « Ecosystèmes »

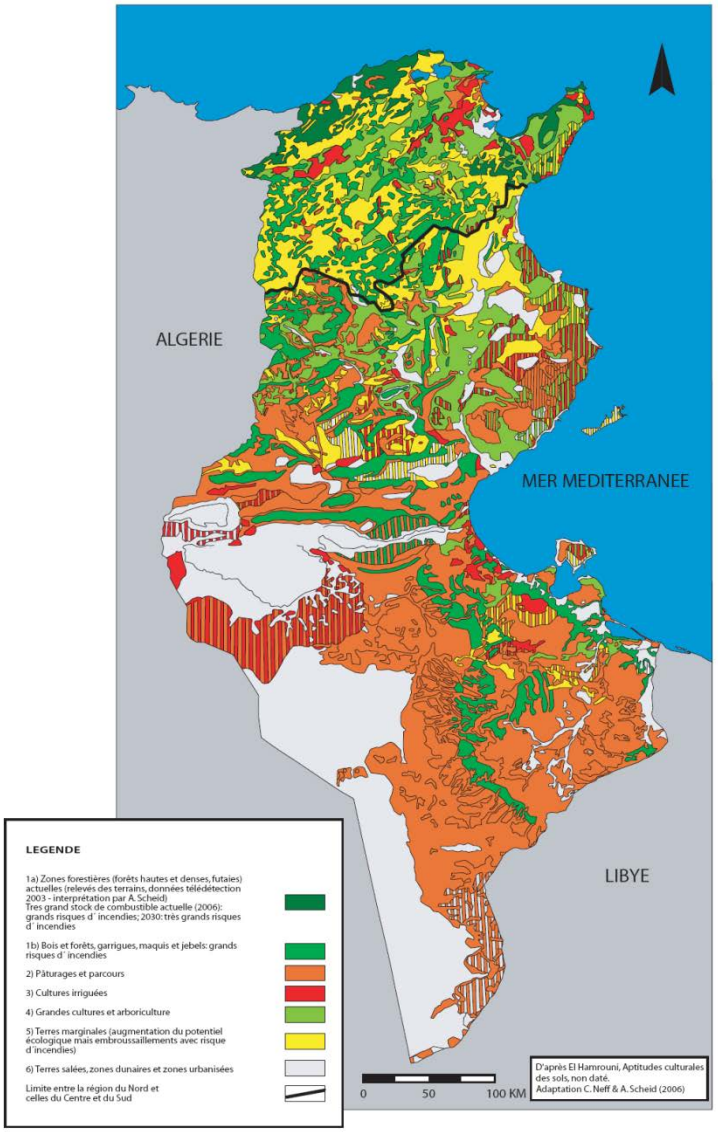
Christophe Neff
Université de Karlsruhe
GOPA
27.10.2006

GOPA
WORLDWIDE CONSULTANTS

ExAConsult
Tunisie

Objective of the Study
Forecast for ecosystem services & main ecological risks under climate change conditions in Tunisia 2030

CARTE DES PRINCIPAUX RISQUES ECOLOGIQUES EN TUNISIE EN 2030



Exotics, Aliens (Néos)
How to get the awarness of scientific & stake-holders in Tunisia!

- alien plants**:** phyto-sanitaires risks
- alien animals**:** zoo- sanitaires risks
- alien plants + alien animals = alien species (Neobiota)

Neobiota
risk to see new diseases emerge for :
mankind, domestic animals & plants
Example:
Chikungunya
Vector: *Aedes albopictus* (Tigermoskito)

Since 2010 Chinkungunya is established in mediterranean France (Dept. Var)

Source Photo: Lorenz King 1.07.2005

Definitions and Terminology

- **a) native (indigenous): species naturally occurring in an area since prehistorical time;**
- **b) introduced (alien, exotic): deliberate or accidental release of a species into an area in which it has not occurred in historical times;**
- **c) invasive (naturalised, neophyte, adventive): the establishment of self-regenerating, usually expanding, populations of an introduced species in a free living state in the wild;**
- **d) weed (pest): any plant, either native or introduced, interfering with the objectives or requirements of people.**

- **Adapted after : Bingelli, P. (1994): Misuse of the terminology and anthropomorphic concepts in the description of introduced species. In: Bulletin of the British Ecological Society, 25,1, 10-13.**

Les Neos – pyramides des risques -

Maladies humaines
(vecteurs de maladies)

Risques veterinaires
(production animale)

Risques phytomedicinales
(production agricole)

Risques ecologiques
(perturbation des courant energetiques, Augmentation de risques de feux)

Risques pour la biodiversité

Risques pour des especes phares

Transformation de l‘ image esthetique du paysage (Leitbilddiskussion/quel paysage desirons nous?)

Source : Neff, C. (2006) : Projections Ecosystèmes tunisiens 2030, (Resumé revise de L'EXPOSE «Projections Ecosystèmes tunisiens 2030» tenu le 6.7.2006 à Sidi Bou Said), Version draft du 17.8.2006 21:30, Karlsruhe.

Riskpyramide sensu Neff 2006

Threats for Human health
(Vector for disease)

Threats for Veterinerian medicine
(Farmanimals)
(Solanum elaeagnifolium (Mounir Mekki 2006))

Phytomedical Risks
(Plantproduction)

Threat for Ecosystem services
(metabolic cycles, increasing fire risks)

Threat for biodiversity

Threat to rare or protected Species

Threat to esthetics of Landscape/Imagery of Landscape

Source : Translated & adapted from Neff, C. (2006) : Projections Ecosystèmes tunisiens 2030, (Resumé revise de L'EXPOSE «Projections Ecosystè
le 6.7.2006 à Sidi Bou Said), Version draft du 17.8.2006 21:30, Karlsruhe fig. 6.

Technologies de production de biocarburants au niveau international et application pour la Tunisie - Appui à la mise en oeuvre de la convention cadre sur le changement climatique (UNFCCC, CCC/GTZ)

Origin of the Study (GTZ)
Objective of the GTZ Biocarburant Study

- A growing demand of private national and international investors to launch large scale *Jatropha curcas* plantation projects for bio-diesel production in Tunisia.
- The plant was unknown in Tunisia
- Tunisia had no experience in liquid biofuel production
- Jatropha curcas was (in 2007/08) the new star in the biofuel scene

  (in Germany heavily promoted by Prof Klaus Becker Univ. Hohenheim)

- Technologies de production de biocarburants au niveau international et application pour la Tunisie = **Testing potentially usable plant species for liquid biofuel production in Tunisia using a SWOT- Analyse (Strenght, Weakness, Opportunities and Threats as defined by GTZ)**

Jatropha curcas experimental plot in Tunisia (Nabeul)

Photos: By courtesy of Ghazi Gader

Recommandations for Tunisia

NO : for liquid biofuels first generation (concurence for food-production) at the national level

Yes :
For liquid biofuels first generation at the
Regional level: ethanol / Sugar cane (use of sewage irrigation)
Local level: biodiesel/ Jatropha/ Ricinus

Yes:
For production of pre-product for second generation liquid biofuels based on rapid growing forest-trees using degraded land
Local & regional level
Wood-pellets for heating or electricity production
International & global level
Wood-pellets & pyrolyse oil for BTL Production

Source: adapted after ; Neff, C., Scheid, A. (2008b) : Les Biocarburants – Analyse du potentiel de production de biocarburants et orientations pour la Tunisie. Résumé de l' étude. Octobre 2008. In: République Tunisienne, Ministere de l'Environnement et du Développement Durable, Coopération Technique Allemande gtz (Eds) : Colloque – les biocarburants : potentiel et perspectives d'une énergie durable en Tunisie. Tunis, 4 Novembre 2008 – Résumés des études -, p. 1-13.

Potentially forest species for biomass production in Tunisia

Name	Biofuel technologie	Situation in Tunisia Tunisie	Degradaded areas & badlands	Sewage irrigation	Salt tolerant
Acacia cyanophylla	BTL, BETH	Naturalized, introduced by french foresters for dune stabilization, Short rotation forestry adapted	X	X	
Pinus pinea	**BTL, BETH**	**Native to Tunisia/ native to complete thermomediterranean Area**	**X**	**X**	
Eucalyptus Camadulensis	BTL, BETH	One of the most important forest trees in Tunisia		X	X
Eucalyptus globulus	BTL, BETH	Introduced by French foresters for Swampland melioration		X	

Source: adapted from Neff & Scheid 2008b: Les Biocarburants - Analyse du potentiel de production de biocarburants à l'échelle internationale et en Tunisie. Executive summary/sommaire exécutif. "Orientations pour la production de biocarburants en Tunisie". Karlsruhe, Tunis, GTZ.

Acacia cyanophylla in Tunisia

Acacia cyanophylla used to fixe moving coastal dune in Tunisia
Photo: By courtesy of Ali Aloui

Outcome of the biocarburant project in Tunisia ?

Dear Mr Neff,

In order to allow my colleague Ghazi Gader to follow this exchange I'll reply in English:.
We were told that there was very little work on this issue after our study. The Ministry of Agriculture apparently made some effort to apply for donor funds for pilot projects etc. however without any tangible outcome. This does not mean of course that the study and the discussions around it did not contribute to strengthen knowledge and competencies in the country.
The only practical work on this issue we know of are some trial plots of which we send you a brief evaluation in annex.

With regard to our project, quite frankly, we do not follow the biodiesel/biofuel discussion very actively as we do not believe it to be of great potential neither for soil protection nor for income generation nor for climate change adaptation or mitigation or for energy security here in Tunisia.

Best, Anselm Duchrow

Email from Anselm Duchrow, GIZ Teamleader Tunis 18.10.2011

Riskpyramide sensu Neff 2006 actualized 2011

Threats for Human health
(Vector for disease)

Threats for Veterinerian medicine
(Farmanimals)
(Solanum elaeagnifolium (Mounir Mekki 2006))

Phytomedical Risks
(Plantproduction)

Threat for Ecosystem services
(metabolic cycles, increasing firerisks)
(Acacia cyanophylla for Pinus pinea productive Forests In the Tabarka region)

Threat for biodiversity

Threat to rare or protected Species

Threat to esthetics of Landscape/Imagery of Landscape

Source : Translated from Neff, C. (2006) : Projections Ecosystèmes tunisiens 2030, (Resumé revise de L'EXPOSE «Projections Ecosystèmes le 6.7.2006 à Sidi Bou Said), Version draft du 17.8.2006 21:30, Karlsruhe fig. 6.

Acacia cyanophylla invading productive Pinus pinea forests in North Tunisia

Photo: By courtesy of Ali Aloui

Impact studies & Invasive Potential

Tunisia - French Protectorate
Acacia cyanophylla, Eucalyptus globulus etc (no impact studies)

Tunisia - Ben Ali regime
Jatropha curcas (no impact studies)

Germany
Silphium perfoliatum is actually promoted in Baden-Württemberg as an alternative for maize-based biogas production
(no impact studies concerning the invasive potentiel of Silphium perfoliatum were carried out (pers. Commun. Kerstin Stolzenburg LTZ Augustenberg))
Is considered as naturalized in France (Fournier 1990)

Conclusion

Exotic forest trees & alien plants can be in some cases a reasonable way to produce biomass for liquid biofuel production.

But before deliberatly realising a plant for economic purpose in a „new habitat“ – Impact studies concerning „invasive potential“ should be engaged.

Such „Impact studies“ should be ecological cost – benefit studies, as suggest by Fillipi & Aronson 2010 for mediterranean garden plants – and tested for *Lippia canescens* (hairy fog fruit) (Verbenacae orig South – America) by the same authors (same ref).

(Fillipi, O., Aronson, J. 2010: Plantes invasives en région méditerranéenne : quelles restrictions d'utilisation préconiser pour les jardins et les espaces verts ? In: Ecologia mediterranea, V. 36, 2, p. 31- 54.)

What we (Wg Neff IFGG -KIT) can provide for a Sino-German research cooperation concerning „invasive exotics plants“

- Theoretical frame work: who is invasive, where and why
- Spatial Modelling: Modelling spatial spread of invasive plants
- historical landscape approach: Old-Word MTE, SBMTE (sensu largo)
- Imagery approach : Human preceptions of „alien plants“
- management strategies : prescriped fire, controll by use (bioenergy)

Sources & Bibliography

BINGELLI, P. (1994): Misuse of the terminology and anthropomorphic concepts in the description of introduced species. In: Bulletin of the British Ecological Society, 25,1, 10-13.

GADER, G. (2009): Experimental trials for Jatropha curcas cultivation in Tunisia. Presentation on the Regional Symposium on "Oil Trees for Energy Production and Valorization of Marginal Land and Water Resources, Luxor, Egypt 10-13 Feb. 2009

FOURNIER, P. 1990. Les quatre flores de France – Corse comprise (Générale, Alpine, Méditerranéenne, Littorale) – nouveau tirage. Paris, Éditions Lechevallier, 1104 pp.

Fillipi, O., Aronson, J. 2010: Plantes invasives en région méditerranéenne :
quelles restrictions d'utilisation préconiser pour les jardins et les espaces verts ? In: Ecologia mediterranea, V. 36, 2, p. 31- 54.

NEFF, C., MARINGER, J., SCHOENENBERGER, N., CONEDERA, M. (2011): Presenza e grado di naturalizzazione della flora esotica nella regione di Sasso Fenduto (Comune di Cugnasco-Gerra, Ticino). In: Bolletino de la Società ticinese di Scienze naturali, V. 99, pp. 53 – 62. (ISSN 079-1254).

NEFF, C., ALOUI, A., EL HAMROUNI, A., SOUISSI, A. , GROßMANN, A. (2007) : 7.4 Ecosystèmes. In : République Tunisienne, Ministère de l'agriculture et des ressources hydrauliques, GTZ (Coopération technique allemande) (Eds.) : « Stratégie nationale d'adaptation de l'agriculture tunisienne et des écosystèmes aux changements climatiques », Cahier 7, Rapport des groupes d' experts, p. 33- 43.

NEFF, C., SCHEID, A.(2008a) : Les Biocarburants - Analyse du potentiel de production de biocarburants à l'échelle internationale et en Tunisie. Executive summary/sommaire exécutif. "Orientations pour la production de biocarburants en Tunisie". Karlsruhe, Tunis, GTZ.

NEFF, C., SCHEID, A. (2008b) : Les Biocarburants – Analyse du potentiel de production de biocarburants et orientations pour la Tunisie. Résumé de l' étude. Octobre 2008. In: République Tunisienne, Ministere de l'Environnement et du Développement Durable, Coopération Technique Allemande gtz (Eds) : Colloque – les biocarburants : potentiel et perspectives d'une énergie durable en Tunisie. Tunis, 4 Novembre 2008 – Résumés des études -, p. 1-13.

Rotherham, I.D., Lambert, R.A. (Eds) (2011): Invasive & Introduced Plants & Animals. Human perceptions, Attitudes and Approaches to Management. London (Earthscan)

Ricinus communis

Native & invasive

in Tunisia

Nobody semeed to be concerned about!

„Many species, in the wrong place at the wrong time, can and will cause problems to nature and people. Alien species are often particularly invasive but then so are many native species (Rotherman & Lambert 2001, 9).“

Thank you for your attention

Photo: © C. Neff Ricinus communis on urban wasteland in Tunis (Feb. 2008)