TEXTE
03/2011

Incentives for development and application of environmentally friendly biotechnological products and processes

Summary

Umwelt Bundes Amt
Für Mensch und Umwelt

| TEXTE | 03/2011

ENVIRONMENTAL RESEARCH OF THE
FEDERAL MINISTRY OF THE ENVIRONMENT,
NATURE CONSERVATION AND NUCLEAR SAFETY

Project No. (FKZ) 3708 66 300
Report No. (UBA-FB) 001399

Incentives for development and application of environmentally friendly biotechnological products and processes

Summary

by

Dr. Hans-Bernhard Rhein (project management)
Katharina Endler
Umweltkanzlei Dr.Rhein, Sarstedt (Germany)

Prof. Dr. Roland Ulber
Dr. Kai Muffler
Felix Müller
Technische Universität Kaiserslautern (Germany)

On behalf of the Federal Environment Agency (Germany)

UMWELTBUNDESAMT

This publication is only available online. It can be downloaded from
http://www.uba.de/uba-info-medien-e/4057.html
along with the complete version (in German) and a German-language summary.

Publisher: Federal Environment Agency (Umweltbundesamt)
P.O.B. 14 06
06813 Dessau-Roßlau
Germany
Phone: +49-340-2103-0
Fax: +49-340-2103 2285
Email: info@umweltbundesamt.de
Internet: http://www.umweltbundesamt.de
http://fuer-mensch-und-umwelt.de/

Edited by: Section III 2.3 K Chemical Industry, Energy Production
Dr. Wolfgang Dubbert

Dessau-Roßlau, January 2011

Summary

Biotechnology is one of the innovative technologies required in order to secure Germany as a sustainable production location in terms of global competition. The proportion of biotechnological products in the chemical industry was 5% in 2005. Some studies forecasted an increase in biotechnological products, taking the proportion to up to 20% by 2010. From a current perspective, the current proportion of approximately 5% for 2010 will not increase significantly.

The subsequent question as to why biotechnological processes and products are not establishing themselves on the market more quickly forms the subject of this study. The current constraints, as well as existing and new incentives, will be analysed in order to be able to promote systematically the development and use of environmentally friendly biotechnological products and processes.

The primary focus of the study is on white (industrial) biotechnological (WBT) processes and products.

Based on preliminary research using published arguments in favour of the naming of relevant growth factors in biotechnology, it has proven useful to collect a broad range of opinions from experts in Germany, starting with a developed questionnaire.

The results and theses based on the evaluation of the questionnaire were then presented to an audience of specialists and experts as part of two follow-up events and individual interviews.

Using selected case studies, it was possible to check the statements made during the study and to clarify the constraints and incentives by way of example:

1. Biocatalytic production of sugar as a platform chemical made up of plant substances such as (hemi)cellulose for the synthesis of 2nd generation biofuels for example
2. Environmentally friendly (fermentative) production of polymer materials (e.g.: PHB (polyhydroxybutyrate)) from renewable raw materials

3. Production of the enzyme phytase using genetically modified micro-organisms to improve the utilisation of phosphates by non-ruminant animals (monogastric animals) and to simultaneously reduce environmental pollution resulting from phosphorus being released into the atmosphere

The examples permit the following main points to be considered at the same time:

1. The environmental relevance of the products and processes, in particular as regards CO_2 reduction and effects on the climate, sustainable use of resources and other effects that serve to relieve the burden on the environment directly during the production process (e.g. reduction of plant-related dangers or the risk to operational safety) or when using the product (the avoidance of hazardous substances).
2. Consideration of synthetic production processes primarily instead of, for example, the use of microorganisms to decompose hazardous substances as part of remedial environmental protection.
3. Differentiated consideration of bulk and fine chemicals, comparisons with traditional-chemical processes, including those biotechnologically produced products that cannot be produced using traditional methods or can only be produced with considerable outlay.

As constraints and incentives depend primarily on the subjective approach of players and their respective roles, the correspondingly differentiated respective interests (SMEs/large companies, state-funded/non-state-funded education and research facilities and associations) are taken into account in the evaluation.

Overall, projects are carried out in the following stages:

- **Phase 1:** preliminary survey of literature, identification of agents
- **Phase 2:** Survey of experts with the aid of a developed questionnaire on the range of topics:
  - Qualification, research and knowledge transfer

- Establishment of biotechnological processes
- Establishment of biotechnologically produced environmentally friendly products
- General incentive instruments

- **Phase 3:** Evaluation of the survey and presentation of a preliminary study with formulated consequences and incentives together with a basis for discussion for the experts' meeting
- **Phase 4:** Experts' meeting in the form of two consecutive expert discussions aimed at considering the incentives proposed in the preliminary study, in order to determine the need for suitable incentives to encourage the development and use of environmentally friendly biotechnological products and processes
- **Phase 5:** Evaluation of the expert discussion(s) and individual interviews
- **Phase 6:** Final report on results and recommendations for incentives

The results of the individual phases are evaluated in the study of practical and general recommendations with regard to incentives to be provided by the client and the government and the content structured according to the following topics:

Governmental incentives
Tax policy/subsidies: ▪ Tax treatment of R&D and venture capital ▪ SME-specific impact ▪ Tax incentives outside Germany ▪ Process and product-oriented tax regulations
Subsidies, education and research policy ▪ Support programmes and development ▪ Funding priorities in terms of content and funding criteria ▪ Sponsorship of start-up companies ▪ Promotion of networks

▪ Promotion of demonstration projects ▪ Promotion of public facilities and education/research policy
Basic political conditions ▪ Licensing tools and tools relating to policies and regulations ▪ Patent law ▪ Quota systems ▪ Sustainable development strategies ▪ Government certificates, ecological labels
Government demand
Information policy/consumer intelligence

Non-governmental incentives
Knowledge transfer and cooperation
Organisation-related policy
Capital market financing

Various incentives to promote or establish environmentally friendly biotechnological processes and products can be formulated from the aforementioned results. These strategy recommendations are divided pragmatically into direct and indirect monetary promotion opportunities, modified basic educational, economic and environmental conditions and accompanying measures. They are individually summarised below:

Direct promotion of biotechnological products/processes

- Organise existing funding initiatives in a more effective manner:
  - Enhanced structuring according to topic and grouping of support programmes, improvement in the transparency of SME support programmes, e.g. by introducing an SME pilot service
  - Better coordination of funding bodies
  - Increased integration of professional associations in defining support programmes
  - Simplification of the application process
  - More short-term grant approvals (1 – 3 months following application)

- Periods covered by support programmes to be organised in a more flexible manner (a few months to 5 years)

- Expand funding areas,
  Longer funding periods (2 – 5 years) also across a number of developmental stages, e.g. extensive funding of downstream processing for low-priced products *until products are marketable*
- Set simultaneous funding priorities,
  e.g. by providing financial resources in order to support junior staff
- Open up new funding areas,
  e.g. by guaranteeing subsequent funding during the post-seed phase, if necessary using profit-sharing models instead of funding subsidies
- Extend funding quotas,
  e.g. by increasing funding for subsidies when more important such as sustainable development criteria are met
- Adjust the basic conditions of funding,
  e.g. by reducing or varying the number of SME shareholdings required
- Make decisions regarding funding more transparent,
  e.g. by putting together, in an interdisciplinary and topic-based manner, committees of technical consultants for expert services
- State-funded support of demonstration facilities:
  - Extensive funding of demonstration facilities (“direct subsidies”), that are planned between colleges/universities and SMEs/large companies
  - Loan-based funding of demonstration facilities that are tailored to individual processes and remain company-owned from the point of view of protecting knowledge and expertise
  - Government opportunities to invest in demonstration facilities with the resources being poured back into the funding bodies that provided the venture capital or subsequent partial socialisation of the profits

- Clear distinction between so-called “demonstration facilities” with regard to their own marketability (plant construction) and/or with regard to their use to develop/optimise processes

- Provision of guarantees in order to support company collaborations with SMEs
- Government support for suitable participation models throughout the funding phase and beyond (cf. *Founding Angels* model)

Indirect promotion of biotechnological products/processes

- Capital mobilisation for start-ups and SMEs:
  - Exemption from tax on profits from private disposal transactions relating to shareholdings in technology companies, with a minimum holding period being introduced, if necessary, including employee shareholdings
  - Abolition of capital gains tax on capital gains from direct or indirect shareholdings in innovative companies
  - Extending the regulations pertaining to balancing losses for investors, opportunities to make unlimited use of losses in innovative companies, SMEs to be put on an equal footing with large companies (modification of the German Corporation Tax Act)
  - Introduction of a quota - based on the overall investment volume – for institutional investors in order to establish a minimum proportion of innovative and environmentally friendly companies
- Increase in the potential demand for WBT products,
  within the framework of public calls for tender for e.g. biotechnologically produced detergents and cleaning agents and plastic packaging or similar.

Basic educational, economic and environmental conditions

- Expansion of tertiary education:
  - Incorporate special foundation courses into studies
  - Promote practical plans to undertake training/further training more
  - Promote doctorate-level qualifications in specialist research areas

- Strengthen and develop existing skills networks
  Launch comparable networks that are distributed in a sensible manner in terms of location and topic addressed and establish a strategic coordinating body at the national level
- Development of guidelines and models for establishing consortia between companies, in particular legal assistance for start-ups and SMEs, in order to safeguard know-how and the granting of licences

Accompanying measures

- Central allocation of labels (for products) and certificates (for processes) in accordance with standard, verifiable awarding criteria: clear identification of environmental advantages compared to conventional products/processes (see heading “Government Certificates, Ecological Labels” in section 4.1.3)
- Access to demonstration facilities, publication of model projects across the entire value creation chain
- Proactive PR work, involvement of environmental protection and consumer associations, differentiated consumer intelligence carried out by independent and impartial institutions; above all, tackling the issue of “genetic engineering in closed and open systems”
- Launching of a public acceptance campaign to emphasise the usefulness of biotechnology
- Introduction of “Round Tables” to accompany policy:
  - Overcoming communication barriers (“businessmen/women”, “technical experts” and “politicians”)
  - Organisation of an exchange of experience between knowledge transfer centres and with networks
  - Early involvement of associations in the development of new incentives
- Preparation of WBT success stories by media executives to be used for PR work (journalists) and non-technical knowledge-based disciplines (business people and politicians)

- Introduction of legal preferences or quotas compared to conventional processes/products subject to the requirements of sustainable development aims being met
- Creation of an incentive system or statutory provisions for identifying and analysing production processes that are hazardous to the environment and determining sustainable development criteria with the possibility of transferring these to biotechnological (partial)processes; perhaps include these provisions in BAT data sheets.

The aforementioned proposals of ways to promote environmentally friendly biotechnological procedures and processes only lead to limited results when taken individually.

This means that ecological labels and certificates will not have an impact on WBT unless they are accompanied with immediate monetary advantages (tax benefits, special funding). Individual incentives also run the risk of being counterproductive in the medium term if used without due consideration. One-sided funding of application-based research at colleges and universities may therefore give rise to a market distortion that prevents start-ups from emerging and threatens the existence of SMEs conducting the same style of research. Taking this into account, although indirect taxes primarily appear to be more ineffective, they nevertheless produce “more desirable” results and are therefore much more effective.

It will therefore be important to develop an agent-based matrix in which the aforementioned incentive systems are usefully combined and further developed in a consistent manner, for example, with politically desirable sustainable development strategies being awarded priority.

In order to make this necessary grouping of a very wide range of incentive systems socially acceptable, it is necessary to involve people in important positions. This must be accompanied by targeted and differentiated PR work.

For it to be effective in the medium-term, consideration must be given to fundamental economic principles: the guaranteeing of investments made,

international competitiveness and therewith observation of comparable models and regulations in other countries.